EFFICACY OF DIETARY INTERVENTION AND PSYCHOSOCIAL MANAGEMENT FOR DEPRESSION CARE AMONG PERINATAL WOMEN IN URBAN LOW-INCOME NAIROBI KENYA

BEATRICE AUGUSTINE MADEGHE

A80/52096/2017

A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN APPLIED HUMAN NUTRITION

DEPARTMENT OF FOOD SCIENCE NUTRITION AND TECHNOLOGY FACULTY OF AGRICULTURE

UNIVERSITY OF NAIROBI

2022

DECLARATION

This thesis is my original work and has not been submitted for the award of a degree in any other university.

Signature..... Date 15/06/2022

Beatrice Augustine Madeghe

This thesis has been submitted with our approval as university supervisors.

Signature..... Date June 16, 2022

Professor. Wambui Kogi-Makau
Professor (Human Nutrition)
Department of Food Science Nutrition and Technology (DFSNT)
University of Nairobi.

Signature..... Date June 17 2022

Dr. Sophia Ngala
Lecturer (Human Nutrition)
Department of Food Science Nutrition and Technology (DFSNT)
University of Nairobi.

Signature..... Date June 19th 2022

Professor. Manasi Kumar.
Clinical Psychologist and psychotherapist
Senior lecturer
Department of Psychiatry
College of Health Sciences

DECLARATION OF ORIGINALITY

Name of student:	***Beatrice Augustine Madeghe***
Registration Number:	***A80/5296/2017***
Faculty/School/Institute:	**Agriculture**
Department:	***Food Science Nutrition, and Technology***
Course Name:	***Doctor of Philosophy in Applied Human Nutrition***

Title of the work: ***Efficacy of Dietary Intervention and Psychosocial Management for Depression Care among Perinatal Women in Urban Low-Income Nairobi Kenya***

DECLARATION

1. I understand what Plagiarism is and I am aware of the University's policy in this regard.
2. I declare that this thesis, is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work, or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it off as his/her own work.
5. I understand that any false claim in respect of this work shall result in disciplinary action in accordance with University Plagiarism Policy.

Signature: B.Madeghe.....

Date: June, 16, 2022.....

TURNITIN REPORT

Turnitin Originality Report

EFFICACY OF DIETARY INTERVENTION AND PSYCHOSOCIAL MANAGEMENT FOR DEPRESSION CARE AMONG PERINATAL WOMEN IN URBAN LOW-INCOME NAIROBI KENYA by Beatrice Augustine Madeghe

From FOOD SCIENCE NUTRITION AND TECHNOLOGY (DOCTOR OF PHILOSOPHY IN APPLIED HUMAN NUTRITION)

- Processed on 25-May-2022 14:39 EAT
- ID: 1843881219
- Word Count: 40630

Similarity Index
13%
Similarity by Source

Internet Sources:
10%
Publications:
3%
Student Papers:
6%

June 16, 2022

sources:

1 < 1% match (Internet from 09-Apr-2020)
https://edoc.unibas.ch/76124/

2 < 1% match (Internet from 19-Mar-2022)
https://figshare.com/articles/dataset/Maternal_Depression_experiences_FDG_transcription/13265549

3 < 1% match (Internet from 13-Jul-2020)
https://www.health.govt.nz/system/files/documents/publications/guidance-for-healthy-weight-gain-in-pregnancy-jun14-v2.docx

4 < 1% match (Internet from 11-Oct-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/25215/Mekides%20Getnet%20%202020.doc?isAllowed=y&sequence=1

5 < 1% match (Internet from 06-Dec-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/4563/Woinshet%20Gezahegn.pdf?isAllowed=y&sequence=1

6 < 1% match (Internet from 11-Oct-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/22943/Leyuwork%20Antonious.pdf?isAllowed=y&sequence=1

7 < 1% match (student papers from 23-Oct-2020)
Submitted to Mount Kenya University on 2020-10-23

8 < 1% match (student papers from 14-Feb-2020)
Submitted to Mount Kenya University on 2020-02-14

9 < 1% match (student papers from 12-May-2018)
Submitted to Mount Kenya University on 2018-05-12

10 < 1% match (student papers from 09-Dec-2021)
Submitted to Pennsylvania State System of Higher Education on 2021-12-09

11 < 1% match (student papers from 06-Dec-2011)
Submitted to Pennsylvania State System of Higher Education on 2011-12-06

12 < 1% match ()
Caparrós González, Rafael Arcángel. "Consecuencias de la activación del eje hipotalámico-Hipofisario-Adrenal sobre la salud materno-fetal durante el embarazo, parto y puerperio",

19/6/22

CHAIRMAN
DEPT. OF FOOD SCIENCE, NUTRITION

DEDICATION

I dedicate this thesis to the almighty God, the source of wisdom and knowledge. I dedicate this work to my husband, John Recha, who has supported me throughout my Ph.D. journey. To my children, Joycatherine, Shammah, Josiah, and Ethan, who encouraged me and gave me their time to undertake this Ph.D., may this inspire you in life. To my mother, Catherine, and my father, Augustine Madeghe, who always believed in me. To my brother Emmanuel Madeghe who laid the foundation of my education. Thank you, and may the Lord God bless you all.

ACKNOWLEDGMENT

I am grateful to my academic supervisor, Professor. Wambui Kogi-Makau. Thank you for your guidance and support. I have benefited greatly from your wealth of knowledge. My sincere gratitude goes to Dr. Sophia Ngala and Dr. Manasi Kumar for their professional guidance and endurance in supporting me in this work; they have all diligently guided me through developing the study protocol, study design, and data collection to the completion of writing up this thesis.

My sincere acknowledgment goes to the International Centre of Insect Physiology and Ecology (ICIPE) who provide the Bio Innovate Africa Fellowship for Women Scientists award during my Ph.D. studies. My sincere gratitude goes to the International Livestock Research Institute- ILRI- Food and Nutritional Evaluation Laboratory, International Potato Center (CIP), which hosted me during my fellowship. I wish to thank the health facilities staff from Kangemi and Riruta, Health Canters, for allowing me to conduct the research in their facilities. My special thanks go to all pregnant women from Kangemi and Riruta whom we have walked together in the intervention study up to completion and infants who participated in the study. My appreciation goes to Ruth Mwaura, and Theresia Mutisyo, the research assistants who helped with data collection and training sessions. Thank you to the Community Health Volunteers who worked so hard to mobilize women for the study till the completion of the intervention. I wish to thank Albert Tele and Mr. Mugo Joseph, who provided statistical support.

I wish to thank my extended family and friends for unconditional love and generous support, inspiration, and prayers. To all many others not mentioned here who helped in one way or another, thank you very much, and may God bless you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

ANC	-	Antenatal Clinic
BFE	-	Brain Food Essentials
BMI	-	Body Mass Index
CHW	-	Community Health Worker Volunteers
CI	-	Confident Interval
CMD	-	Common Mental Disorders
DDS	-	Dietary Diversity Score
DASS-21	-	Depression Anxiety and Stress Scale 21 depression subscale
CBT	-	Cognitive Behavior Therapy model
CESD-R	-	Centre for Epidemiological Studies Depression Scale
DSM-1V	-	Diagnostic & Statistical Manual of Mental Disorders 4th edition
EPDS	-	Edinburgh Postpartum Depression Scale
ERC	-	Ethical and Research Committee
FGD	-	Focus Group Discussion
HBF	-	Health Belief Model
ICD-10	-	International Classification of Diseases, 10th edition
KAP	-	Knowledge Attitude and Practice
KNH	-	Kenyatta National Hospital
LBW	-	Low Birth Weight
LMICs	-	Low- and Middle-Income Countries
MCH	-	Maternal and child health
MDD	-	Major depressive disorders
MhGAP	-	Mental Health Gap Action
MOH	-	Ministry of Health
MUAC	-	Mid Upper Arm Circumference
OR	-	Odds Ratio
PHQ9	-	Patients Health Questionnaire
PHC	-	Primary Health Care
PPD	-	Postpartum depression

PUFA	-	Polyunsaturated Fatty Acids
RDA	-	Recommended Dietary Allowances
RCT	-	Randomized Controlled Trial
SD	-	Standard Deviation
SPSS	-	Statistical Package for Social Science
SRQ	-	Self-Reporting Questionnaire
SSA	-	Sub Sahara Africa
THP	-	Thinking Healthy Program
UNICEF	-	United Nation Children Fund
UON	-	University of Nairobi
USAID	-	United State Agency for International Development
USD	-	U.S. Department of Agriculture
WHO	-	World Health Organization

OPERATIONAL DEFINITIONS

Brain Food Essentials (BFE): Brain food essentials are essential nutrients / chemical substances required by the brain to function well and balance the neurotransmitters (dopamine, norepinephrine, and serotonin). These brain essentials include high protein food in this study, Omega-3 fatty acids foods (fish, groundnuts, pumpkin seeds, Sunflower seeds, lean meats, organ meats, margarine, and eggs); B vitamins (whole grains, legumes, meat, eggs, fish, green leafy vegetables): Minerals Zinc (Pumpkin seeds); Iron (kidney beans, lentils, organ meat; Magnesium (black beans, avocado, pumpkin seeds) and antioxidant vitamins example foods containing vitamin C.

Depression: In this study, depression refers to a mood disorder associated with a serious and persistent feeling of sadness, loss of sleep, appetite, lack of concentration, low energy, lack of interest in pleasurable activities, and suicidal ideation (WHO,1999); (DSM-IV, 1994).

Diet Quality**:** A quality diet is a diet that includes varieties of food such as dark green vegetables, fruits, whole grains and legumes, nut; lean, protein sources; low-fat dairy foods, sufficient water, and rich in nutrients to promote good health and well-being mentally and physically (Gernand & Christian, 2016).

Dietary Intervention: In this study, dietary intervention refers to nutrition education and dietary counseling given to pregnant women in an ongoing process (twelve sessions of basic nutrition education and counseling) in which a dietitian assesses usual dietary intake and identifies areas where change is needed.

Dietary counseling in this study dietary counselling refers to a process where a registered dietitian, works with a pregnant woman to assess her usual dietary intake and identify areas where change is needed. The nutrition counselor provides information, materials, support, and follow-up (in this study twelve sessions were done) to help the mothers make the needed dietary changes, with a goal to improve the overall health.

Efficacy/ impact of the intervention: This refers to the intervention's ability to produce beneficial effects on the course of a disease. In this study, the efficacy is remission of depression (i.e., recovery from depression; to no longer having clinical depression or depressive symptoms, indicated by EPDS score below six or reduction of depression levels by 7sevenpoints less out of the total score at an individual after the intervention.

Enhanced usual care*:* In this study, enhanced usual care refers to the basic nutritional knowledge and dietary counseling almost the same as the one that is given to all pregnant women at the maternal and child care clinic in the primary health care, but this one is structured and given in sessions and followed up sessions the same like the interventions groups as in the thinking healthy structure.

Nutrition education: involves teaching the client about the importance of nutrition, providing educational materials that reinforce messages about healthy eating, teaching skills essential for making a dietary change, and providing information on how to sustain behavior change.

Nutrition status: Is defined as an individual's health condition as the intake and utilization of nutrients influences it. Optimal nutritional status is attained by consuming sufficient, but not excessive, sources of energy, essential nutrients, and dietary fiber which does not contain toxins or contaminants. In this study, Anthropometry measurements were used as nutritional indicators. The Mid Upper Arm Circumference assessed pregnant women's nutritional status. The Body Mass Index (BMI) was used to monitor the weight gain.

Perinatal depression: Perinatal (maternal) depression is a mood disorder affecting women during pregnancy and after childbirth. It refers to major and minor episodes during pregnancy (termed antenatal) and/or within the first 12 months after delivery (termed postpartum or postnatal) (WHO,1999); (DSM-IV, 1994). In this study, perinatal depression refers to a mood disorder affecting women during pregnancy and up to 4 months after childbirth, as indicated by scores of 10 and above in Edinburgh depression scale.

Perinatal period: Refers to the period when a woman is pregnant and up to one year after childbirth. In this study, the perinatal period is when a woman is pregnant from 12 weeks to four months postpartum.

Psychosocial Management- (Thinking Healthy - Cognitive Behavioral Therapy): Cognitive behavioral therapy (CBT) is a type of psychotherapeutic treatment that helps people learn how to identify and change destructive or disturbing thought patterns that negatively influence behavior emotions. Thinking Healthy Program (THP) is an evidence-based psychosocial intervention for depression tailored to the perinatal period. It is a (step by step) form of talking therapy to change the sequence of harmful thinking to helpful thinking. It is based on the principles of Cognitive Behavioral Therapy (CBT), which assumes that problems start with a negative thought which affects the feelings and results in undesirable actions. In this study, *Psychosocial Management* is the **(**Thinking Healthy - Cognitive Behavioral Therapy -CBT).

Semi-Mental Nutritional Intervention: Is the term used in this study that defines a combined (two interventions) dietary intervention and psychosocial management (Thinking healthy - Cognitive Behavioral Therapy) for depression care to impact positively on women's mental health.

ABSTRACT

Depression is the most common mental health problem affecting women during pregnancy and after childbirth. Simultaneously, nutritional deficiencies are common in pregnancy, and after child birth. Poor nutrition has been associated with an increased risk for depression and makes it a good target for early intervention. Furthermore, the World health organization recommended cognitive behavioral therapy as the first line intervention for depression care. Therefore, the main objective of this study, was to examine the efficacy of dietary intervention and psychosocial management (Thinking healthy - Cognitive Behavioral Therapy) for depression care among pregnant women in urban low-income Nairobi, Kenya. This study consisted of two designs. A cross-sectional design was used to collect baseline data to understand the situational context on the association between exposure variables, and outcome. All pregnant women who came for the antenatal checkup, and met the inclusion criteria were screened for depression using Edinburg depression scale (EPDS), and other baseline data collected, these included the socio-demographic characteristics, assessment of nutrition status, by Mid-Upper Arm Circumference and Body Mass Index indicators, 24-hour recall assessment for dietary intake. Brain Food Essentials assessed using a brain food checklist, nutritional knowledge, attitude, and practice assessed using knowledge test tool. A longitudinal cohort design was used for the intervention study. The cohort involved depressed pregnant women, who screened positive for depression on the Edinburg depression scale. After baseline assessments, enrolled in the intervention were pregnant women who were 18 years and older and were in the second/third trimester with a specific depression score (EPDS cut-off ≥10) a score indicating moderate depression levels and higher. The intervention study comprised two arms. The intervention group were depressed pregnant women who received the combined dietary intervention, and psychosocial management (Thinking healthy - Cognitive Behavioral Therapy). The comparison group consisted of depressed pregnant women, who received usual enhanced care which was general nutrition education/ counselling, health talks, and reading materials. The sample size estimation for longitudinal designs was used to calculated sample size for two-time points with attrition by Diggle et al., formula. Approximately100 subjects were required, 50 subjects for each group, considering attrition, 120 participants were required for the study. At baseline, a consecutive sampling was used to obtain the required sample size, all pregnant women who came for the antenatal checkup, and met the inclusion criteria were screened for depression. A total of 262 pregnant women were screened to obtain the required sample, all women who had EPDS of ≥10, were asked to participate in the longitudinal study. Both groups were followed prospectively from second /third trimester pregnant to fourth months postpartum for the study period (March to November 2019). Descriptive statistics summarized the percentages, means, and standard deviation. An EPDS score of >13 pointed the presence of clinical depression. Outcome measures were assessed by (EPDS score) as a continuous variable and categorical defined by score ranges and compared between clinically depressed and non-depressed women. Inferential statistics were used to draw an association between independent and outcome variables. An odds ratio with a 95% confidence interval (CI) was used to test the associations. Variables with $p < 0.05$ were considered significant. For the intervention study, a comparison between the two groups was performed to assess the degree of comparability. The primary outcome was depression remission, the recovery from clinical

depression, and depressive symptoms. Secondary outcomes were the women's Body Mass Index change and the newborn's outcome. A comparison for outcome measures was made at various time points (at baseline, at three months after baseline, and at 14 weeks postpartum). ANOVA was used for groups' comparisons and specific follow-ups. Multiple generalized regressions were performed to understand the effect of variation due to groups and due to follow-up time. Results at baseline revealed that out of the 262 pregnant women screened, 33.6% were found to have clinical depression. Pregnant women in the second trimester were three times more likely to experience depression [OR 3.37; (95% C.I 1.60 - 7.10); *p <0.001*]. The lower-income level <10,000 Kes per month was statistically significantly associated with maternal depression [OR 0.39; (95%; C.I 0.23 – 0.66); *p<0.001*]. Thematic analysis of qualitative data indicated that poverty, lack of social support, domestic violence, and unfriendly health care services were major contributors to perinatal depression. Poor nutrition status by Mid Upper Arm circumference indicator was statistically significantly associated with depression [OR 0.27; (95% 0.11-0.63); p< *0.001*]. Poor intake of brain food essentials was statistically significantly associated with depression p= *0.002.* Poor nutrition status by Mid Upper Arm Circumference < 23 cm was statistically associated with low intake of brain food essentials [OR 2.631 (95% 1.15-6.00); *p= 0.018*]. Low education level was statistically significantly associated with poor nutritional knowledge P <0.001. For the intervention study, 85 pregnant women completed the study and their data analyzed, 43 women from the intervention group and 42 from the comparison group. Results revealed a clinically significant depression remission from baseline as indicated by EPDS mean scores 16.8±3.4 and endpoint assessment 4.4±2.2 in the intervention group. In the comparison group depression remission from 15.4±3 to 4.4±2.6. Multiple generalized regressions reveal that, the follow-up time with the intervention was statistically significantly associated with depression remission p = 0.000 in both groups. Pearson's correlation revealed a strong positive correlation in weight gain among pregnant women from baseline to second point assessments to endpoint assessment p=0.00. There was positive neonatal weight gain from birth to fourteen weeks postpartum p=0.00 in both groups. Brain food items were evaluated, and after the intervention**,** there was an improvement adherence to brain foods essential items p=0.00, and improved nutrition attitude and practice. The study findings led to the conclusion that both interventions were beneficial for perinatal women to recover from their depression. But combined dietary intervention and Thinking Healthy- Cognitive-behavioral Therapy was more efficacious in improving depression, nutrition and neonatal outcome than usual care enhanced alone. The cognitive-behavioral therapy was an instrumental to women to get over their depression, better manage stress, and take up nutrition intervention positively. The study recommends integrating nutrition-enhanced mental health counseling for depressed women. Moreover, findings led to recommendation to the Ministry of Health to include screening of depression as part of routine antenatal care to identify women needing mental health intervention and intensive dietary monitoring.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Mental health disorders have been documented worldwide as a top priority and the most dominant neglected diseases (Fisher et al., 2012; Patel et al., 2018). Despite its high prevalence rate, it lacks proper attention in health sectors and in action (Hanlon, 2013). Depression is the most diagnosed common mental disorder, highly prevalent in the population (Duko, Ayano, & Bedaso, 2019; WHO, 2017). Depression impacts the mood or feelings of affected persons; it is defined as a mood disorder that causes a serious and persistent feeling of sadness, low energy, loss of sleep, lack of appetite, lack of concentration, lack of interest in things one used to enjoy and sometimes leads to suicidal tendency (Fisher et al., 2012; WHO, 2012). Symptoms of depression ranges in terms of their severity; it can be mild to severe and duration from months to years (Accortt, Cheadle, & Schetter, 2014). This disorder can be diagnosed, and it is different from feelings of sadness, stress, or fear that anyone can experience from time to time in their lives (Bredström, 2019; Bell, 1994; DSM-IV, 1994; WHO, 1993). At times all people may experience depressive feelings as a component of normal life and stress, but when depression symptoms become disabling and last for a long time, then depression may be confirmed (Cabout, Brouwer, & Visser, 2017). For one to be diagnosed with depression, the symptoms have to be present for at least two weeks (Bredström, 2019).

1.1.1 Perinatal Depression

Perinatal (maternal) depression is defined as a mood disorder affecting women during pregnancy and up to a year after childbirth (Bitew, et al., 2016). It refers to major and minor episodes during pregnancy (termed antenatal) and/or within the first 12 months after delivery (termed postpartum or postnatal) (Saeed,et al, 2015; Sparling, 2017). Perinatal depression is a broad term for a range of depressive conditions, including prenatal depression, postpartum depression, and postpartum psychosis (Fisher et al., 2012).

Perinatal depression affects the mother's well-being and how she views life (Patel et al., 2018; Saeed et al., 2016). In developing countries, many cases of perinatal depression are not diagnosed and go untreated; untreated perinatal depression has severe consequences for both mother and child (Hanlon, 2013). It can cause sadness, low energy, low motivation, and poor parenting (Guo et al., 2013). It can also lead to a lack of hope, self-blame, doubt, confusion, and guilt that the affected people are not good parents (Baskin, Hill, Jacka, O'Neil, & Skouteris, 2017). When a woman struggles with depressive symptoms, those feelings affect the whole family because the mother is the center of the family (Field, 2011). In pregnancy and the early years of an infant's life, perinatal depression can cause substantial problems to the mother and her infant (Bredström, 2019); (Stewart, 2007). The risk of low birth weight, preterm birth, intrauterine growth restriction, and pregnancy complications are known to be higher in association with antenatal depression (Dadi et al., 2020; Mochach et al., 2018). Suicide is an ever-present risk with depression along with adverse effects on infant growth and birth weight (Surkan et al., 2011).

1.1.2 Risk Factors for Perinatal Depression

The specific cause of perinatal maternal depression has not been identified in the literature, and the exact etiology is still unclear; this explains that depression is a multi-factorial disorder, and its risk is determined by a combination of factors including biological factors, physiological factors, social and cultural influences, environmental factors, genetics, and lifestyle factors including nutrition among others (Cabout, Brouwer, & Visser, 2017; Leung & Kaplan, 2009). Furthermore, the social determinant of health can explain this interplay; that the conditions that people are born with grow with, live with, work with, and age with including the health systems affects the health outcomes, the dissemination of power, money molds those factors, and resources at local levels, national, and global levels (WHO, 2015; Benach et al., 2010).

The focus of this study was the biological factors. Nutrition and lifestyle basis has been identified as the biological factor to mental illnesses (Lukose et al., 2014), and the factor that is given increasing consideration is inadequate nutrition, among other theories about

the causes of depression (Pina-Camacho et al., 2015). It has been found that patients who suffer from depression have altered levels of monoamine neurotransmitters (Kennedy, 2016). The researches evidence on the pathophysiology of depression has focused on the monoamine neurotransmitters, and three different mechanisms have been identified in which depression occurs, these include:- low dopamine, serotonin, and norepinephrine levels in the brain; second, due to neuro-membranes, which have been altered and the polyunsaturated fatty acids impact on the membranes; third is hormones, specifically hormonal changes which occur during and after pregnancy (Lim et al., 2016; Leung & Kaplan, 2009). Such deficits can contribute to perinatal depression, and both of these pathways are affected by particular nutrients and may be corrected by nutritional approaches (Rechenberg & Humphries, 2013).

1.1.3 Nutrition during Pregnancy

Pregnancy is accompanied by many biological changes (Gernand et al., 2016). Research evidence shows that malnutrition among perinatal women is still unacceptably high across regions of South-central and Southeast Asia and Sub-Sahara Africa (Desyibelew & Dadi, 2019). Pregnant women are vulnerable to nutrient deficiencies because their nutritional needs are elevated due to increased demand during pregnancy compared to non-pregnant and non-lactating women (Pina-Camacho et al., 2015; Rechenberg & Humphries, 2013). A serious decrease in nutrient stores throughout the pregnancy period and a lack of recovery after childbirth increase a woman's risk of nutrition deficiencies which may contribute to developing depression (Rocha, Teixeira, Coelho, Alves, & Machado, 2021) (Bodnar & Wisner, 2005). Malnutrition, specifically during pregnancy, includes several nutrient-related disorders or deficiencies, conditions such as protein-energy malnutrition, iodine deficiency disorders, vitamin A deficiency, iron-deficiency anemia, intrauterine growth retardation, overweight/obesity, and other diet-related non-communicable diseases (Beck, Conlon, Kruger, & Coad, 2014). Women of childbearing age are vulnerable and are most affected by poor nutrition and at high risk of developing depressive disorders (Rocha et al., 2021; Bodnar & Wisner, 2005).

1.1.4 Nutritional Knowledge Attitude and Practice

Nutritional knowledge and attitude (KAP) are essential factors of dietary practices and are potential targets for appropriate planning of nutrition care programs for vulnerable groups (Masuku & Lan, (2014). Knowledge, attitude, and practice (KAP) surveys collect information on what is known, believed, and done about a particular topic and are the most frequently used study tool in health-seeking behavior research (Masuku & Lan, 2014). KAP surveys reveal misconceptions or misunderstandings that may represent obstacles to the activities that need to be implemented and potential barriers to behavior change. For example, poor nutrition has been identified as a potential risk factor for depression, and depression has been associated with low birth weight, preterm birth, breastfeeding difficulties, increased infant diarrhea episodes, and infant growth impairment (Black et al., 2013). The past century has seen a major global shift in lifestyle. Dietary intake has changed with a marked increase in sugar consumption, snacks and takeaway food, and high energy foods, while the consumption of nutrient-dense food has diminished; unhealthy lifestyle behaviors are driving an increase in chronic non-communicable diseases. Recent evidence suggests that poor diet and lack of exercise contribute to the genesis and course of depression (Sparling et al., 2021; WHO, 2011).

1.1.5 Nutritional Education as a Tool in Influencing Attitude, Practice and Behavior

Nutrition education involves teaching the client about the importance of nutrition, providing educational materials that reinforce messages about healthy eating, teaching skills essential for making a dietary change, and providing information on how to sustain behavior change (Masuku & Lan, 2014; Hamulka, Wadolowska, Hoffmann, Kowalkowska, & Gutkowska, 2018; Croll J, & Neumark-Sztainer D, 2001). Nutrition education is influential in changing participant knowledge, attitudes, and behaviors supporting consuming a more healthful diet (Hamulka et al., 2018). Critical reviews examining its effectiveness have demonstrated that nutrition education can significantly contribute to improved dietary practices. Well-designed and effectively implemented nutrition education can motivate those participating in changing dietary behaviors and provide them with the knowledge and skills to make healthy food choices in their lifestyles and economic resources (USDA Food and Nutrition Service; Prochaska, 2011). Nutrition

education enhances nutritional knowledge, thereby influencing attitudes and practices toward good nutrition (Masuku, & Lan, 2014).

1.2 Statement of the Problem

Perinatal depression is the most common mental health problem affecting women during pregnancy and after childbirth. On the other hand, nutritional deficiencies are common during pregnancy and the lactation period, suggesting some connection between nutrition deficiencies and maternal depression. Depression affects women's well-being and reduces their quality of life. It is a global threat to child development because it affects mothers' caregiving capability (Chowdhary et al., 2014). Depression is among the leading causes of perinatal morbidity and mortality in women (Ayano, Tesfaw, & Shumet, 2019). In addition, it is disabling and affects mothers' health, and increases the risk of suicide among women (Dennis & Shiri, 2017). Despite being a fundamental right for every woman of emotional well-being and children's health, recognition of maternal mental health has not been a priority in many low- and middle-income countries (WHO, 2017). Women depressed during pregnancy are at a higher risk of postpartum depression; Depression also affects mother-child attachment and increases malnutrition among children (Black & Richter, 2016; Madeghe et al., 2016; Madlala & Kassier, 2018; Rechenberg & Humphries, 2013).

At the global level, about 10% of pregnant women and 13% of postpartum women experience a mental disorder, mainly depression. In low and middle-income countries (LMICs), about 12.5 - 42% of pregnant women and 12 - 50% of mothers of newborns screen positive for symptoms of depression (Tefera et al., 2015; World Health Organization, 2008). The prevalence of depression among perinatal women is too high compared to the 5.9% prevalence among females generally in the African region (Lodebo et al., 2020). In Kenya, maternal depression is prevalent; studies found the estimated prevalence of maternal depression at (38.4%) among antenatal mothers (Mochache et al., 2018); the prevalence of 32.9% among pregnant adolescents using PHQ-9 using a cut-off score of 15+ (Osok et al., 2018); the prevalence of 13% was found among postpartum mothers (EPSD cut-off of 13) (Madeghe et al., 2016a), and prevalence of 50% among HIV women (Yator et al., 2016).

Under-nutrition is prevalent during pregnancy; about 23.5% of pregnant women in the African region suffer from under-nutrition (Desyibelew & Dadi, 2019). Micronutrient deficiencies are highly prevalent, including vitamin A deficiencies, iron-deficiencies vitamin B6, and vitamin B-12, folate, magnesium, calcium, iron, zinc, and omega-3 types, all essential nutrients for the brain, which may contribute to mood disorders among pregnant women (Rechenberg & Humphries, 2013). Prevalence of anemia in Africa ranges from 21 to 80%; similarly, high deficiencies in both vitamin A and Zinc deficiency levels have been experienced (Lartey, 2018). Maternal malnutrition contributes to 800 000 neonatal deaths annually due to stunting, wasting micronutrient deficiencies (Dadhich & Faridi, 2013). The overwhelming levels of stunting result from poor nutrition in-utero and early childhood, indicating poor nutrition (UNICEF/WHO/WORLD, 2019). According to The Lancet series, more than 43% of the children (249 million) in LMIC are at a greater risk of poor physical and mental development because of stunting and poverty resulting from long-lasting problems of lack of enough food, infectious diseases, and lack of nutritional knowledge (Lu et al., 2016). Providing nutrition education to women during pregnancy, has proven to have a significant impact on improving the women's knowledge, attitude and practices regarding the appropriate dietary choices and practices during pregnancy (Radukunda1 & Ngomi, 2020). There is a need to emphasize pregnant women's nutritional knowledge, attitudes, and practices to improve nutritional status among women during pregnancy and after child birth.

The gap in the literature shows limited research in the area of perinatal depression and nutrition. Little is known about how poor diet and nutrition affect women’s mental health during pregnancy and after childbirth (Barker et al., 2013). The available research on the relationship and impact of nutrition on depression has found a promising linkage between the quality diet and the risk of depression (Sparling et al., 2021; Young, 2007) but, these assumptions are inadequately tested. With this backdrop, the objective of this study is to examine the efficacy of dietary intervention and psychosocial management (Thinking healthy – Cognitive Behavioral Therapy) for depression care among perinatal women in urban low-income settlements Kangemi and Kawngware.

The study sites Kangemi health center and Riruta Health centers in Kawangware, were selected because these two sites are both growing informal settlements located on the outskirts of the Nairobi city center. They were chosen purposively because the antenatal clinics (ANCs) at these health facilities receive a high volume of pregnant women for easy recruitment; and the fact that in low income settlement like these, socioeconomic deprivation indicators such as unemployment, low income and low education have been cited as risk factors for mental health disorders.

1.3 Study Justification

Perinatal depression is a serious mental problem that requires early identification, intervention and treatment (Barker et al., 2013; WHO, 2017). Moreover, the perinatal period is a critical time to address nutritional issues because they are associated with an elevated risk of malnutrition and mental disorders. Pregnant women and mothers deserve the best health care, including the very best mental health and physical health. Women's well-being is fundamental in the family, which translates to the well-being of a healthy nation (Tuncalp, Rogers, Lawrie, Bucagu, & Asia, 2020; Bodnar & Wisner, 2005). However, most treatments for depression mainly focus on pharmacology pathways that have some side effects on mothers and children (Leung & Kaplan, 2009). Thinking Health-Cognitive Behaviour Therapy intervention is recommended by WHO for perinatal depression; if this intervention is enhanced with dietary intervention, it is a safe way to prevent depression that needs to be tested for its efficacy. Nutrition education is influential in changing participant knowledge, attitudes, practice and eating behaviors change to consumption of a healthful diet. This intervention is in line with Sustainable Development Goals health targets 2030 Strategy 1 and 6, which targets improving women's nutritional status during reproductive ages; prevention and control of diet-related Non-communicable diseases in which mental health is among the neglected non-communicable disease.

1.3.1 Potential Beneficiaries of this Study

At individual level	Pregnant women gained skills helpful in life to be better able to plan healthy meals, manage stress through positive thinking, and better able to care for their children and the whole family**.**
Family level	The knowledge acquired by women is helpful to them to improve their health, which translates to the whole family's health. The program assisted mothers in adopting healthy dietary practices and managing stress through thinking healthy.
At the community level	Community health workers gained nutrition knowledge, counseling skills, and psychosocial management of depression, useful in their life long career to help their community members experiencing depression.
At national government	Results of the study have the potential to guide, influence, and improve the current policy.
Academic research	Recommendations of this research highlight gaps in knowledge that researchers can address.

1.4 Broad Objective

The general objective of this study was to examine the efficacy of dietary intervention and psychosocial management for depression care among perinatal women in urban low-income settlements in Nairobi, Kenya.

1.4.1 Specific objective one (Baseline study)

To establish the situational context: (the association between nutritional status, diet quality, socio-demographics, and perinatal depression) among pregnant women attending antenatal clinic at Kangemi health center and Riruta health center-Kawangware.

1.4.2 Specific objective two (Baseline study)

To assess the nutrition knowledge, attitude and practice among pregnant women attending antenatal clinic at Kangemi health center, and Riruta health center Kawangware.

1.4.3 Specific objective three (Intervention study)

To determine the efficacy of dietary intervention for depression care among pregnant women attending antenatal clinics at Kangemi health center and Riruta health center Kawangware.

1.4.4 Specific objective four (Intervention study)

To examine the efficacy of the psychosocial intervention (Thinking healthy - Cognitive Behavioral Therapy) for depression care among pregnant women attending antenatal clinic at Kangemi health center and Riruta Health centers Kawangware.

1.5 Research Questions

i. What is the situational context (association between nutritional status, diet quality, socio-demographics, and perinatal depression)?
ii. What is the level of nutritional knowledge, attitude, and practices among pregnant women?
iii. What is the efficacy of dietary intervention for depression care among perinatal women?
iv. What is the efficacy of psychosocial management intervention (Cognitive Behavioral Therapy) for depression care among perinatal women?

1.6 Hypothesis

In this study we hypothesized that; Poor nutrition status caused by poor diet, may contribute to nutritional deficiencies of some essential brain food nutrients for the brain to function, leading to depressive mood disorders. Therefore, dietary intervention enhanced mental health intervention, may improve women's mental health, and nutritional status.

1.7 Conceptual Framework

The framework for this study was developed from two suitable theoretical models: The Health Belief Model (Kacunko, 2018; Jones & Bartlett, 2003) and the Thinking Health - Cognitive Behavior Therapy (CBT) structure (WHO, 2015). The Health Belief Model focuses on individual beliefs and attitudes about health or disease conditions as an approach to health promotion and disease. Cognitive Behavior Therapy emphasizes the way one thinks and the actions one takes. It is evidence-based and planned or (step by step) form of talking therapy to change the sequence of harmful thinking (cognitions), which may lead to unhelpful feelings and the resulting undesirable actions (behavior) and change the cycle to health thinking which lead desirable actions or behavior. The theoretical construct of the Health belief model was adopted to provide direct help or similar thinking for this study. (See figure 1.1).

The conceptual framework adapted the health belief model constructs only. The study variable was developed and populated in the construct. Being the intervention study the variables were as follow: -

Independent variables: Include Demographic profile: The Age, Marital status, education level, family income level, nutrition status, nutritional status, Nutrition knowledge, attitude, and practice.

Dependent variables: Maternal depression; maternal malnutrition.

Study Input: The intervention, dietary intervention and Thinking health- cognitive behavioral therapy.

Output expected: Depression remission; Eating healthy; improved nutritional status for mother and baby.

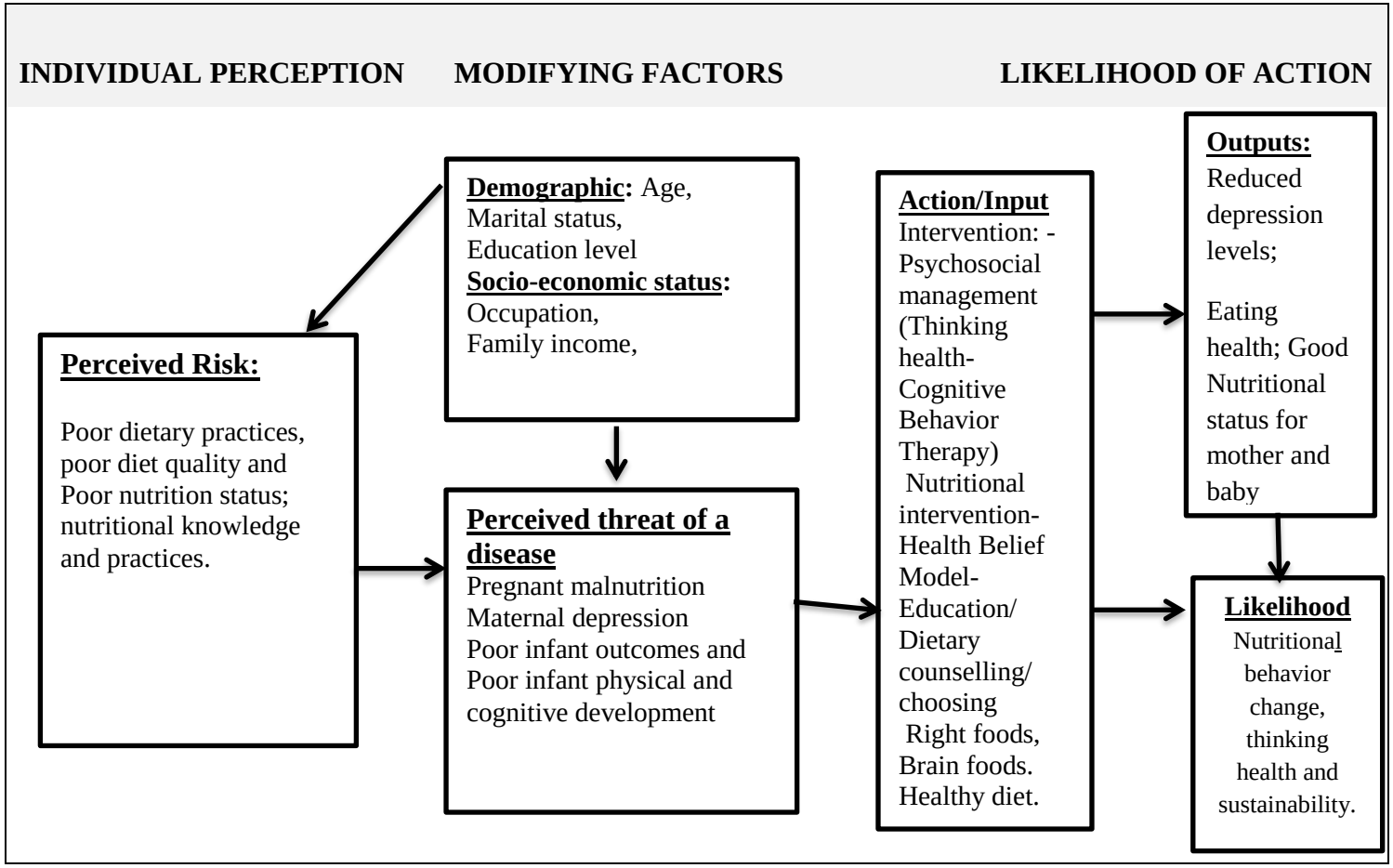


Figure 1.1: Conceptual framework of the study based on health belief model (Jones & Bartlett, 2003) and Cognitive behavior therapy Source: (Jones & Bartlett, 2003; WHO, 2015).

CHAPTER TWO: LITERATURE REVIEW

2.1 Maternal Mental Health Situation at Global Africa and Kenya

World Health Organization defines maternal mental health as a state of well-being in which a mother recognizes her capabilities and can deal with everyday life stress, can work efficiently and productively, and can make a contribution to her community (Howard & Khalifeh, 2020; WHO, 2008); this definition is central in understanding the capacity of a mother to respond to her own requirements and those of her newborn. Depression is a growing disease burden worldwide. At a global level, over 322 million people are estimated to suffer from depression, equivalent to 4.4% of the world's population (WHO, 2017). Depression is third in rank, contributing to the global disease burden, and is predicted to rise to the number one contributor to disease burden by 2030 (Cabout, Brouwer, & Visser, 2017). Depression is 50 % higher for females than for males (Saeed et al., 2016). The prevalence varies by WHO Region, from a low of 2.6% among males in the western Pacific region to 5.9% among females in the African region (Lodebo et al., 2020).

Depression is predicted to be the leading cause of disease burden by 2030; among women of reproductive age, it is already the leading cause of disease burden (Albert, 2015). The global prevalence indicates that at least one in ten women in developed nations and two in five women in the developing world develop depression during pregnancy (Tilahun et al., 2017). In Western countries, perinatal depression prevalence is between 10% and 15% (Guo et al., 2013). In non-Western countries, the perinatal depression rate is estimated to be anywhere from 15% to 57% (Surkan et al., 2011).

Research evidence shows that, prenatal depression during pregnancy is more severe than postnatal depression; besides, mental illness is generally more prevalent in urban than rural areas (Madlala & Kassier, 2018). It has been established that mental disorders are more prevalent in developing countries, predominantly among poorer women with gender-based risks or psychiatric history (Fisher et al., 2012; Sparling et al., 2017). High rates of mental health problems in pregnant women and mothers have been reported among the poor in many countries. A prevalent rate of 20.2 % was found in Brazil; 25 % in Pakistan, 29 %

in Bangladesh, 39 % in South Africa Cape Town, 38.5 % KwaZulu-Natal, and a prevalence rate of 39% antenatal and 34.7% postnatal depression were reported in a Peri-urban settlement outside Cape Town (Madlala & Kassier, 2018).

Systematic reviews on perinatal mental disorders established the pooled prevalence of antenatal depression in Africa at 26.3% (Dadi et al., 2020). Findings from sub-Saharan Africa reveal varying prevalence rates. In Ghana, the prevalence of depression at 16.1% (Guo et al., 2013). In Tanzania, a prevalence rate of 39.5 % was found; in Ethiopia, a prevalence range between 11.8% and 31.1% was found (Ayano et al., 2019). In Kenya, prevalence estimates of prepartum depression were reported at 32.9% among pregnant adolescents (Osok et al., 2018); Prepartum prevalent rate of 38.4% was reported among pregnant women (Mochache et al., 2018).

2.2 Relationship between Nutrition, Brain, and Mental Health

Nutrition is the science of food and its relationship to health (Kaur Jaswinder, 2014; Liu, Zhao & Reyes, 2015); and there is no health without mental health (Cairns et al., 2012; Louise et al, 2018). Nutrition is fundamental to brain health, needed for countless aspects of brain functioning including the regulation of neurotransmitters (Rechenberg & Humphries, 2013). Neurotransmitters are chemical messengers released by neurons to stimulate neighboring neurons to allow the impulses to pass from one cell to the next in the nervous system (Lodish et al., 2000). Strong connection between neurotransmitter imbalances, has been identified as a key element that brings the connection between nutrition and depression (Leo & Lacasse, 2008). Almost a hundred years back in history, a strong connection between nutrition and mood have been identified for B-complex vitamins, including vitamin B6 and vitamin B-12, folate, magnesium, calcium, iron, zinc, and omega-3 types (Bodnar & Wisner, 2005; Bourre, 2005; Gómez-pinilla, 2010; Kennedy, 2016; Rechenberg & Humphries, 2013).

Research evidence revealed the properties and functions of these nutrients, and their role in several ways in which they affect neural and endocrine pathways to the pathophysiology of depression (Kennedy, 2016; Rechenberg & Humphries, 2013). Folate has been reported

as a vitamin required for the biosynthesis of the three monoamine neurotransmitters; serotonin, dopamine, and norepinephrine (Leung & Kaplan, 2009). The deficiency of these vitamins may affect the production of the neurotransmitters leading to depression (Rechenberg & Humphries, 2013). A review by Kennedy reported vitamin B6 in the involvement of neurotransmitter pathways, it is a co-factor in the production of serotonin from tryptophan, and that low plasma levels of B6 have been associated with depression (Kennedy, 2016). Vitamin B-12 has a neurological function, and it is also a cofactor in the production of neurotransmitters (Ford et al., 2018; Piao, Cong, Lu, Feng & Ge, 2018). Zinc is an essential nutritional element that plays a crucial role in learning and memory function and mood stability (Rechenberg & Humphries, 2013). Another critical nutritional element is polyunsaturated fatty acids (PUFAs), particularly n-3 PUFAs, these are the building blocks for healthy brain function and development, epidemiological evidence established that low consumption of n-3 PUFA is associated with mood disorders (Reimers & Ljung, 2019). Other nutrients commonly associated with mental health include antioxidant vitamins, such as the C vitamin, and bioactive substances found in foods (Larson & Yousafzai, 2017; Opie, Neil, Itsiopoulos, & Jacka, 2017; Rechenberg & Humphries, 2013). These nutrients are mostly available in healthy diets such as dark green leafy and orange or red-colored vegetables and whole-grain (Davison et al., 2012).

2.3 Maternal Malnutrition Situation in Africa

Maternal malnutrition is prevalent among African women, where about 5 and 20% of African women have a small Body Mass Index (BMI) (Rocha et al., 2021; Lartey, 2008). The double burden of malnutrition also co-exists in developing countries due to poverty, poor eating behavior, and eating habits, which lead to increased under-nutrition and obesity (Kimani-Murage et al., 2015). The prevalence of anemia ranges from 21 to 80%; similarly, high deficiencies in both vitamin A and zinc deficiency levels have been experienced among pregnant women (Rocha et al., 2021; Lartey, 2008). Studies revealed that maternal malnutrition, worldwide contributes to neonatal death due to stunting, wasting, and micronutrient deficiencies (Dadhich & Faridi, 2013). Chronic energy deficiency, inadequate weight gain during pregnancy, and poor micronutrient status are common, and many women suffer these conditions (Serbesa et al., 2019); which influences maternal,

neonatal outcomes (Desyibelew & Dadi, 2019). It is associated with a high, mortality rates, and adverse birth outcomes such as Low Birth Weight and preterm birth (Serbesa et al., 2019). About 20% of maternal deaths in Africa have been attributed to anemia, in sub-Saharan Africa, iron deficiency is the cause of 75% of anemia cases (Swaminathan et al., 2019).

2.4 Effect of Perinatal Depression on Newborn Outcomes

Pregnant women are at high risk for major depressive disorders, this is because pregnancy and lactating are major nutritional stressors to the body (Bodnar & Wisner, 2005). In LMICs, pregnant women are even at higher risk of poor nutritional deficiencies as a result of poverty, food insecurity, and frequent pregnancies (Chaparro et al., 2014; Lindsay et al., 2012; Salam et al., 2015).

Studies that investigated perinatal depression and feeding revealed that perinatal depression may affect compensatory feeding and lead to early termination of breastfeeding (Dennis & McQueen, 2009; Hatton et al., 2005). Studies have found a link between infant growth and maternal depression where, mothers with depressive symptoms were 40% more likely to have underweight than mothers who were not depressed (Surkan et al., 2011). It is also estimated that between 23 and 29% less children would not be underweight or stunted if the infant population were not exposed to perinatal depression symptoms (Chowdhary et al., 2014).

2.5 Dietary Intervention Studies

Research has shown that many health problems, including mental disorders, can be prevented by targeting maternal dietary intake during pregnancy (Rahman et al., 2013). Research evidence suggests that diet has a protective effect on depression risk, and adherence to a healthy diet can prevent brain diseases (O'Neil Adrienne et al., 2014). Some studies suggest a two-way link between good nutrition and psychological health, where persons with a healthy diet are less likely to have depression, and that depression can impact food intake and food-related behaviors (Cabout et al., 2017; Francis et al., 2019).

Dietary intervention can be defined as diet modifications with a planned goal designed to improve overall health, to increase the uptake of micronutrients and decrease deficiencies in food, at individual, and household level (Beck et al., 2014). Dietary modification can be the consumption of nutrient-rich food with the purpose to improve certain deficiencies (Gibson, 2014). For example, iron-rich foods if taken simultaneously with ascorbic acid (vitamin C) it increases the absorption of iron in the body. Several dietary patterns have been studied, and five dietary recommendations have been identified for the prevention of depression; these includes:- traditional dietary patterns; increasing intake of wholegrain cereals, fruits, vegetables, legumes, seeds, and nuts; high consumption of foods rich in omega-3; eating wholesome, nutritious foods instead of unhealthy diet; and limiting the intake of processed foods (F N Jacka et al., 2017). However, epidemiological studies point out that diet quality has implications for the risk of depression, and studies on nutritional enhancement as a treatment strategy for depression are still needed (Saeed et al., 2016; O'Neil et al., 2014; Lukose et al., 2014).

Studies done by Kaplan and colleagues found potentially beneficial effects of many vitamins such as vitamin B, C, D, and E, and minerals such as calcium, magnesium, chromium, iron, zinc, and choline on mood symptoms (Bodnar & Wisner, 2015; Rechenberg & Humphries, 2013; Leung & Kaplan, 2009). Both groups of omega-three have been identified positively in treating depression (Jans, 2010). Evidence from meta-analytic studies suggests that some specific nutrients, especially omega-3 fatty acids, vitamin D3, folic acid, zinc, selenium, and calcium, have an impact on depression (Sparling et al., 2017; Kennedy, 2016).

It is also known that food is medicine for the mind and mood (Lindsay et al., 2017). Different plant-based diets from around the globe share collective characteristics that support mental health (Sparling et al., 2017). Several randomized controlled trials evaluated the efficacy of dietary improvement as a therapeutic intervention for moderate to severe depression and the results revealed improved mental health (Jacka et al., 2017).

2.6 Nutrition Education in Changing Participants, Attitudes and Practices

Nutrition education is a procedure to coach a patient willingly to adjust food choices, and eating behavior to improve health (Stang & Story, 2005). Nutrition education is influential in changing participant knowledge, attitudes, practice and eating behaviors change to consumption of a healthful diet (USDA, 2010). Whereby Dietary/ nutritional counseling is an ongoing process in which a registered nutritionist/dietitian, works with an individual to assess his or her usual dietary intake and identify areas where change is needed. Dietary advice includes providing guidelines on a food selection that will help to meet the Recommended Dietary Allowances (RDA) to reduce the risk of disease, particularly chronic disease (Naghashpour et al., 2014). Studies examining its efficiency have proved that nutrition education can substantially improve dietary practices, encourage participants to adjust dietary behaviors, and provide them the skills and knowledge to have healthy lifestyles (USDA, 2010).

Group education can provide an effective means of reaching pregnant mothers with common nutrition messages. Eating a healthy diet always helps prevent malnutrition in all its forms and a range of non-communicable diseases, including mental health and conditions (O'Neil et al., 2014). The nutrition counselor provides information, educational materials, support, and follow-up to help the individual make and maintain the needed dietary changes, with a goal to improve the individual's overall health.

Knowledge, attitude, and practice of dietary calcium were studied to examine the impact of nutrition education program among female students based on the Health Belief Model (Naghashpour et al., 2014). Results support nutrition education's effectiveness based on the HBM in improving the knowledge, attitude, and practice relating to calcium consumption among adolescent students, the intervention group had better attitudes and practice than the controls.

2.7 Thinking Healthy - Cognitive Behavioral Therapy (Psychosocial Management)

The Thinking Healthy Program, is the psychological management of perinatal depression endorsed by WHO as an evidence-based intervention for perinatal depression; Thinking Healthy Program (THP) is based on the principles of Cognitive Behavioral Therapy, which is an evidence-based and step by step form of talking therapy that aims to alter the cycle of unhealthy thinking (cognitions), leading to unhelpful emotions and the resulting undesirable actions to bring about a change in the mother's symptoms and functioning (WHO, 2015; Chowdhary et al., 2014). It is also designed to be offered by any layperson who can be trained, such as a community health worker (CHW), and it can be delivered away from a health care setting example at home where community Health Workers routinely see the mothers (Vanobberghen et al., 2020). It is designed to help reduce perinatal depression in deprived settings to improve health outcomes in pregnant women (Chowdhary et al., 2014). A study in Pakistan delivered TPH Intervention using community healthcare workers. The results of this study were highly effective, halving the risk of perinatal depression and significantly improving infant health outcomes (Rahman et al., 2008).

The knowledge gap in the literature shows that little is known about how poor nutrition affects women's mental health explicitly during pregnancy and after childbirth. Furthermore, there is limited research on the role of diet in preventing the disorder. Thus, there is a compelling need for more research that targets this critical research area to confirm the associations towards sufficing as a window of opportunity for reducing the risk of mental disorders in mothers and offspring alike that are attributable to the nutritional deficiencies.

REVIEW PAPER

Nutritional Deficiencies and Maternal Depression: Associations and Interventions in Lower and Middle-Income Countries: A Systematic Review of Literature Global

Social Welfare https://doi.org/10.1007/s40609-020-00199-9; Springer

Beatrice A. Madeghe1 & Wambui Kogi-Makau1 & Sophia Ngala1 & Manasi Kumar2

2.8 Abstract

Introduction: Mood disorders affect women of childbearing age during pregnancy up to one year postpartum. Research shows that, women of childbearing age are at increased risk of nutritional deficiencies and maternal depression due to increased demands for fetus development. The objective of this review was to explore the existing information on the subject matter and expose gaps in knowledge to spring board for launching the primary research and avoid duplication.

Methods: - A literature search included PubMed databases and a Google Scholar search engine published in English from June 2009 to June 2019. Medical subject heading terms were used to identify relevant studies. Inclusion criteria were studies that examined the association between nutrition deficiencies and maternal depression, studies that examined the role of diet for depression and presented measures of association. The population included women of childbearing, pregnant and lactating women. All titles and abstracts identified by the search were screened, and those that were eligible for inclusion for full-text analysis were reviewed. Further, hand searching of reference lists of the articles was used to identify additional studies.

Results: - The search identified eighteen full-text articles eligible for final analysis. Of the eighteen studies, eight were cross-sectional studies, six were prospective cohort studies, and four were intervention studies. Out of 18 studies, 15 (83.3%) reported positive associations between nutrition and maternal depression, and 3 (16.7%) reported no associations between nutrition and depression. Out of 15 studies that reported a positive association, four studies established the association between nutrition deficiencies and maternal depression, and 11 studies demonstrated the role of diet for depression.

Conclusion: The review findings reveals the existence of an association between nutrition deficiencies and maternal. Dietary means may play a role in preventing depressive disorder. Considering that most of these associations in this review come from cross-sectional studies, we have to be cautious in making causal connections. Based on the existing literature, we conclude that there is a need for longitudinal nutritional intervention studies to confirm the associations, sufficing as a window of opportunity for reducing the risk of mental disorders in mothers and offspring alike.

Keywords: diet, nutrition deficiencies, maternal depression.

2.9 Introduction

Maternal depression refers to a mood disorder that occurs during pregnancy and/or after delivery within the first year after childbirth, also called perinatal depression (Gelaye, Rondon, Araya, & Williams, 2016; WHO, 2017). Maternal, perinatal depression is a significant public health problem that affects women's well-being and contributes to obstetrics complications and adverse birth outcomes (Sparling et al., 2017; WHO, 2012). It is documented that about 12.5 - 42% of pregnant women and 12 - 50% of mothers of newborns in Low and Middle-Income Countries (LMICs) screen positive for symptoms of depression (Shidhaye, 2014). The treatment of maternal depression in LMICS specifically is not known; however, in the general population, it is documented that about 76% and 85% of individuals suffering from mental illnesses in LMICS receive no treatment for their disorder (WHO, 2019). This is an indication that treatment for maternal depression is likely to be very low or not treated at all (WHO, 2017); the reason being that screening of maternal depression is not part of service delivery in antenatal clinics in LMCs (Biratu & Haile, 2015; Shidhaye, 2014).

In pregnancy and early years of an infant's life, maternal depression can cause substantial problems to the mother and her infant (Hasselmann, Werneck, & Silva, 2008). It can cause sadness, low energy, low motivation, and poor parenting (Madeghe et al., 2016a). It can also lead to a lack of hope, self-blame and doubt, confusion, and guilt of not being a good parent (Stein et al., 2014; Surkan et al., 2011). Suicide is an ever-present risk with perinatal depression and adverse effects, including low birth weight and poor infant growth (Hanlon, 2013; Qiao, Wang, Li, & Wang, 2012). Evidence from research shows that women of childbearing age are at increased risk of nutritional deficiencies (Sparling et al., 2017); because of the increased demands for fetus development and other metabolites during pregnancy, which results in depletion of the maternal nutrient stores in the blood and brain (Abasizadeh, Hemati & Deres, 2016). The serious decrease in nutrients from the body stores throughout pregnancy, and lack of quick recovery after childbirth increases women's risk of maternal depression (Bodnar & Wisner, 2005).

Given the evidence of dietary inadequacy in pregnancy, and the link between nutrient deficiency and depression (Bodnar & Wisner, 2005; Leung & Kaplan, 2009), there is a knowledge gap existing in the literature specifically in LMIC's where there is limited research in the area of maternal depression and nutrition. With this backdrop, the objective of this review was to identify research gaps in the existing literature, to identify research gaps in the existing literature for further research. The mechanisms between nutrition deficiencies and maternal depression has been conceptualized in the table below (figure 2.1).

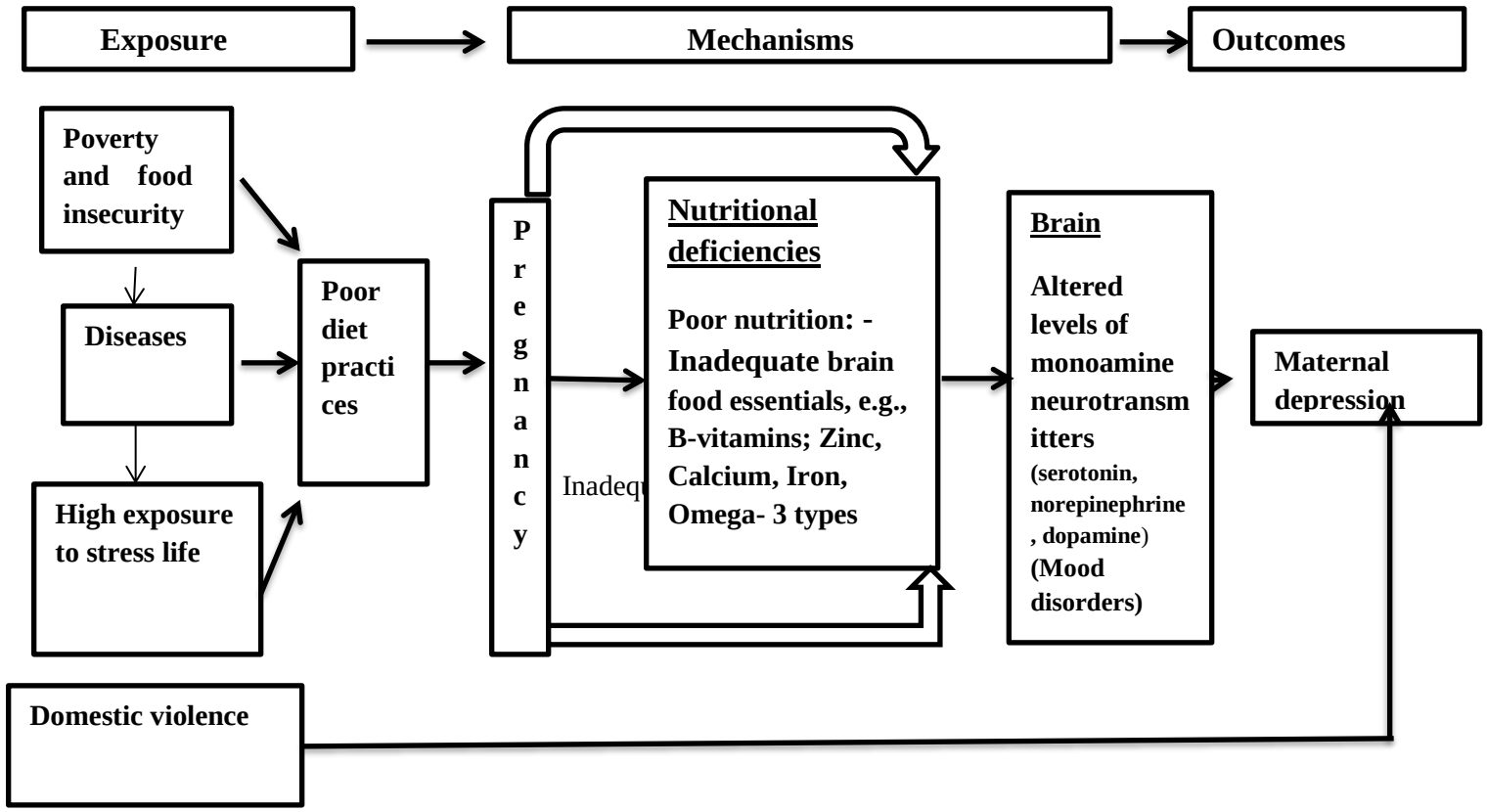


Figure 2.1: The conceptualization between nutrition deficiencies and maternal depression.

2.10 Materials & Methods

2.10.1 Search Strategy

A literature search included PubMed databases and a Google Scholar search engine published in the English language from June 2009 to June 2019. Medical subject heading terms was used to identify all relevant studies. The first search combined nutritional deficiencies terms with maternal depression terms, and the second combined diet and maternal depression. Potentially relevant articles were screened for eligibility based on titles and abstracts. The full-text publication was retrieved and reviewed if considered eligible. The reference lists of relevant review articles identified during this process were also examined to be included in the studies.

2.10.2 Study Eligibility

Studies that examined the association between nutritional deficiencies and maternal depression, and studies that examined the role of diet and depression, and whether they presented association measures were considered. The population included women of childbearing, pregnant, and lactating women. There were no limitations placed on age due to known high rates of adolescent pregnancies across developing countries or the timing of pregnancy. We excluded studies that examined nutrient deficiencies in animals, or examined the effects of additives on mental health, examined emotional or binge eating, studies that were published in a language other than English, and studies that assessed hormones or other compounds synthesized by the body but not directly affected by dietary intake.

This review was conducted based only on the currently limited literature associated with nutrition and maternal depression. This is due to the shortage of established evidence in the form of peer-reviewed literature, and indexed articles; on the role of diet as a protective factor in the prevention of maternal depressive disorders in LMICs where the burden is high.

2.10.3 Data Extraction

The data extraction was conducted by two authors (BM and MK), who independently extracted the data addressing the criteria of the study. Where areas of uncertainty arose, co-authors were consulted (WKM, SN). We extracted the following key information from those eligible articles for the author's, sample size, screening instruments (dietary and mental health measures), and their main findings.

2.10.4 Search Outcomes

The initial search strategy identified 1250 citations, where 42 were excluded because of duplication, leaving 1,208. Out of those studies, 1,132 were excluded upon initial screening for not meeting inclusion criteria based on information available in the titles and abstracts. Of the remaining seventy-six articles, fifty-eight were excluded because some were not the target group or examined individual nutrients or supplements, or some examined nutrients deficiencies in the general population, some focused-on children's mental health and nutrient deficiencies and some emotional or binge eating. As a result, only 18 studies were eligible for data charting and final analysis, as indicated in (figure 2.2).

Flow diagram showing the studies selection process

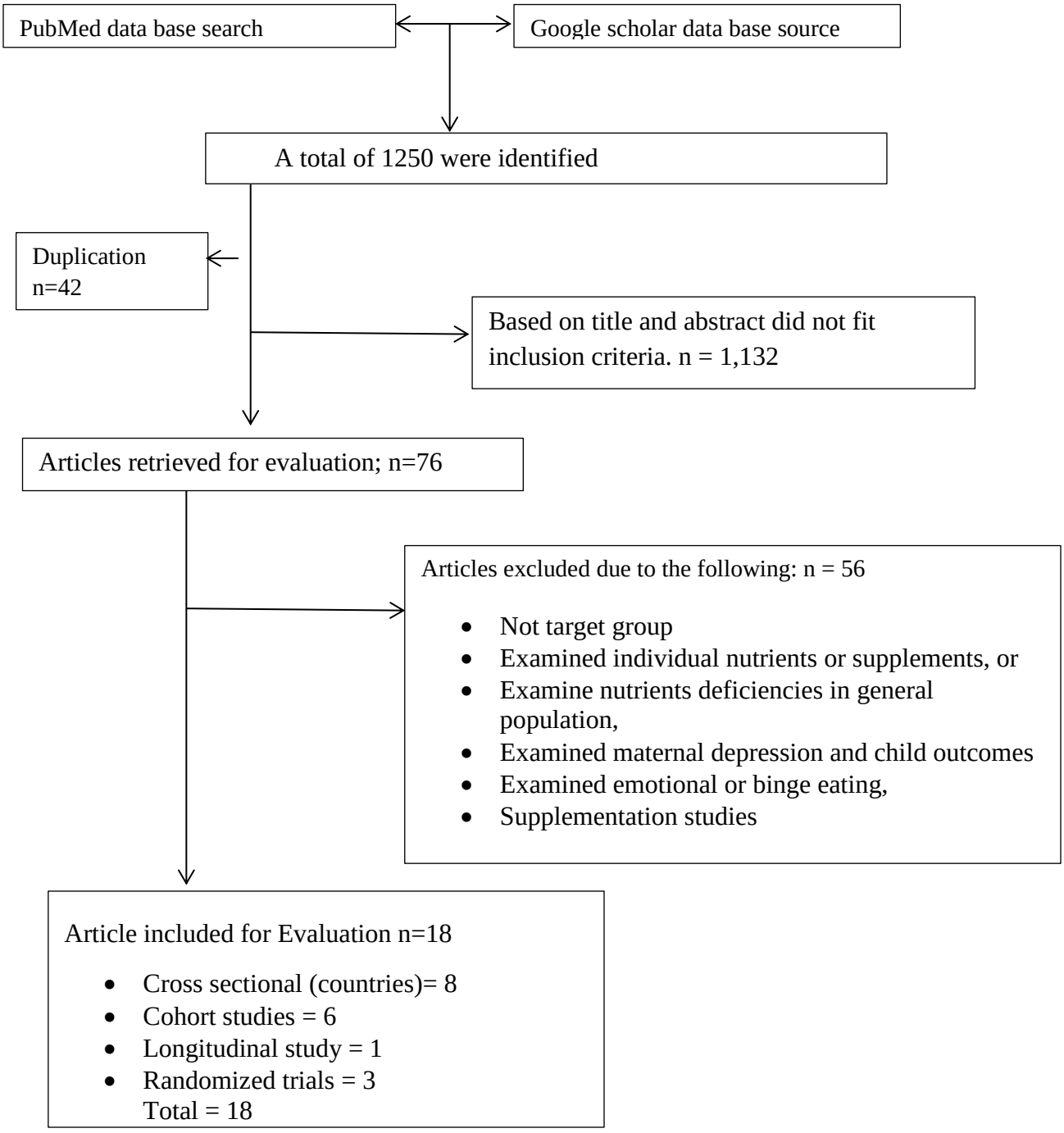


Figure 2.2: Flow chart of study selection.

2.11 Results

2.11.1 Overview of Studies

Studies included for analysis were separated by study design, sample size, objectives, screening instruments, primary outcomes, and study limitations. We calculated proportions of studies that demonstrated positive and negative associations between nutritional deficiencies and maternal depression using these stratifications.

A total of eighteen studies were eligible for data charting. Of the eighteen studies reviewed, 8 (44.4%) were cross-sectional, 6 (33.3%) were prospective cohort, and 4 (22.2%) were intervention studies. Out of the studies four studies were done in Australia, two studies were done in Britain, and two studies were carried in New Zealand with one study conducted in both Australia and New Zealand; and one study was conducted from each of these countries; Cape town South Africa, Southern Brazil, South India, Iran, Singapore, Pakistan, Greece, Austin Texas, Columbia, and Egypt respectively. Out 18 studies, 15 (83.3%) found a positive association between nutrition and maternal depression and 3 (16.7%) reported no associations between nutrition and depression. Out of 15 studies that reported positive association, 4 studies established the association between nutrition deficiencies and maternal depression, and 11 studies demonstrated the role of diet for depression. All these studies included in the review were tabulated and presented in a table (see table 2.3).

Table 2.1: Studies included in the review on the association between nutritional deficiencies and the role of diet for depression

N	**Author, year.**	**Design, Objective, Sample size**	**Measurements**	**Main findings**	**Limitations**
1.	(Francis et al., 2019)	▪ -Design: - A randomized controlled trial (RCT) ▪ Objective: - To examine whether young adults with elevated depression would comply with a brief, 3-week diet intervention and whether this can improve depression ▪ Sample size: - n=38 diet change groups and n=38 habitual diet group ▪ Country: - New Zealand	Depression tool: - Centre for Epidemiological Studies Depression Scale; CESD-R; and Depression Anxiety and Stress Scale 21 depression subscale; DASS-21-D. Diet compliance was measured via self-report questionnaires and spectrophotometry.	The diet change group (n=38) were significantly lower than the habitual diet (n=38) group following 3 weeks of diet improvement,	The study lacks an active control group as a comparison, the reason being that you can't tell people to eat an unhealthy diet to be a comparison group.
2.	(Teo et al., 2018)	▪ Design: - A prospective cohort ▪ Objective: -To examined the associations of dietary patterns during the confinement period in a multi-ethnic Asian cohort with postpartum depression and anxiety ▪ Sample: - (n 490) ▪ Country: - . in Singapore	Dietary intakes 3-day food diaries and dietary patterns And depression was measured using Edinburgh Postnatal Depression Scale (EPDS)	Traditional-Indian-Confinement diet and Soup- Vegetables-Fruits diet. were positively associated with reduced depression symptoms Four dietary patterns were identified There was no association observed between Traditional- Chinese-Confinement diet, and Eat-Out diet with maternal mental health,	The dietary patterns were specific to Asia's context and cannot be generalized to the entire population

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
3.	(Nathanson et al., 2018)	▪ Design: - A prospective study ▪ Objective: - To examine the association between consumption of food groups, quality diet during pregnancy, and postnatal depressive ▪ Sample: - (n = 253) ▪ Country: - in Australia.	Self-report questionnaires assessing fruit, vegetable, and fish intake as well as depressive symptoms at early- to mid-pregnancy.	There were no associations between fruit, vegetable, or fish intake in pregnancy and postnatal depressive symptoms.	Antenatal diet quality as measured by intake of food groups. Overall adherence to evidence-based dietary guidelines need to be explored
4	(Jacka et al., 2017)	▪ Design: - RCT called SMILES is a 12-week parallel-group, single-blind, randomized controlled trial. ▪ Objective: -To investigated the efficacy of a dietary improvement program for the treatment of major depressive episodes (diet intervention. ▪ Sample size: - n=33; control *n*=34) ▪ Country: - In Australia and Newzland	Depression was assessed using the Montgomery–Åsberg Depression Rating Scale (MADRS)and 12 weeks of diet intervention	The dietary support group demonstrated greater improvement between baseline and 12 weeks on the MADRS than the social support control group, $t(60.7) = 4.38$, $p < 0.001$,	The study sample was a fairly small group, with a short duration of 12 weeks only Expectation bias is observed due to the inability to blind the participants to their intervention group. Small sample size increases the possibilities that the sample was not representative
5.	(Poorrezaeian et al., 2017)	▪ Design: - A cross-sectional study ▪ Objectives: - To determine the relationship between the dietary diversity score (DDS) and stress	The dietary intake was measured using 24h dietary recall and depression, anxiety, and stress was measured using 42-item depression, anxiety, stress scales questionnaire,	Results indicate that a one-unit increase in DDS was associated with a 39% reduction in the risk of severe depression.	24-h dietary recall results in failure in recalling diet and portions consumed and no cause-and-effect relationship between DDS and stress and

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
		and depression in women ▪ Sample size: - (n=360 ▪ Country: -South of Tehran- Iran			depression could be inferred in this cross-sectional study.
6.	(Singh et al., 2017)	▪ Design: - A cross-sectional study ▪ Objectives: - To evaluate the prevalence of nutritional deficits in pregnant teenagers and the associations among micronutrient dietary intake, stress, and depression ▪ Sample size: - (n =108) ▪ Country: - Columbia	Automated Self-Administered 24-hour dietary recall (ASA24) in the 2nd-trimester Stress was measured using the Perceived Stress Scale and the Prenatal Distress Questionnaire.	Mood and dietary factors were associated. More than 50% of pregnant teenagers had an inadequate intake of folate, vitamin A, vitamin E, iron, zinc, calcium, magnesium, and phosphorous thiamin, riboflavin, niacin, vitamin B6, vitamin B12, vitamin C, copper, and selenium.	One 24-hour food recall was done in this study, which may reduce the validity of the findings. Depression scale used in this study was not validated in a Latina population, limiting the reliability and validity of their findings.
7.	(Paskulin et al., 2017)	▪ Design: A cross-sectional study ▪ Objective: -To evaluated the association between dietary patterns and mental disorders among pregnant women ▪ Sample size: - (n= 712). ▪ Country: - in southern Brazil	Food Frequency Questionnaire. The Primary Care Evaluation of Mental Disorders (PRIME-MD)	High prevalence of major depressive disorder was observed among women with low fruit intake (43%, PR 1.43, 95%CI 1.04-1.95) and high sweets and sugars intake (91%, PR 1.91, 95%CI 1.19-3.07). Low intake of beans was significantly associated with a generalized anxiety disorder (PR 1.40, 95%CI 1.01-1.93).	It is a cross-sectional design that prevents a conclusive inference on the direction of the relationship. Food Frequency Questionnaire have the poor capability to estimate the actual ingestion -These results cannot be generalized to the

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
					entire universe of Brazilian pregnant
8.	Baskin et al. (2017). (Baskin et al. 2017)	▪ Design: - A cross-sectional study. ▪ Objective: - To explore the predictive role of antenatal diet quality for antenatal and postnatal depressive symptoms. Sample size: - (n=167). ▪ Country: - New Zealand	Edinburgh Postnatal Depression Scale (EPDS); a food frequency questionnaire. Diet quality was determined by extracting dietary patterns	Two dietary patterns were identified; Unhealthy diet was associated with increased rates of depressive symptoms	the predictive nature of either dietary patterns or depressive symptoms cannot be concluded
9.	(Saeed et al., 2016)	▪ Design: - A cohort study ▪ Objectives: - To investigate the relationship of antenatal depression with maternal dietary intake and neonatal outcome ▪ Sample size: - 94 middle class antenatal (hospital-based ▪ Country: -In Pakistan	Edinburgh Postnatal Depression Scale (EPDS) and Healthy Eating Index Rates	Results indicated that antenatal depression increased the risk of poor healthy eating index Rates and neonatal outcomes consist of fetal growth retardation. preterm birth low Apgar score (and low birth weight)	The study population also belonged to the middle class, therefore results cannot be generalized to the entire universe
10	Pina-Camacho et al., 2015)	▪ Design: - A prospective birth cohort study of mother-child pairs ▪ Objective: - to examine the inter-relationships between maternal depressive symptoms and ▪ an unhealthy diet with	Edinburgh Postnatal Depression Scale (EPDS) and food frequency questionnaire And Infant Temperament Scale	Results indicated that higher prenatal maternal depression symptoms were prospectively associated with a higher unhealthy diet, both during pregnancy and the postnatal	• The prospective association between maternal depression, unhealthy nutrition, and child dysregulation was not large. • Dietary pattern

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
		child emotional–behavioral dysregulation in Britain ▪ Sample size: - (n=7814) ▪ Country: - Britain			analysis using factor analysis can only detect a small percentage of the variance in dietary intakes. • There may be measurement error because measures were based on maternal self-reports rather than on clinical observations.
11	Tsai, Tomlinson, Comulada, & Rotheram-Borus, 2016)	▪ Design: - a three-year cluster- randomized trial ▪ Objective: - To determine the association between food insecurity and depression among pregnant women ▪ Sample size: - (n 1,238) ▪ Country: - in Cape Town South Africa	Single-item food insufficiency measure was used to inquire about the number of days of hunger in the past week. Depression symptom was measured using the Xhosa version of the 10-item Edinburgh Postnatal Depression Scale	Food insufficiency had a strong and statistically significant association with depression symptom severity (β=0.70; 95% CI, 0.46-0.94), Suggesting a 6.5% relative difference in depression symptom severity per day.	Findings may not generalize beyond the study population.
12	(Naem et al., 2014)	▪ Design: - A randomized controlled trial ▪ Objectives: - To assess the zinc status and dietary intake of zinc and other macronutrients among pregnant women.	24-h recalls method and a food frequency questionnaire. The blood hemoglobin level, serum zinc level, and fasting blood sugar were determined.	Zinc deficiency was identified among 53.5% of the sample, and three iron intakes were below 50% of the RDA. Protein intake was less than 70% of the RDA. High deficient of zinc and	24hrdietary recalls includes under- or over-reporting of intake, variations between foods eaten, and honest of the participants to provide wrong answers

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
		▪ Sample size: - (n=100) ▪ Country: - Alexandria, Egypt		Iron c is associated with Depression	
13	(Lukose et al., 2014)	▪ Design: - A cross-sectional based assessment of a prospective randomized controlled trial of vitamin B12 supplementation in urban pregnant ▪ Objective: -To examined the association between depressive symptoms and nutrients intake ▪ Sample size: - 365 ▪ Country: - South India	The Kessler Psychological Distress Scale (K-10). Nutritional, clinical, and biochemical factors were also assessed.	Nutrient intakes, serum vitamin B12, methyl-malonic acid, homocysteine, and red cell folate levels were not associated with measures of depression	This study did not assess the severity of medical symptoms, vomiting was found to have a positive association with depressive symptoms.
14	(Fowles, Stang, Bryant, & Kim, 2012)	▪ Design: -A cross-sectional study ▪ Objective: - To investigated the diet quality and its relationship with stress, depression, social support, and eating habits. ▪ Sample size:-(n =71) ▪ Country: - Low-income women in Austin, Texas	The Edinburgh Postnatal Depression Scale was used to measure depression and The Prenatal Psychosocial Profile was used to assess stress and social support. The Dietary Quality Index–Pregnancy was used to assess overall diet quality. and three 24-hour dietary recalls	Results revealed that women with diet quality scores below the median (n=35) had more depression (9.6±5.1 vs 6.7±5.1) and stress (22.1±5.4 vs 19.3±4.8) and less control over meal preparation (5.0±1.5 vs 4.2±1.5) and Support from others (52.0±12.0 vs 57.4±7.2) than did women with high diet quality scores (n=36).	• This study was conducted targeting only low-income women this may limit the application of these findings to wealthier women. • 24hrs recalls has a weakness that it includes the under- or over-reporting of intake, which may limit the validity of the results

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
					• and because it is a cross-section study it limits the causal relationship
15	Jacka, Maes, Pasco, Williams, & Berk, 2012)	▪ Design: - A, population-based cross section study. ▪ Objective: - To examine the relationship between the dietary intakes of ▪ Three (Magnesium, folate, and zinc) micronutrients and clinically determined depressive and anxiety disorders. Among women ▪ Sample size: - (n=1494) ▪ Country: - in Australia	Food frequency questionnaire. The General Health Questionnaire-12 measured psychological symptoms, and a clinical Interview (Structured Clinical Interview for DSM-IV.	Increase in the intake of zinc, magnesium and folate was associated with reduced odds ratio (OR) for major depression/dysthymia (zinc: OR=0.52, 95% confidence interval (CI) 0.31 to 0.88; magnesium: OR=0.60, 95% CI 0.37 to 0.96; folate: OR=0.66, 95% CI 0.45 to 0.97).	Reverse causality and confounding cannot be ruled out as explanations.
16	Chatzi et al., (2015).	▪ Design: - A prospective cohort study of pregnant women. ▪ Objective: - To investigate whether dietary patterns during pregnancy are related to postpartum depression. ▪ Sample size: - (n = 529) ▪ Country: -, In Greece.	Food Frequency Questionnaire in mid-pregnancy and the Edinburg Postpartum Depression Scale (EPDS) at 8-10 weeks postpartum	High adherence to a 'health-conscious' diet, characterized by vegetables, fruit, pulses, nuts, dairy products, fish, and olive oil, was associated with lower EPDS scores (highest v. lowest tertile: β-coefficient = - 1·75, P = 0·02).	During pregnancy, Dietary intake is complicated because of various factors in the period of pregnancy. Depression symptoms were assessed with the self-administered EPDS, so it can lead to bias, there was a low participation rate only (57%).

N	Author, year.	Design, Objective, Sample size	Measurements	Main findings	Limitations
17	(Felice N. Jacka et al., 2010)	▪ Design: - A cross-sectional study ▪ Objectives: - To examine the extent to which the high-prevalence mental disorders are related to the habitual diet. ▪ Sample size: - (N= 1,046) ▪ Country: - Australian	Food frequency questionnaire F and General Health Questionnaire to measure psychological symptoms	Results demonstrate an association between habitual diet quality and the high- prevalence mental disorders	This is a cross-sectional study; it cannot establish the causal relationship between mental disorders and the habitual diet.
18	(Akbaraly et al., 2009)	▪ Design: - A prospective cohort ▪ Objectives: - To examined the association between dietary patterns and depression using an overall diet approach ▪ Sample size: - (n = 3486). ▪ Country: - Britain	Epidemiologic Studies – Depression scale (CES-D) scale Two dietary patterns were identified: 'whole food' (heavily loaded by vegetables, fruits, and fish) and 'processed food' (heavily loaded by sweetened desserts, fried food, processed meat, refined grains and high-fat dairy products).	Whole food patterns had lower odds of CES-D depression (OR = 0.74, 95% CI 0.56-0.99). In contrast, high consumption of processed food was associated with an increased odd of CES- D depression (OR = 1.58, 95% CI 1.11-2.23).	There may be some bias due to the selective retention of participants. A semi-quantitative food questionnaire coved only specific foods and is recognized to be less precise than dietary assessment by diary questionnaire.

2.12 Discussion

2.12.1 Studies on Specific Nutrients for Maternal Depression: Cross-sectional Associations

The review findings demonstrated an existence of the association between nutritional deficiencies and maternal depression. A study by Singh et al. (2017) in Columbia evaluated the prevalence of nutritional deficits in pregnant teenagers and the associations among micronutrient dietary intake, stress, and depression in women of Latina origin (n =108); the results indicated that more than 50% of pregnant teenagers had an inadequate intake of folate, vitamin A, vitamin E, folate, iron, zinc, calcium, magnesium, and thiamin phosphorous, niacin riboflavin, vitamin B6, vitamin B12, vitamin C, copper, and selenium. The study concluded that the mood and dietary factors were associated (Singh et al., 2017). These results agree with studies by Kaplan and colleagues, who found potential beneficial effects of vitamin B, C, D, E, and minerals like calcium, magnesium, chromium, iron, zinc, and vitamin-like compounds known as choline on mood symptoms (Bodnar & Wisner, 2005; Leung & Kaplan, 2009; Rechenberg & Humphries, 2013). Moreover, these findings agree with meta-analytic studies that found nutrients, such as omega-3 fatty acids, folic acid, calcium selenium, and zinc, which have impact on depression (Cairns et al., 2012a; Jans et al., 2010; Kennedy, 2016).

In Australia, a population-based study by Jacka et al. (2012) examined the association between the dietary intakes of magnesium, folate, and zinc micronutrients and clinical depression and anxiety among women sample. (n=1494). Results indicated that increased magnesium intake, folate, and zinc were associated with reduced odds of major depression. These results compare well with other findings in the literature that found an association between folate, vitamin B12, and zinc for maternal depression; these nutrients have important roles in homocysteine metabolism and neurotransmitter functioning (Cairns et al., 2012a; Jans et al., 2010; Kennedy, 2016).

2.12.2 Intervention Studies on Specific Nutrients for Maternal Depression

A randomized controlled trial by Naem et al. (2014) in Egypt assessed zinc status and dietary intake of zinc among pregnant women. (n=100). Results revealed that zinc deficiency was identified among 53.5% of the sample, and three iron intakes were below 50% of the Recommended Daily Allowance (RDA), Protein intake was less than 70% of the RDA; the study concluded that high deficient of zinc and Iron is associated with depression. These results concur with the findings of other studies in the review of Rechenberg and Humphries (2013) found an association between micronutrients and mood symptoms.

In contrast, not all cross-sectional studies found a positive association. A cross-sectional-based assessment by Lukose et al. (2013) examined the association between depressive symptoms and nutrient intake serum vitamin B12, methyl-malonic acid, homocysteine, and red cell folate levels in South India a sample of pregnant (n=365). Results indicate that Nutrient intakes of serum vitamin B12, methyl-malonic acid, homocysteine, and red cell folate levels were not associated with measures of depression. There was no prospective cohort that assessed specific nutrients and maternal depression in this review, and there was no intervention study on specific nutrients and maternal depression.

2.12.3 Studies that Evaluated Dietary Patterns and Maternal Depression, Cross-Sectional Studies

Our review findings have established a relationship between dietary patterns and maternal depression. It is documented that adherence to a healthy dietary pattern that comprises higher intakes of fruit and vegetables, fish, and whole grains is the better way to address depression in both the general population and clinical settings (Sparling et al., 2017). A cross-sectional study by Poorrezaeian et al. (2017) in Iran determined the relationship between the dietary diversity score (DDS) and stress and depression in a sample of women (n=360). Results indicate that 31.4% and 25.8% of the subjects suffered from depression and stress. Furthermore, respectively, a one-unit increase in DDS was associated with a 39% reduction in the risk of severe depression.

A cross-sectional study by Paskulin et al. (2017) in southern Brazil evaluated the relationship between dietary patterns and mental disorders in a sample of pregnant women (n= 712). A high prevalence of major depressive disorder was observed among women with low fruit intake (43%, PR 1.43, 95% CI 1.04-1.95) and high sweets and sugars intake (91%, PR 1.91, 95%CI 1.19-3.07). A low intake of beans was significantly associated with a generalized anxiety disorder (PR 1.40, 95%CI 1.01-1.93). Moreover, in a cross-sectional study, Baskin et al., 2017, in New Zealand, explored the predictive role of antenatal diet quality for antenatal and postnatal depressive symptoms in a sample of pregnant women (n=167). Identified two dietary patterns a healthy diet and an unhealthy diet. An unhealthy diet was associated with increased rates of depressive symptoms.

In Austin, Texas, a cross-sectional study by Fowles et al. (2012) investigated diet quality and its relationship with stress, depression, social support, and eating habits among low-income women sample (n =71). Results revealed that women with diet quality scores below the median (n=35) had more depression (9.6±5.1 vs. 6.7±5.1) and stress (22.1±5.4 vs. 19.3±4.8) and less control over meal preparation (5.0±1.5 vs. 4.2±1.5) and support from others (52.0±12.0 vs. 57.4±7.2) than did women with high diet quality scores. Additionally, in Australia, a cross-sectional study by Jacka et al. (2010) examined the extent t of mental disorders are related to the habitual diet in pregnant women sample (n= 1,046). Results demonstrate an association between habitual diet quality and the high- prevalence of mental disorders. Among the cross-sectional studies reviewed, no study revealed a negative association between dietary patterns and maternal depression.

2.13.4 Prospective Association between Dietary Pattern and Maternal Depression

Our review findings demonstrated a prospective association between dietary patterns and maternal depression. By evidence, a prospective cohort study by Chatzi et al. (2015) in Greece investigated whether dietary patterns during pregnancy are related to postpartum depression among women (n = 529). Results demonstrated that high adherence to a 'health-conscious' diet, characterized by vegetables, fruit, pulses, nuts, dairy products, fish, and olive oil, was associated with lower- Edinburgh Postnatal Depression Scale (EPDS scores) (highest v. lowest tertile: β-coefficient = - 1·75, P = 0·02). A prospective cohort by

Akbaraly et al. (2009), in Britain, examined the association between dietary patterns and depression using an overall diet approach among women (n = 3486). Whole food patterns had lower odds of depression (OR = 0.74, 95% CI 0.56-0.99). In contrast, high consumption of processed food was associated with an increased odd of depression (OR = 1.58, 95% CI 1.11-2.23).

Likewise, in Britain, a prospective birth cohort study of mother-child pairs by Pina (2015) examined the inter-relationships between maternal depressive symptoms and an unhealthy diet with child emotional–behavioral dysregulation in women (n=7814). Results indicated that major prenatal depression symptoms were related to an unhealthy diet during pregnancy and after childbirth; additionally, a cohort study by Saeed et al. (2016). Finally, in Pakistan, Investigate the relationship between antenatal depression with maternal dietary intake and neonatal outcome among pregnant women (n= 94) in middle-class antenatal hospital-based. Results indicated that antenatal depression increased the risk of poor healthy eating index Rates and neonatal outcomes consist of fetal growth retardation, preterm birth, low Apgar score, and low birth weight.

However, some studies did not find an association between dietary patterns and maternal depression. For example, a prospective cohort by Teo et al. (2018) in Singapore, examined the associations of dietary patterns during the confinement period in a multi-ethnic Asian cohort with postpartum depression and anxiety. Four dietary patterns were identified. Results indicated no association between the traditional- Chinese-Confinement diet and the Eat-Out diet with maternal depression. Another prospective study by Nathanson et al. (2018) in Australia examined the association between consumption of food groups and quality diet during pregnancy and postnatal depression among pregnant women (n = 253). Results indicated that there was no relationship between fruit, vegetable, or fish intake in pregnancy and postnatal depressive symptoms.

2.11.5 Intervention Studies on the Association between Dietary Pattern and Maternal Depression

The dietary intervention comprised personalized dietary advice and nutritional counseling support, including motivational interviewing, goal setting, and mindful eating, from a clinical dietician to support optimal adherence to the recommended diet (Jacka et al., 2017). It is documented that adherence to a healthful dietary pattern that contains higher intakes of fruit, vegetables, fish, and whole grains may be a valuable and accessible strategy for addressing depression in both the general population and in clinical settings (Sparling et al., 2017).

A randomized controlled trial (RCT) by Francis et al. (2019) in New Zealand examined whether young adults with elevated depression would comply with a brief, 3-week diet intervention and whether this could improve depression. Women sample n=38 diet change groups and n=38 habitual diet groups were identified. The diet change group (n=38) had significantly lower levels of depression than the habitual diet (n=38) group following three weeks of diet improvement. Moreover in, a 12-week parallel-group, single-blind, randomized controlled trial called the SMILES by Jacka et al. (2017) in Australia, and New Zealand (ANZCTR) investigated the efficacy of a dietary improvement program for the treatment of major depressive episodes (diet intervention n =33; control n = 34).

The dietary support group demonstrated greater improvement between baseline and 12 weeks on the MADRS than the social support control group, (60.7) = 4.38, $p < 0.001$. Additionally, three-year cluster-randomized trials by Alexander et al. (2015) in Cape Town, South Africa, determined the association between food insecurity and depression among pregnant women Sample size (n 1,238). Results indicated that food insufficiency had a strong and statistically significant association with depression symptom severity (β=0.70; 95% CI, 0.46-0.94). Food insecurity leads to nutritional deficiencies, which may link to maternal depression. This review was conducted based on the limited literature currently on nutrition and perinatal depression published in the English language. This is due to the general paucity of established evidence in peer-reviewed

literature and indexed articles on the role of diet as a protective factor in the prevention of maternal depressive disorders in LMICs where the burden is high. Therefore, most studies that reported positive and negative results might be underreported. In this review, most of the studies were cross-sectional, which established the relationship between maternal mental disorders and the role of diet intervention in preventing the disorders, but a causal relationship needs to be established.

2.12 Conclusion

Nutritional deficiencies are widespread during the perinatal period, especially in resource-poor settings. The findings of this review demonstrate an association between nutrition deficiencies and maternal depression and that dietary means may play a role in preventing the disorder. The deficiencies caused by inadequate dietary intake and increased nutrient needs can be a key factor in women's susceptibility to maternal depression during pregnancy. Nutrition is fundamental to numerous aspects of brain functioning; therefore, nutritional interventions need to be tested to determine their efficacy in the prevention of maternal depression; this can offer a window of opportunity to reduce the risk of maternal depression in mothers and offspring alike. As a recommendation to substantiate these associations between diet quality and maternal depression, more robust study designs such as RCTs and longitudinal studies are needed to be conducted to confirm the preventive nature of nutrition for mental disorders and other chronic diseases.

CHAPTER THREE: RESULTS

Risk factors and experiences of prepartum depression in urban- low-income settlement Nairobi Kenya: a mixed method study

DOI link: https://doi.org/10.12688/F1000RESEARCH.27434.3; peer review: 2 approved]
Beatrice A. Madeghe1 & Wambui Kogi-Makau1 & Sophia Ngala1 & Manasi Kumar

3.1 Abstract

Background: Prepartum/prenatal depression is common among pregnant women and has not been studied much in low and middle-income countries. Evidence shows that mental illnesses are more prevalent in urban than in rural areas. The study objective was to establish the situational context of the magnitude of perinatal depression, experiences, and associated demographic factors among pregnant women.

Method: A mixed-method cross-sectional study design was conducted. It included 262 pregnant women attending antenatal clinics in two public health facilities in the urban low-income settlement of Nairobi, Kenya. Edinburgh Postnatal Depression Scale (EPDS) with a cut-off >13 was used to classify clinical depressive illness. Further, a focus group discussion was conducted with 20 women identified with depression. Descriptive statistics were used to obtain percentages, means, and standard deviation. The outcome measure was assessed by (EPDS score) as a continuous variable and a categorical defined by score ranges. Odd's Ratio was used to test associations. Variables with a $p<0.05$ were considered significant.

Result: Out of the 262 women, 33.6% had clinical depression as indicated by an EPDS score of >13. Women's gestational age was statistically significantly associated with prepartum depression, where women who were in second trimester pregnancy were three times more experiencing depression than other trimesters [OR 3.37; (95% C.I 1.60 - 7.10); *p <0.001*] The lower-income level <10,000 KES was statistically significantly associated with maternal depression [OR 0.39; (95%; C.I 0.23 – 0.66); *p<0.001*. Further, thematic analysis of qualitative data indicated that poverty, lack of social support, domestic violence, and unfriendly health care were major contributors to prepartum depression.

Conclusion: Significant numbers of pregnant women were found to experience clinical depression. This prevalence rate indicates a high disease burden of women who live with depression, which is not diagnosed; because screening of depression is not done at the primary health care. This study calls for a need and consideration for screening for perinatal depression in primary health care facilities, mainly in resource-poor areas. In addition, interventions targeting means of resolving conflicts in families are highly needed. Such steps would help achieve key sustainable development goals where maternal and child health remains a key priority.

Keywords: prepartum depression, risk factors, experiences, Kenya

3.2 Introduction

Prepartum maternal depression has been identified as a neglected component of care for women during pregnancy (Ogbo et al., 2018; Patel et al., 2018; Vargas et al., 2017). While pregnancy is expected to be the most unique and happiest moment in a woman's life, to some women is a different scenario filled with tears, fears, confusion, stress to severe depression (Barker et al., 2013; Fisher et al., 2012). Perinatal depression refers to mood disorders during pregnancy and/or after delivery within the first twelve months postpartum; thus, prepartum depression is a mood disorder during pregnancy (Fordet al., 2017; Leung & Kaplan, 2009). Global prevalence indicates that at least one in ten women in developed countries and two in five women in the developing world develop depression during pregnancy (Tilahun et al., 2017). The prevalence rates of prepartum depression range between 12.5 - 42% and 12 - 50% of women screened for depression symptoms in low and lower middle-income countries (WHO, 2008; Woldetsadik, Ayele, Roba, & Haile, 2019). Systematic reviews that determined the occurrence and determinants of prepartum depression found prevalence rates that range from 15% to 65% globally (Fisher et al., 2012; Oliveira, Cianelli, Gattamorta, Kowalski, & Peragallo, 2017). In Kenya, prevalence estimates of depression are found at 32.9% among pregnant adolescents (Osok, Kigamwa, Stoep, et al., 2018), with postpartum depression prevalence rate of 13% (Madeghe, Kimani, Vander Stoep, Nicodimos, & Kumar, 2016b).

Research evidence reveals that the stresses of life, especially around pregnancy and childbirth, can affect women's emotions, and the behavior of many mothers, hence increasing the risk of depression during pregnancy and after childbirth (Govender, Naidoo, & Taylor, 2020). In addition, the Socio-determinants, which refer to the social conditions where people are born, grow, live, work, and age influences their health outcomes (Benach et al., 2010). During pregnancy, maternal mental health is fundamental for the health of the mother and the infant's brain health and development; it needs to be prioritized early in the life course to prevent mental health problems later in life (Patel et al., 2018). Given this backdrop, this study aims to determine the magnitude of prepartum depression, identify risk factors for prepartum depression, and picture real-life experiences of pregnant women of low-urban income in Nairobi, the capital city of Kenya.

3.3 Methods

3.3.1 Study Setting and Participants

This was a cross-sectional- mixed-method cross-sectional study that involved pregnant women who attended antenatal care clinics during the study period from March to April 2019. In a cross-sectional study, data is assessed at one point in time. Pregnant women were captured at baseline, and data was collected at a point in time, including qualitative inquiry. Ethical approval was obtained from The Kenyatta National Hospital/University of Nairobi Ethical and Research Committee (KNH/UoN-ERC Ref: P56/02/2018). The study took place in two public health facilities in two urban low-income settlements, namely Kangemi and Kawangware. The two sites are both growing informal settlements located on the outskirts of the Nairobi city center. They were chosen purposively because the antenatal clinics (ANCs) at these health facilities receive a high volume of pregnant women; and the fact that in low income settlement like these, Socioeconomic deprivation indicators such as unemployment, low income and low education have been cited as risk factors for mental health disorders.

Eligibility criteria included all pregnant women aged 18 years and older, who visited ANCs for antenatal checkups in Kawangware or Kangemi, and pregnant women who were approximately at 12 weeks to 25 weeks of pregnancy. Excluded were pregnant women whose expected date of delivery was within eight weeks after the screening date, Women who appeared to have a disturbed mental state inhibiting correct information collection, and women who were not likely to be in the locality in the following 12 months. This cross-sectional study was part of the baseline assessment of a longitudinal cohort study, which t targeted depressed pregnant women for intervention. The sample size was calculated using Sample size estimation for longitudinal designs (Diggle et al., 2002); (Diggle, 2013). Approximately 50 subjects (depressed pregnant women) were needed from each site. Purposive sampling was used to obtain the above sample size, where every pregnant woman who came for antenatal checkup during the study period and met the inclusion criteria was screened. A total of 262 pregnant women were recruited 134 pregnant women from Kangemi and 128 from Kawangware.

3.3.2 Data Collection

Data were obtained from pregnant women employing an interview administered questionnaire. All women who came to the ANCs and queued in the waiting room were approached to participate. With a help of the ANC nurse, at baseline all pregnant women who came to ANC checkup, and in the waiting room, who were 12 weeks to 25 weeks pregnancy, 18 years and above, were identified as eligible, and were asked to be screened for depression. The study purpose was explained to them that participation was voluntary, and refusal to participate would involve no penalty of benefits to which one is entitled at the clinic. The participants were assured of their privacy and confidentiality. After obtaining a written informed consent signed by the respondent based on willingness to participate, the interview commenced.

Socio-demographic characteristics questionnaire: Using a questionnaire**,** pregnant women provided data on socio-demographic characteristics, age, marital status, maternal education level, employment status, partner's occupation, monetary decision-making, and family monthly income.

Maternal depression questionnaire: Edinburgh Postnatal Depression Scale (EPDS) was used to assess maternal depression. The EPDS is a 10-item questionnaire in which women report how they have been feeling in the past seven days. According to Edinburgh Postnatal Depression Scale (EPDS), a score of 10 or greater indicates possible depression. 'Women who score above 13 are likely to be suffering from clinical depression of varying severity (Cox, Holden, & Sagovsky, 1987). EPDS, has a Kiswahili translation version, and has been validated for detecting depression in both prepartum and postpartum mothers in many countries, including Kenya (Linnet Ongeri, 2015). EPDS is one of the most well-known and evaluated instruments for maternal depression and has demonstrated acceptable clinical utility as a screening tool. It has a sensitivity of 86%, specificity of 78% and a positive predictive value of 73% (Joshi, Shrestha, & Shrestha, 2019; Tesfaye, Hanlon, Wondimagegn & Alem, 2010). The depression scores were categorized into two levels; EPDS score higher than 13 indicated existence of clinical depression (Cox et al., 1987).

Edinburgh Postnatal Depression Scale (EPDS) was used to assess maternal depression. The EPDS is a 10-item questionnaire in which women report how they have been feeling in the past seven days. According to Edinburgh Postnatal Depression Scale (EPDS), a score of 10 or greater indicates possible depression. 'Women who score above 13 are likely to be suffering from clinical depression of varying severity (Cox, 1987). EPDS has a Kiswahili translation version and has been validated for detecting depression in both prepartum and postpartum mothers in many countries, including Kenya (Kumar et al., 2015). EPDS is one of the most well-known and evaluated instruments for maternal depression and has demonstrated acceptable clinical utility as a screening tool. It has a sensitivity of 86%, specificity of 78%, and a positive predictive value of 73% (Tesfaye et al., 2012); (Joshi et al., 2019).

The depression scores were categorized into two levels; EPDS scores higher than 13 indicated the existence of clinical depression (Cox et al., 1987. According to Edinburgh Postnatal Depression Scale (EPDS), a score of 10 or greater indicates possible depression. 'Women who score above 13 are likely to be suffering from clinical depression of varying severity (Cox, Holden, & Sagovsky, 1987). EPDS has a Kiswahili translation version and has been validated for detecting depression in both prepartum and postpartum mothers in many countries, including Kenya (Linnet Ongeri, 2015). EPDS is one of the most well-known and evaluated instruments for maternal depression and has demonstrated acceptable clinical utility as a screening tool. It has a sensitivity of 86%, specificity of 78%, and a positive predictive value of 73% (Joshi, Shrestha, & Shrestha, 2019; Tesfaye, Hanlon, Wondimagegn & Alem, 2010). The depression scores were categorized into two levels; EPDS scores higher than 13 indicated the existence of clinical depression (Cox et al., 1987)

Focus group discussions: Additionally, the qualitative inquiry was conducted with women who were identified with depression using focus group discussion (FDG's), to get a deeper understanding of women's experiences with depression during the present pregnancy. Convenience sampling was used to select and invite the depressed pregnant women for focus group discussion. A convenience sample is a type of non-probability

sampling method where the sample was taken from a group of people easy to contact or to reach.

The aim of FGD's was to identify the women's view about depression and the experiences around them. In this qualitative inquiry, 20 pregnant women with depressive symptoms (EPDS score cut-off score >13) were invited to participate. Two FGDs with a group of 10 participants were conducted from each site at Kangemi and Kawangware. Face to face discussion was conducted away from the health center by two female field researchers (Clinical psychologist and a nutritionist). The consenting process was followed, with the introduction of the study and the purpose of the study was explained to participants. Participants were informed that their participation was free and voluntary, with no penalty for those who declined to be part of the discussions. Confidentiality was assured, privacy was upheld, serial numbers were used instead of names. All information obtained from participants was kept under lock and key. Information in computers was stored in password-protected locations to assure confidentiality. In the facility, the investigators did not interfere with routine patient management. The FGDs was conducted in a hired community hall that was convenient for the women to come and discuss. The Clinical psychologist and a Nutritionist were both trained on mental health and qualitative methods. The relationship between researcher and pregnant women was established prior to study. The FGD lasted for 60–90 minutes, and it was conducted in the Kiswahili language and was audio-recorded.

3.3.3 Data Analysis

Quantitative analysis

The filled questionnaires were checked for completeness, errors, and discrepancies; this was followed by data entry, cleaning, and analysis using SPSS version 22. Descriptive statistics the percentages mean and standard deviation were used to summarize the socio-demographic data. An EPDS score of >13 pointed the likelihood of the presence of clinical depressive illness. Independent variables were categorized to analyzed, as a continuous variable and as a categorical to determine the association between independent and outcome variables, comparison was done between depressed women and non-depressed

women Odds ratio (OR) with 95% confidence interval (CI) was used to test the association. The variables that were associated at $p<0.05$ were considered significant.

Qualitative analysis

The FDGs in Kiswahili was transcribed to Kiswahili first and then translated into English. Thematic analysis was employed to process the data. Two coders (BM and a research assistant) were involved in the coding process. The study primarily followed the inductive approach and identified the emerging codes, and to some extent, the deductive approach was also used to determine the codes as described by (Alhojailan, 2012) Coding was manually done, the data was coded until all the information required for the study was exhausted, and finally four major themes emerged from the discussion. Consent was given by participants for future uses of data, such as publication, preservation, and long-term use of research data. Confidentiality was assured, that the information collected kept confidential, no identification, serial numbers used instead of names.

3.4 Results

3.4.1 Socio-demographic Characteristics of Pregnant Women in the Urban Low-Income Settlement

All approached pregnant women during prenatal clinic visit at Kawangware and Kangemi Health center during the study period were screened for depression as part of service delivery. A total of 262 women responded to the questionnaire 134 from Kangemi and 128 from Kawangware**.** An exploratory data analysis technique was used to uncover the distribution structure of the study variables as well as identify outliers using descriptive statistics**.** The data was tested for normality and there were no outliers. The mean (SD) age of the 262 women was 25.3±5.0 years (range, 18-42 years). The majority of the women (82%) were married, with 29.8% having less than high school education and 14% had tertiary level education. About 79.4% of the women had no employment but depended on their partners or parents, only 20.6% were employed. Slightly less than half of the women (43%) were first-time mothers, while 70% of them were in their second trimester during baseline assessment. Almost all the women (98%) owned a basic personal phone, and slightly less than three quarters had a television at home (73%). The mean (SD) income

level was 10845.8±5005.6 Kenyan shillings (KES) per month, and almost half of the women (49.6%) lived on an income less than KES 15,000, equivalent of 150 USD per month, and two-fifths of the women (38.9%) had their husbands make decisions on household finances (Table 3.1).

Table 3.1: Socio-demographics characteristics of pregnant women from urban low-income settlements in Nairobi, Kenya.

Variable	**Category**	**Percentage (%) /(N=262)**
Age	18-24 Years	51.1
	25-42 Years	48.9
Age	Mean (SD) 25.3±5.0	
Marital Status	Single/ Lives Alone	18.3
	Married/ Live with a Partner	81.7
Gestational Age	First Trimester	9.2
	Second Trimester	69.5
	Third Trimester	21.4
Employment	No	79.4
	Yes	20.6
Education Level	Primary and below	29.8
	Secondary	56.5
	Tertiary	13.7
Decision Maker	Both	42.0
	Husband	38.9
	Others	19.1
Number of Household members	Mean (SD) 2.9±1.2	
Number of children under 18 years	None	42.7
	One	30.5
	Two	18.7
	3 and Above	8.0
Income per month	Mean (SD)	5005.6
Income per month	5000 Ksh and Below	11.8
	5,001-15,000 Ksh.	49.6
	10,001-15,000 Ksh	26.3
	15,001 Ksh and Above	12.2
Owns Mobile	Yes	97.7
	No	2.3
Owns Radio	Yes	81.3

	No	18.7
Owns TV	Yes	73.3
	No	26.7
Owns Laptop	Yes	9.5
	No	90.5

3.4.2 Prevalence of Depression

The EPDS has 10 questions with four responses which are scored 3, 2, 1, or 0 with the top box scored as 3 and the bottom box scored as 0. Guided by Edinburgh Postnatal Depression Scale (EPDS) scoring system, the 10 items question generated depression score that ranges from 0 to 30 maximum (Cox et al., 1987). . The depression scores were categorized into two levels (depressed and not depressed). A score greater 13 indicated the existence of clinical depressive illness of various severities (see table 3.2).

Table 3.2: Prevalence of depression.

EPDS Depression	**Frequency**	**Percentage**	**95% C.I.**
No Symptoms (0-6)	74	28.2	22.9-34.0
Mild Symptoms (7-9)	34	13.0	8.8-17.6
Moderate Depressive Symptoms (10-12)	39	14.9	10.7-19.5
Probable Major Depression (13-14)	32	12.2	8.4-16.4
Probable Major Depression (15-19)	59	22.5	17.6-27.5
Severe Depression (≥ 20)	24	9.2	5.7-12.6
Depression (Cutoff ≥13)	**115**	**43.9**	**38.2-49.6**
Clinical Depression (Cutoff >13)	**88**	**33.6**	**27.9-40.7**
Suicidal Ideation (EPDS item 10)	*63*	*24.0*	*18.7-29.4*

3.4.3 Clinical Depression

Out of the 262 women, a third (33.6%; 95% CI 27.9-40.7) had clinical depression as indicated by EPDS >13 (Figure 2). Suicidal Ideation (EPDS item 10) revealed that 24% of pregnant women had some suicidal ideation. The mean (SD) EPDS score was 11.1, interquartile range of 10 with a minimum score of 0 and a maximum score of 26. All women who appeared to have suicidal ideation and those who were experiencing violence were referred to the mental health counselling services provided at the health facility, because they needed the first aid counselling. they were not excluded from the intervention, there were referred to the mental health services offered by the facility, then attended the

intervention sessions, this is because second part of the study was an intervention study which intended to help women going through such disputes. Since the facility does not have the mental health services daily, but only one day a week, when the Psychiatrist is available in the facility, the referred women, only met the facility counselor, and were enrolled to proceed with the intervention, because the intervention intended to help women going through such disputes. Severely affected, and mentally unstable were not included in the study.

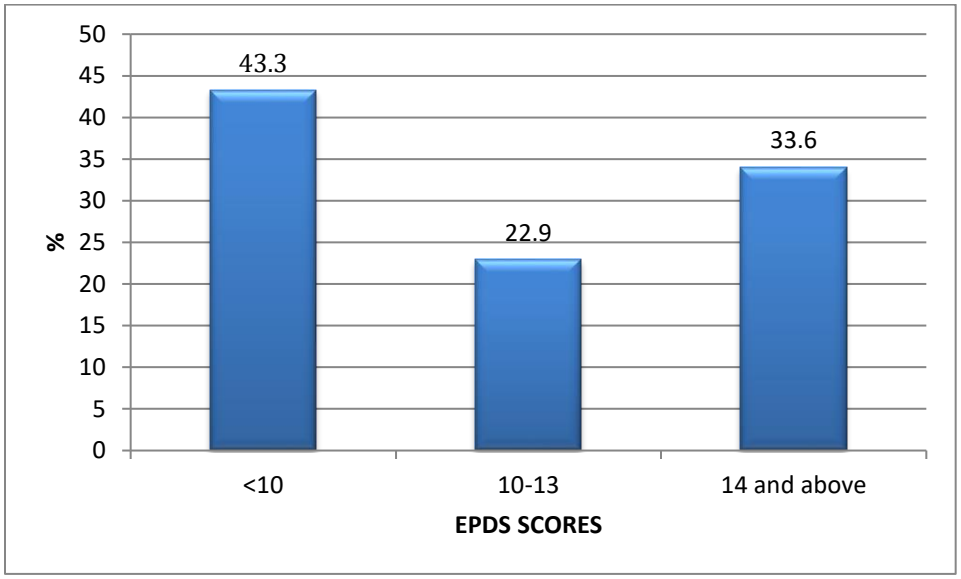


Figure 3.1: Prevalence of depression (EPDS Cut-off > 13) among pregnant women in urban low-income Nairobi –Kenya.

3.4.4 Characteristics between Depressed Pregnant and Non-Depressed Pregnant Women

Comparison between depressed pregnant women and pregnant women was made to find out whether there is significant difference between the two groups. Results revealed gestation age, was statistically significantly associated with maternal depression, where pregnant women in second trimester were three times more experiencing depression than other trimesters [OR 3.37; (95% C.I 1.60 - 7.10); $p < 0.001$]. The lower-income level <10,000 KES was statistically significantly associated with maternal depression [OR 0.39; (95%; C.I 0.23 – 0.66); $p < 0.001$] (see table 3.3).

Table 3.3: Demographic Characteristics and their effect on maternal depression EPDS cut-off >13.

Variable	Category	Depressed No N=174 (%)	Depressed Yes N=88 (%)	O.R(95% C.I)	P-Value
Age	18-24 Years	49.4	54.5	0.83(0.44-1.39)	0.484
	25-42 Years	50.6	45.5		
Marital Status	Single	17.8	19.3	0.90(0.47-1.74)	0.767
	Married	82.2	80.7		
Gestational Age	First Trimester	13.81	(4.5	2.76(0.94-8.07)	0.064
	Second Trimester	60.3	87.5	3.37(1.60-7.10)	0.001
	Third Trimester	22.9	8.0		
Employment	No	77.0	84.1	0.63(0.32-1.24)	0.181
	Yes	23.0	(15.9		
Education Level	≤ Primary	30.5	28.0	0.74(0.33-1.69)	0.475
	Secondary	55.7	58.0	0.98(0.47-2.08)	0.935
	Tertiary	13.8	13.6		
Decision Maker	Both(husband/wife)	42.5	37.5		
	Husband	38.5	39.8	1.38(0.79-2.43)	0.672
	Others	19.0	22.7	1.55(0.78-3.09)	0.212
Income (KES.)	<10,000	35.1	58.0	0.39 (0.23-0.66)	0.001
	>10,000	66.4	42.0		
Household size Children ,18	Mean±SD	2.95±1.20	2.84±1.21		0.475

3.4.5 Qualitative Result

Participants in the Focus Group Discussions (FDG's), had an age range between 18 to 33 years, and these women all had an EPDS score 14 to 25 and were in their second trimesters. Table 3.4 provides participant's characteristics in the FGDs. (See table 3.4).

Table 3.4: Characteristics of the participants in focus group discussions among pregnant women in urban low-income settlements in Nairobi, Kenya.

Participant ID	Age (years)	Marital status	Education	No. of children	Gestational age/In months	EPDS
Depressed women from Kawangware						
1	19	Single	Secondary	1	6	14
2	22	Married	Primary	1	4	18
3	26	Married	Primary	0	5	17
4	23	Married	Secondary	0	6	16
5	20	Married	Primary	1	5	14
6	21	Married	Secondary	0	5	15
7	18	Married	Primary	0	5	14
8	30	Single	Collage	2	6	16
9	24	Married	Secondary	0	6	14
10	33	Married	Secondary	1	6	19
Depressed women from Kangemi						
11	23	Married	Primary	1	5	14
12	22	Single	Secondary	0	6	25
13	25	Married	Secondary	0	6	18
14	22	Married	Secondary	0	6	17
15	30	Married	College	0	5	14
16	21	Married	Primary	0	4	16
17	33	Married	Primary	3	5	17
18	23	Married	Primary	1	6	14
19	24	Single	Secondary	0	5	19
20	20	Married	Secondary	2	4	16

The qualitative results from the FDGs were categorized into four major themes**: Poverty –** manifested through sub-theme financial struggle, unemployment and food insecurity. **Social support** – women reported inadequate support from their partners/husbands, the lack of a trustworthy person/friend who they could share their worries, loneliness, living far from family members, and feeling neglected: **Marital disharmony**; This manifested through issues of domestic violence (physical abuse and psychological/emotional abuse), and separation/divorce were reported: **Trauma experiences** – women reported fear and worries about childbirth and birth outcome, considering that most of them were first-time mothers, and some women reported a previous loss of a child, previous birth difficulties, and fear of facing health care providers. The experiences of these themes are discussed in details below.

Table 3.5: Codes and themes generated from the focus group discussion.

THEMES	CODES
1. Poverty	• Financial struggle • Unemployment • Food insecurity
2. Social support	• Lack of partner's support • Lack of trustworthy person/ friend • Loneliness • Living far from family members • Neglect/ Lack of family care • Living condition
3. Domestic violence	• Physical abuse • Psychological abuse • Marital disharmony
4. Fear and worries of health care and services	• Fear and worries of birth and birth outcome • Fear to face the health providers due to abuse • Previous loss of a child

Theme discussion - Poverty

Poverty is the root cause of stress and depression which contributes to other risk factors of depression. Women reported having not enough making and everything seeming difficult because of lacking. Poverty was manifested through three sub-themes identified as financial struggles, food insecurity, and lack of employment. The experiences of these are explained in quotes below.

Financial struggles

Pregnant women reported having financial struggles because they have no income, or their partner not being employed, so it becomes so difficult for them.

> *"I don't have a job, and I'm pregnant, and my husband doesn't have a job, and we live that way looking here and there; we are supposed to pay rent, food, and different kinds of needs. So, you live with questions and start questioning yourself."*
> Participant 20

"Lack of money is a big problem; if I have money in my pocket, I would be just fine." Participant 15

"Because I have no job, I'm only a stay home mom, when I lack something and I ask my husband, when he doesn't have money; he begins to become harsh, then it results in quarreling, just that." Participant 5

Food insecurity

Some pregnant women reported a lack of enough food, or sometimes basic food may be available, but the food that they crave during their pregnancy they cannot get.

"Sometimes we don't have food, and there is nothing to eat, this causes me to be sad" Participant 12

"My husband will leave home and there is nothing to eat at home, I'm pregnant and I have no job so that one usually bores me so much." Participant 17

"Sometimes the food may be available, but my husband stresses me, how will I be able to eat? You cannot." Participant 10

"Sometimes the basic food may be available, but the food that I crave for and I feel like eating is not available, I can't get it because there is not enough money to buy. I love and admire eating pizza, but no money." Participant 11

"When I ask my husband about the house needs, he becomes harsh and doesn't understand me so it makes me feel sad." Participant 6

Social support

Most of the pregnant women felt that they lack emotional and financial support from their partners who are responsible for the pregnancy. In addition, some of the partners rejected their pregnancy, and do not want to take any responsibilities**.**

"I stay with my husband's family, but there is no support of any kind that I get from them. My husband himself doesn't support me, so the only people who support me are my neighbors, when I have a problem I tell them and they give me some support." Participant 2

"Before I became pregnant, my boyfriend wanted me to be pregnant and insisted that I should give birth and he will marry me. But when I became pregnant he doesn't want to marry me, he doesn't do what he said, and so that makes me sad." Participant 4

"I Was admitted in the hospital and I was alone, the doctors called my boyfriend because there was a need for blood transfusion on me, so he was asked to come r to replace the blood' He rejected and said he doesn't know me.' He just talks rubbish." Participant 12

"Also, for me, my boyfriend doesn't want to support me, so I'm just waiting to give birth and raise the baby myself because he is not supporting" Participant 19
"My husband doesn't care when he sees me cry, he will ask me, 'what are you crying for? Just cry when you are tired you keep quiet". Participant 5

Some women reported that they don't have a trusted person around them to share their worries and talk heart to heart. Living conditions in slums where people live in one plot, some neighbors are stubborn and like making fun to others, further contributing to stress, anger and depression. Many pregnant women in urban settlement stay away from their family members, and so they feel they lack support as experienced below;

"I'm all alone I don't have anybody around that I can trust to the level that I can tell my story." Participant 7

"I have some people around, but I have never trusted somebody so much, because some of them cannot be true." Participant 5

"It is not possible to trust someone just like that; some people can tell your problems thinking that it's only between you two, but after that you will hear it with everybody and that is very embarrassing." Participant 15

"There are some people whom you can tell and maybe feel that she is a friend, you sit with her and tell her; she also supports you as if she has pity over you, but after you leave she is a type that laughs at you." Participant 16

Marital disharmony

In the FDGs, women reported hopelessness and helplessness around the experience of domestic abuse, which manifested as both physical and emotional abuse. The experiences that women go through have been narrated below:

Physical abuse

"One day, my husband came and quarrel me, and then he later slapped me, and then pushed me. I fell on the table and hit my stomach. I started feeling the stomach pain the stomach and thought my baby in my belly was hurt." Participant 6

"*My husband has a lot of disrespect whereby he sometimes spends a night out when he comes back he doesn't say anything, when I ask him where he was, at that point we start a big fight, and he will leave without leaving any money and no, food usually that make me feel sad."* Participant 17

Some women defend themselves.

"*Yes; whenever he starts, we just hit each other, there is no sparing him; so, he also fears me, I have a lot of energy, and he cannot quarrel with me so much."* Participant 14

Sometimes women are forced to stay with abusive partners even if they are beaten and not happy at all, this is because they cannot sustain themselves.

"If you go tell my parents they say "you cannot live a life with a husband without being beaten" Participant 3

"Now if you leave your partner, where will you go?" Participant 9

"I don't have a job and I don't have money; if I have had a job and money, I would get myself out. Where will I go to stay?" Participant 11

Psychological abuse

Women reported being psychologically abused, the partners refuse to offer does not emotional support to their wives.

"My husband keeps quiet, if I don't talk, he cannot talk, and it hurts me so much." Participant 19

"*My partner said that he will beat me and he is not the one responsible for the pregnancy, He told me that I should do abortion, because of that I decided to abandoned him and be on my own."* Participant 13

"Mine also doesn't want to talk, when I am tired and I tell, him that today I am not feeling well', he tells me 'it's up to you'. Participant 9

Separation/Divorce

Some women experienced separation or divorce.

"I don't stay with him, because he is so contemptuous; he cannot even offer me any support, he has even blacklisted my number." Participant 12

"*I don't know how to put it, but we parted ways those days when I was the first month, so all along I have been surviving, and I have become used. To living myself"* Participant 8

Trauma experiences

Some women had previous trauma experiences, such as loss of a child and/or difficult birth experiences.

> *"I Fear childbirth and I don't know how it will be like when the time comes. I don't know I if my child will be alive or die so I think a lot"* Participant 3

> *"I fear how that situation will be during childbirth, so my mind is being tormented y that, one day I will undergo child birth, it scares me."* Participant 7

> *"I fear delivery that gives me stress, since I have never had a baby, people tell me it's okay and everybody gives birth, but still it frightens me"* Participant 1

Some women feel that health care is unfriendly. When they go to the clinic, nothing is explained to them, even during a physical examination pregnant woman are not given any feedback about how they are doing, or if their babies are growing well, they are dismissed without any information given to them only given the date to come back for checkup. Therefore, the women reported that health care it sometimes is source of stress.

> *"They pressed my belly so hard and painful, and they tell me go you are done, and another one is being called; you are not told how your baby is doing, so I don't understand."* Participant 6

Summary of the Risk Factors Associated with Perinatal Depression

The study findings from both the quantitative and qualitative analyses, revealed a number of factors that contribute to perinatal depression among pregnant women, these has been summarized in the figure below. These risk factors are in three categories, the socio-economic position, material circumstances and the impact on health. (see figure 3.2).

Summary of the risk factors associated with perinatal depression

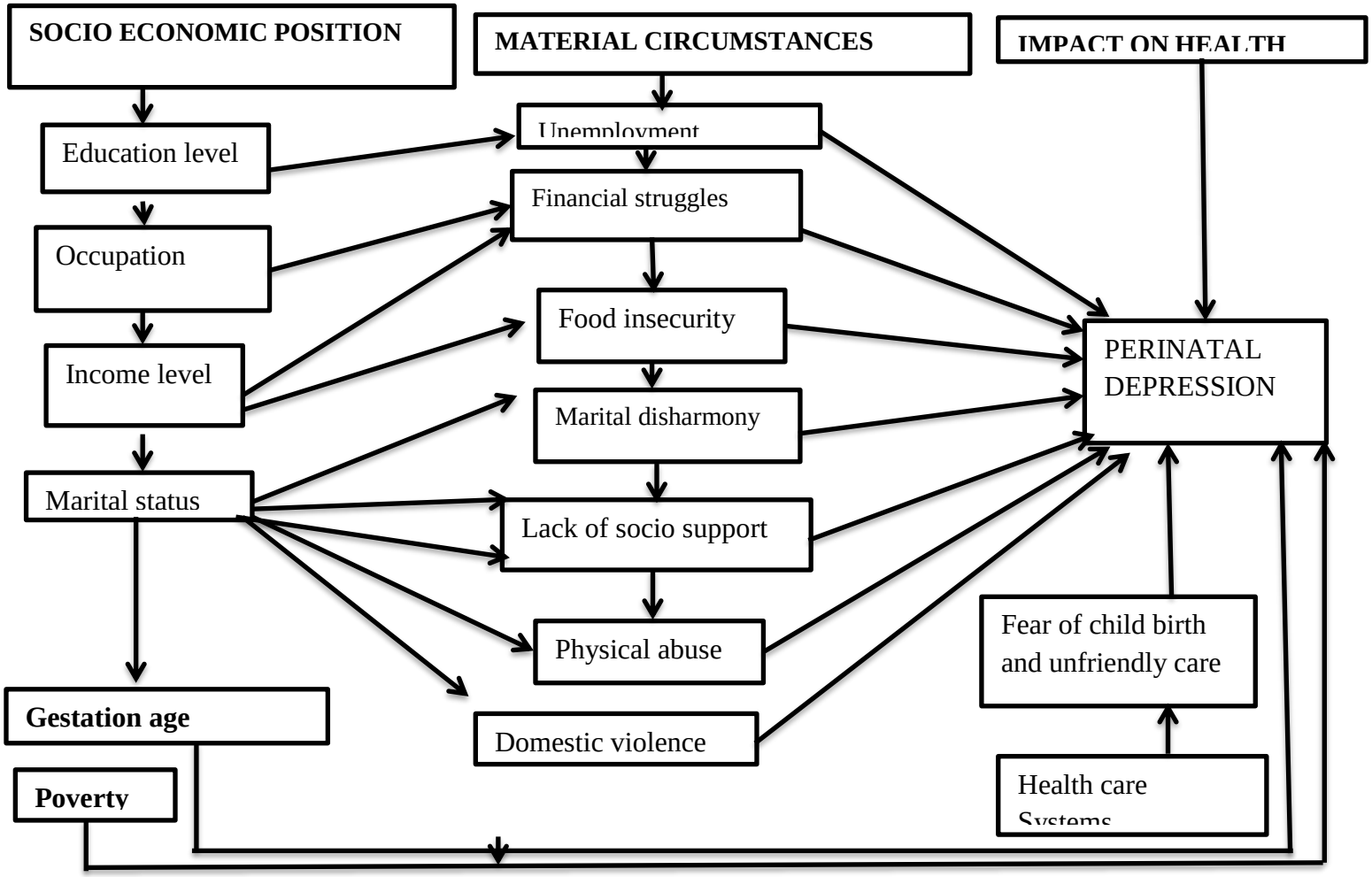


Figure 3.2: Summary of the risk factors associated withprenatal depression among women attending antenatal clinic in urban low income of Nairobi Kenya

3.5 Discussion

Results revealed one out of every three pregnant women experience clinical depression, as assessed by EPDS. Women in second trimester are at higher risk of experiencing depression. This prevalence rate indicates a high number of women who live with depression that is not diagnosed. This estimate lies within the wide range of prior prepartum prevalence rates of depressive symptoms (12.5-42%) among pregnant women in low and middle-income countries (WHO-UNFPA, 2008; Woldetsadik et al., 2019). These findings revealed relatively similar prevalence rates to the study by De Oliveira et al. (2017), found 37.5% depression prevalence among Hispanic pregnant women in South Florida using PHQ-9. A study by Sheeba et al. (2019) in Ethiopia found a prevalence rate of 35.7% among pregnant women using EPDS >13. Likewise, among Chinese women a prevalence rate of 28.5% was found among pregnant women in late pregnancy using the Self-rating Depression Scale (Zeng & Li., 2015).

A study by Joshi et al. (2019) from Nepal reported a point prevalence of 18% among pregnant women using EPDS ≥10. Another study in Ethiopia by Duko et al. (2019) found a prevalence rate of 21.5% among prenatal mothers using EPDS ≥13. Results revealed one out of every three pregnant women experience clinical depression, as assessed by EPDS. Women in second trimester are at higher risk of experiencing depression. This prevalence rate indicates a high number of women who live with depression that is not diagnosed. This estimate lies within the wide range of prior prepartum prevalence rates of depressive symptoms (12.5-42%) among pregnant women in low and middle-income countries (WHO, 2008; Woldetsadik et al., 2019). These findings revealed relatively similar prevalence rates to the study by De Oliveira et al., who found 37.5% depression prevalence among Hispanic pregnant women in South Florida using PHQ-9 (Oliveira et al., 2017).

A study by Sheeba et al. (2019) in Ethiopia found a prevalence rate of 35.7% among pregnant women using EPDS >13. Likewise, among Chinese women a prevalence rate of 28.5% was found among pregnant women in late pregnancy using the Self-rating Depression Scale (Zeng, Cui, & Li, 2015). A study in Nepal reported a point prevalence of 18% among pregnant women using EPDS ≥10 (Joshi et al., 2019) Another study in

Ethiopia by Duko et al. (2019) found a prevalence rate of 21.5% among prenatal mothers using EPDS ≥13. Various prevalence estimates of prenatal depression have been reported in various countries, and is experienced differently across countries. The differences in estimates could be due to methodological differences in which the studies were conducted, or the settings of the studies, the timing of pregnancy, screening instruments used, and the cut-off values used to classify mothers as depressed as described in the literature (Duko et al., 2019; Abebe et al., 2019; Rashid & Mohd, 2017; WHO, 2015). Despite all those differences, all the studies have shown a significant number of women that suffer perinatal depression.

The factors that were associated with prepartum depression in this study include socio-economic status, where lower-income. The qualitative findings that revealed poverty as the main a determinant of prepartum depression, Qualitative findings revealed financial worries and psychosocial factors to be associated with prepartum depression. In this study, most of the study participants were young mothers who belonged to the low-income group, and most of them were first-time mothers. These women were unemployed and were entirely dependent on their spouses or partners and family members. It is hypothesized that low income increases the likelihood of poor living conditions; financial struggle influences personal relationships, leading to psychosocial stress (Sheeba et al., 2019) . This hypothesis agrees with our qualitative findings where poverty, including financial struggles and food insecurity, were associated with prepartum depression.

Furthermore, the qualitative findings revealed other factors such as marital disharmony, where women experienced domestic violence, divorce or separation. Other factors included lack of socio- support, and trauma experiences to be among factors that cause pregnant women to be depressed. Our results have similarities with other studies in the literature, which identified risk factors such as such as maternal age and socio-economic status (Benach et al., 2010), domestic violence, social support, history of previous mental disorder (Sheeba et al., 2019), and pregnancy-related complications to be the contributing factors for prepartum depression.

The study by Joshi in Nepal reported higher odds for health problems, gestational age, sex preference, and spousal alcohol intake to be associated with depression (Joshi et al., 2019); the results by Joshi are similar to our study where gestational age was associated with prepartum depression. Another study by (Sheeba et al., 2019) in Ethiopia, reported that age group, educational qualification and occupation were significant predictors of prenatal depression, and that socio-economic status was not significantly associated with depression; these results contrast with our findings where age, education level, and occupation were not related to prepartum depression. The risk factors related to prepartum depression may not be similar. Some studies may find some risk factors associated with prepartum depression are and other studies did not find the same (Psychiatry et al., 2019; Zeng et al., 2015). This could be attributed due to cultural differences, population differences, and study setting, and living conditions that cause people to experience different risk factors for prepartum depression.

This study used mixed methods, both quantitative and qualitative. The qualitative part was useful in gaining a better understanding of the causes of prepartum depression and has complemented the quantitative part of the study to provide a fuller story. Prepartum depression has not been studied much in low and middle-income countries, contributing to a high disease burden. Therefore, study focus on prepartum depression contributes to filling a knowledge gap and awareness to health-care providers, researchers, policymakers, and the public about the rates and risk factors of prepartum depression for this study.

3.6 Conclusion

Given the prevalence of maternal depression that the study findings established, it led to the conclusion that, maternal depression is of public health significance and manifests mainly in the first and second trimester; when the reality hits, women are stressed, thinking about how they will go through the whole process of birth. Nevertheless, when the pregnancy advances, prevalence significantly decreases in the third trimester. Additionally, women appear to have the notion that someone else should take care of them during pregnancy. Support for women during pregnancy is good, but they should also understand that even if that support is not there, they can still do it and take their responsibility. The

finding of this study led to the recommendation that, there is a need to consider screening for perinatal depression at primary health care facilities at the antenatal clinics so that women who experience depression can receive help through counselling and be provided with social support. In addition, interventions targeting resolving conflicts and intimate partner violence are highly needed to help pregnant women going through such conflicts.

CHAPTER FOUR: RESULTS

Nutritional Factors Associated with Maternal Depression Among Pregnant Women in Urban Low-Income Settlement in Nairobi-Kenya

DOI link: https://doi.org/10.1177/03795721211025123; Food and Nutrition Bulletin;

Beatrice A. Madeghe1 & Wambui Kogi-Makau1 & Sophia Ngala1 & Manasi Kumar

4.1 Abstract: Background: Nutritional deficiencies are common during pregnancy and a year after childbirth. At the same time, maternal depression affects many women during pregnancy up to one year after childbirth. Therefore, the objective of this study was to determine the nutritional factors associated with maternal depression among pregnant women in urban low-income Settlement in Nairobi-Kenya.

Methods: This was a cross-sectional study, that included 262 pregnant women aged 18 years and older, who attended the antenatal clinic in two public health facilities in -urban-low income settlement in Nairobi-Kenya. Maternal depression was assessed using Edinburgh Postnatal Depression Scale. Mid-Upper Arm Circumference was used to determine nutritional status. Dietary intake was assessed using the 24-hour recall, and Brain essential nutrients were assessed through a questionnaire checklist. Odds Ratio was used to test the associations. All maternal characteristics with $p < 0.05$ were considered significant.

Results: Out of the 262 pregnant women, 33.6 % (95% CI 27.9-40.7) had depressive illness as indicated by EPDS >13. About 9.9% of pregnant women had MUAC less than >23cm. The study established a statistically significant association between poor nutrition by (MUAC) and maternal depression ($p < 0.001$). Maternal depression was statistically significantly associated with an inadequate intake of brain food essential ($p = 0.002$). In addition, maternal depression was statistically significantly associated with lower income ($p< 0.001$). In multivariable regression analysis, the main predictor of maternal depression was poor nutrition ($p< 0.004$).

Conclusion: The finding revealed an association between poor nutrition and maternal depression. These results suggest that, nutritional deficiencies could be the contributing factor for maternal depression. Study recommends dietary interventions to be considered to reduce deficiencies and alleviate mental health problems among pregnant women. Assessment of maternal depression and dietary intake assessments be integrated as fundamental components of antenatal care.

Keywords: Nutritional, diet, maternal depression

4.2 Introduction

Adequate nutrition for women during pregnancy prevents nutritional deficiencies that affect women's physical and mental health (Kenya Ministry of Health/WHO/UNICEF, 2013; Tuncalp, Rogers, Lawrie, Barreix, et al., 2020). The health of pregnant women, whether good or poor, affects not only the mother's quality of life but also fetal life and long term health problems (Abasizadeh et al., 2016). Maternal depression, defined as a mood disorder, is common during pregnancy and up to one year postpartum(Louise M Howard, Peter Piot, 2018; Patel et al., 2018; Zeng et al., 2015). World Health Organization (WHO) estimates that maternal depression among pregnant women in developing countries ranges from 15% to 57% (Madlala & Kassier, 2018; Surkan et al., 2011). At the same time, pregnancy malnutrition in Africa is still high, with an overall pooled prevalence of 23.5%, with variation between countries (Desyibelew & Dadi, 2019; Lukose et al., 2014; Serbesa et al., 2019; Swaminathan et al., 2019).

Research demonstrates high rates of mental health problems in pregnant women and mothers among the poorer sections of developing countries (Hanlon, 2013). Mental illnesses are generally more prevalent in urban than rural areas (Madlala & Kassier, 2018). Various prevalence rates of maternal depression have been reported across countries; for example, the prevalence rate of 20.2 % in Pakistan, 29 % in Brazil, 39 % in Bangladesh, and 39.5% in Tanzania (Ayano et al., 2019). In Ethiopia, the prevalence rate of 35.7% was found among pregnant women (Sheeba et al., 2019). In Kenya prevalence estimates the rate of 38.4% among pregnant women (Mochach et al., 2018); prevalence rates of 13% was found among postpartum women (Madeghe et al., 2016).

In Sub-Saharan Africa, many women suffer from chronic energy deficiencies during pregnancy due to insufficient food intake, high energy expenditure, and demands of pregnancy contributing to maternal malnutrition (Serbesa et al., 2019). Nutritional deficiencies of essential vitamins and minerals have been linked to maternal depression (Leung et al., 2013). In Kenya, the nutrition situation analysis conducted among pregnant women revealed that iron deficiency, also known as anemia, was 55.1%; iodine deficiency disorders (36.8%), and zinc deficiency among mothers (52%) (National Nutrition Action

Plan, 2012- 2017). It is documented that, around the world, about 800 women die from pregnancy or childbirth-related complications every day (Neggers, 2016; Desyibelew & Dadi, 2019). Epidemiological studies indicate that the quality of diet has implications for malnutrition and depression (Lukose et al., 2014; O'Neil Adrienne et al., 2014; Saeed et al., 2016). Poor diet during pregnancy exposes women to an increased risk of maternal depression (Leung & Kaplan, 2009).

Brain food essentials are important nutrients for brain function and regulation of the neurotransmitters such as serotonin, dopamine, and norepinephrine in mood stabilization (Rechenberg & Humphries, 2013; Women & Delivery, 2012). Deficiencies of brain food essentials, mainly of Omega-3 fatty acids, folate, and B12, iron, zinc, Magnesium, vitamin C, and vitamin A, have been linked to increased incidences of depression (Bourre, 2005; Leung & Kaplan, 2009a; Rechenberg & Humphries, 2013). One study investigating the role of nutrition in depression reported that anemic women have significantly higher depressive symptoms than non-anemic women (Lukose et al., 2014). A study in South Africa, evaluated the relationship between food insufficiency and mental disorders; the results revealed that food insufficiency is associated with mood disorders (Sorsdahl et al., 2011). A systematic review and meta-analysis study by Lai et al. (2014) disclosed that a healthy diet pattern was highly associated with reduced odds of depression, where high intakes of fruit, vegetables, fish, and whole grains may be related to a reduced depression risk.

Nutritional deficiencies adversely affect maternal wellbeing and birth outcomes (Serbesa et al., 2019). Conclusive evidence on nutritional enhancement as a treatment strategy for depression is still lacking (Lukose et al., 2014; O'Neil Adrienne et al., 2014; Saeed et al., 2016). Therefore, the overall objective of this paper is to identify nutritional factors associated with maternal depression among pregnant women in the urban low-income settlement in Nairobi Kenya; where the assessments for maternal depression, dietary intake, brain food essential intake, and nutritional status were the study's specific objectives.

4.3 Materials and Methods

A cross- sectional design was used to obtain the baseline data, to determine the association between nutrition status, diet quality and perinatal/maternal depression. In this cross-sectional study, data was collected at a point in time. Ethical approval was obtained from The Kenyatta National Hospital/University of Nairobi Ethical and Research Committee (KNH/UoN-ERC Ref: P56/02/2018). The study took place in two public health facilities in two urban low-income settlements: Kangemi and Kawangware. The two sites are both growing informal settlements located on the outskirts of the Nairobi city center. These sites were chosen purposively because the antenatal clinics (ANC) at these health facilities receive a high volume of pregnant women.

Inclusion criteria were pregnant women aged 18 years and older who visited ANCs for antenatal check-up in Kawangware and Kangemi; pregnant women who were at 12 weeks to 25 weeks of pregnancy. Excluded were pregnant women whose expected date of delivery was within eight weeks after the screening date, Women who appear to have a disturbed mental state inhibiting correct information collection. This cross-sectional study was part of the baseline assessment of a longitudinal cohort study that targeted depressed pregnant women for intervention, where approximately a hundred pregnant women with depressive symptoms were needed, fifty from each site. The sample size was calculated using Sample size estimation for longitudinal designs by (Diggle et al., 2002) in (Diggle, 2013).

To obtain a sample size of hundred depressed pregnant women, 262 subjects were screened at baseline. Recruitment took place at the ANC at the two selected health facilities one site at a time. Consecutive sampling was used where all the pregnant women who came for antenatal services and met the inclusion criteria, and were in the waiting room were approached to participate. The study purpose was explained to them, highlighting that the participation was voluntary; their refusal to participate would not involve any penalty of benefits to which one was entitled at the clinic. The participants were assured of their privacy and confidentiality. After obtaining a written informed consent signed by the respondent based on willingness to participate, then the baseline assessments commenced.

These interviews and screening were conducted in a room conveniently around the clinic provided, and took about 60–90 minutes. The study analyzed the data of 262 pregnant women who completed the baseline data.

4.3.1 Data Collections

Socio-demographic characteristics: Using a questionnaire**,** pregnant women provided data on socio-demographic characteristics, age, marital status, maternal education level, employment status, partner's occupation, monetary decision-making, and family monthly income.

Maternal depression: Edinburgh Postnatal Depression Scale (EPDS) was used to assess maternal depression. The EPDS is a 10-item questionnaire (see appendix 4) in which women report how they have been feeling in the past seven days (Cox et al., 1987). EPDS has a Kiswahili translation version and has been validated for detecting depression in both prepartum and postpartum mothers in many countries, including Kenya (Linnet Ongeri, 2015). EPDS is one of the most well-known and evaluated instruments for maternal depression and has demonstrated acceptable clinical utility as a screening tool. It has a sensitivity of 86%, specificity of 78% and a positive predictive value of 73% (Tesfaye et al., 2010). The depression scores were categorized into two levels; EPDS score of less than 13 indicated non- clinical depression, and EPDS score above 13 indicated existence of clinical depression (Cox et al., 1987).

Anthropometric assessments: The nutritional status of pregnant women was determined using Mid-Upper-Arm Circumference (MUAC). MUAC is the circumference of the left upper arm and is measured at the mid-point between the tips of the shoulder and elbow. To measure, the left arm was bent; mid-point was identified and marked with a pen then, a non-stretch measuring tape was applied around on the left arm and recorded to the nearest 0.1 mm. The measurements were taken with no clothing on the arm and recorded in duplicate for each respondent to enhance accuracy. Respondents with (MUAC< 23 cm) were classified as undernourished, and respondents with (MUAC ≥23 cm) were classified

as normal/nourished. The MUAC< 23 cm is recommended to include most pregnant women at risk as described in (Ververs, Antierens, Sackl, Staderini, & Captier, 2013).

Hemoglobin levels: Hemoglobin levels of pregnant women were obtained from pregnant women clinic card records. Pregnant women with hemoglobin levels from 11 gm/100 ml and above were classified as Normal hemoglobin. Pregnant women with hemoglobin levels less than 11 gm/100 ml were classified as anemic as described in (Young et al., 2019).

Dietary Assessment: Dietary intakes were assessed using a 24-hour dietary recall method to determine food, energy, and nutrient intake as described in (Salvador Castell, Serra-Majem, & Ribas-Barba, 2015). Food consumed by women was entered in the Nutri-survey software. The NutriSurvey program is German software (EBISpro). It contains an extensive collection of food databases worldwide including Kenya, and is easily integrated into the software. The food consumed was entered into the software, and the software generates an analysis of nutrients consumed from the food record. The software generated the consumed amount by pregnant women (analyzed value) and recommended value per day and generated percentage fulfillment of the daily recommended allowance for pregnant women. Women with a score of <70% (percentage fulfillment) were classified as having inadequate intake, and women with a score of ≥ 70% were classified as having adequate intake as described by (Nana & Zema, 2018).

Moreover, the Brain Food Essentials (BFE) intake was assessed using a questionnaire checklist (Appendix 6). Brain food essentials nutrients are essential nutrients important brain function and help balance the neurotransmitters. The brain food essentials questionnaire contained thirteen food items grouped, where pregnant women were asked if they consumed any of the food items in the past three days. Pregnant women who consumed brain food essentials about 9 out of 13 food items at total correct score of ≥70%, indicated adequate intake of brain food essential. Consumption with a score <70 indicated inadequate intake (Mediterranean Food Alliance & Oldways Preservation Trust, 2012).

4.3.2 Statistical Analysis

The filled questionnaires were checked for completeness, followed by data entry and cleaning. The data were analyzed using SPSS for windows version 22. A descriptive analysis of variables, socio-demographic characteristics, anthropometric data, and dietary 24hour recall, brain food essential and hematological characteristics was undertaken. Descriptive statistics such as percentage means and standard deviation were used to summarize the socio-demographic data. Pregnant women with (EPDS score > 13) were identified as with maternal depression, and pregnant women with (EPDS score < 13) were identified as without maternal depression. A comparison between depressed and non-depressed women was made. The independent variables were categorized to analyze the association between independent and outcome variables; an odds ratio with 95% Confidence Interval was calculated to test the association. The 24-hour dietary recall data were analyzed using Nutri survey software (EBISpro). All maternal characteristics that were associated at a $p < 0.05$ were considered to be significant.

4.4 Results

4.4.1 Socio-demographic Characteristics among Pregnant Women in Urban Low Nairobi-Kenya

The mean (S.D) age of the 262 women was 25.3±5.0, with 18 to 42 age range. The majority of the study women (82%) were married, with 29.8 % having less than high school education and 14% having tertiary level education. About 79.4% of the women had no employment but depended on their partners or parents; only 20.6% were employed. Slightly less than half of the women (43%) were first-time mothers. About70% of the pregnant women were in the second trimester. Almost all the women (98%) owned a basic personal phone, and slightly less than three quarters owned a television (73%). The mean (S.D) income level was 10,845.8 Kenyan shillings (KES) per month, and almost half of the women (49.6%) lived on an income less than 15,000 KES, equivalent of 150 USD per month. About (38.9%) of women had their husbands make decisions on household finances reference (see table 3.1).

4.4.2 Maternal Depression among Pregnant Women in Urban Low-income Nairobi-Kenya

Guided by Edinburgh Postnatal Depression Scale (EPDS) scoring system, the ten items question generated a depression score that ranges from 0 to 30 maximum. A score greater than 13 EPDS indicated the presence of clinical depression (Cox et al., 1987). Out of the 262 pregnant women, a third, 33.6% (95% C.I. 27.9 -40.7) were found to have clinical depression as indicated by EPDS >13. The mean (S.D) EPDS score was 11.1, interquartile range of 10 with a minimum score of 0 and a maximum score of 26 (see figure 3.1).

The socio-demographic characteristics were compared between depressed women and non-depressed. Results revealed that women's gestation age (second trimester) was statistically significantly associated with maternal depression [OR 3.37; (95% C.I 1.60 - 7.10); $p < 0.001$]. The lower-income level <10,000 KES was also statistically significantly associated with maternal depression [OR 0.39; (95%; C.I 0.23 – 0.66); $p<0.001$] (table 4.1).

Table 4.1: Distribution of the sample women according to effects of Social Demographic on maternal depression EPDS cut-off >13.

Variable	Category	Depressed No N=174 (%)	Depressed Yes N=88 (%)	O.R(95% C.I)	P-Value
Age	18-24 Years	49.4	54.5	0.83(0.44-1.39)	0.484
	25-42 Years	50.6	45.5		
Marital Status	Single	17.8	19.3	0.90(0.47-1.74)	0.767
	Married	82.2	80.7		
Gestational Age	First Trimester	13.81	4.5	2.76(0.94-8.07)	0.064
	Second Trimester	60.3	87.5	3.37(1.60-7.10)	0.001
	Third Trimester	22.9	8.0		
Employment	No	77.0	84.1	0.63(0.32-1.24)	0.181
	Yes	23.0	15.9		
Education Level	≤ Primary	30.5	28.0	0.74(0.33-1.69)	0.475
	Secondary	55.7	58.0	0.98(0.47-2.08)	0.935
	Tertiary	13.8	13.6		
Decision Maker	Both(husband/wife)	42.5	37.5		
	Husband	38.5	39.8	1.38(0.79-2.43)	0.672
	Others	19.0	22.7	1.55(0.78-3.09)	0.212
Income (KES.)	<10,000	35.1	58.0	0.39 (0.23-0.66)	0.001
	>10,000	66.4	42.0		
Household size	Mean±SD	2.95±1.20	2.84±1.21	0.82(0.66-1.02)	0.475

4.4.3 Nutritional Status of Pregnant Women in Urban Low-income Nairobi-Kenya

Maternal nutrition status was assessed using MUAC. The results revealed that, out of 262 pregnant women, 9.9% (95% C.I. 5.3- 5.6) had MUAC less than >23. Out of the percentage of pregnant women with MUAC >23, 18% were depressed women. The Hemoglobin levels (HB) was a piece of additional information to the study. Data was collected using the mother's clinic card records, and the results revealed high prevalence where 31.7% (95% C.I. 25.2- 40.3) of pregnant women were anemic as indicated by H.B. <11 gm/100 ml. Out of the percentage of the anemic pregnant women, 29.5% were depressed pregnant women (see figure 4.1). This was just an additional informational which was not on original objective but was added to captures the nutritional anemia status in women.

Nutritional status with maternal depression status EPDS score of >13.

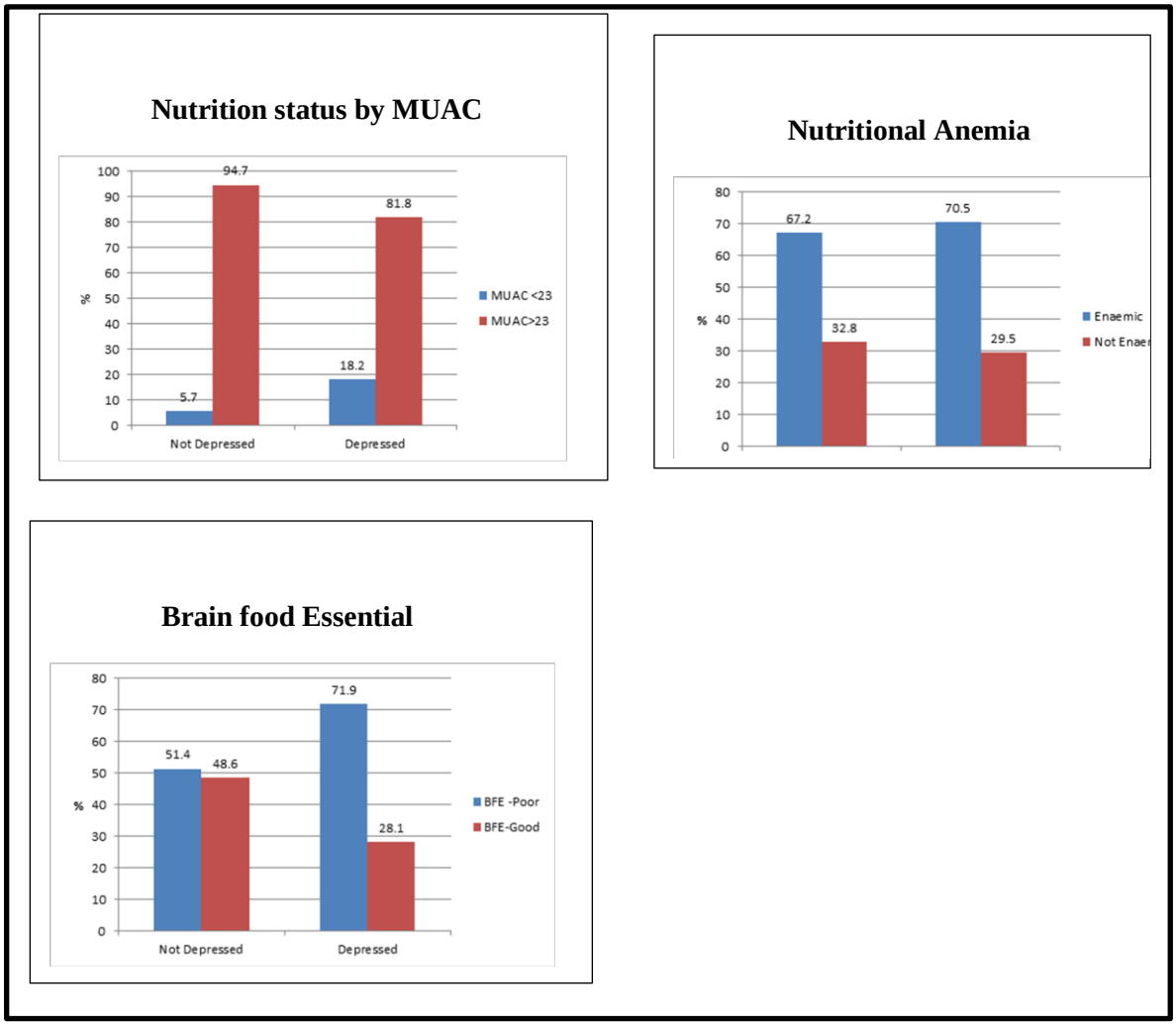


Figure 4.1: Nutritional status between depressed and non-depressed womenEPDS score of >13.

4.4.4 Dietary Intake of Pregnant Women in Urban Low-income Nairobi-Kenya

Dietary intake was assessed using one-time 24-hour recall in this cross-sectional study. The Nutri-survey software category of pregnant women was used for analysis. The food consumed food was entered into the software. The software generates an analysis of the food records amount consumed and generates the results, including the nutrient content, analyzed value, and recommended value per day, and percentage fulfillment for pregnant women.

Results reveal that most pregnant women did not fulfill their recommended daily requirements food intake for pregnancy as shown by percentage fulfillment of <70%, regardless of their status, whether with depression or without depression. When percentage fulfillment was compared to determine the risk and like hood of not fulfilling dietary requirements between depressed women and non-depressed women, results revealed a statistically significant association between energy food consumption fulfillment, Phosphorous consumption and maternal depression; Depressed women were half way more likely not meeting the recommendation than non- depressed women. There was also statistically significant association between phosphorous intake and maternal depression, depressed women were not taking enough phosphorous (see table 4.2).

Table 4.2: Achieved percentage of recommended dietary intake between depressed and non-depressed pregnant women in urban low-income Nairobi-Kenya EPDS cut-off >13 (N=262).

Variable	Category	Depression		O.R (95% C.I)	p-values
		No N=174 %	Yes N=88 %		
Energy	<70	24.7	42.0	0.45 (0.26-0.78)	0.004
	>70	73.3	58.0		
Water	<70	96.0	94.3	1.44 (0.44-4.67)	0.756
	>70	4.0	5.7		
Protein	>70	24.1	33.0	0.65(0.37-1.14)	0.129
	>70	75.9	67.0		
Fat	<70	89.7	94.3	0.52 (0.19-1.46)	0.208
	>70	10.3	5.7		
PUFA	<70	51.1	63.6	0.59 (0.35-1.01)	0.050
	>70	48.9	36.4		
Magnesium	<70	18.4	26.1	0.64 (0.35-1.17)	0.146
	>70	81.6	73.9		
Iron	<70	90.8	94.3	0.59 (0.21-1.68)	0.523
	>70	9.2	5.7		
Zinc	<70	56.3	63.2	0.75 (0.44-1.27)	0.286
	>70	43.7	36.8		
Vitamin B6	<70	38.5	47.7	0.69 (41-1.15)	0.153
	>70	61.5	52.3		
Vitamin B12	<70	78.7	86.4	0.59 (0.23-1.19)	0.135
	>70	21.3	13.6		
Folic Acid	<70	100.0	98.9	0.33 (0.28-0.37)	0.336
	>70	0.0	1.1		
Vitamin C	<70	58.0	54.5	1.15 (0.69- 1.93)	0.589

	>70	42.0	45.5		
Calcium	<70	96.0	93.2	1.75 (0.57-5.36)	0.325
	>70	4.0	6.8		
Potassium	<70	85.6	80.7	1.427 (0.73-2.81)	0.302
	>70	14.4	19.3		
Phosphorous	<70	16.7	28.4	0.50 (0.27-0.93)	0.026
	>70	83.3	71.6		
Carbohydrate	<70	11.5	20.5	5.05 (0,25- 1.01)	0.63
	>70	88.5	79.5		
Dietary fibre	<70	13.2	63.6	0.52 (0.27-1.01)	0.054
	>70	86.8	36.4		
Vitamin A	<70	28.7	35.2	0.74 (0.43-1.28)	0.283
	>70	71.3	64.8		
Vitamin E	<70	54.0	62.5	0.71(0.42-1.19)	0.190
	>70	54.0	37.5		
Vitamin B1	<70	46.0	54.5	0.709 (0.42-1.19)	0.190
	>70	54.0	45.5		
Vitamin B2	<70	78.7	86.4	0.585 (0.29-1.19)	0.135
	>70	21.3	13.6		

4.4.5 Brain Food Essential Intake among Pregnant Women in Urban low-income Nairobi-Kenya

Brain food essentials were assessed to determine whether women were taking enough brain food essentials. Women were asked if they had consumed brain food items in the past three days. Results revealed that 26.7 % of pregnant women had inadequate intake of brain food essentials, as indicated by a score of <70%. Out of the pregnant women with an inadequate intake of brain food essential, 71.9% were depressed pregnant women (see figure 4.1).

Brain food essentials consumption were compared between depressed women and non-depressed women to find out, which food poses more risks for depression; results revealed significant association between maternal depression and low consumptions of legumes, e.g., red kidney beans, chickpeas, lentils P= 0.043, and consumption of dairy products (milk, yogurt, cheese) (table 4.3).

Table 4.3: Brain food Essential intake between depressed and non-depressed pregnant women in urban low-income Nairobi-Kenya EPDS cut-off >13 (N=262).

Brain Food Essential Variables	Category	Depressed No N=174 (%)	Depressed Yes N=88 (%)	O.R(95% C.I)	P-Value
Consumed fish, lean meat, organ meat, sardine, and cod liver oil	No	10.9	89.1	0.597(0.29-1.40)	0.163
	Yes	17.0	83.0		
Consumed groundnuts, pumpkin seeds, sunflower seeds	No	42.5	57.5	0.68(0.40-1.13)	0.135
	Yes	52.3	47.7		
Consumed seed oils, olive oils, margarine and butter	No	27.0	73.0	0.93(0.53-1.66)	0.811
	Yes	28.4	71.6		
Consumed grain whole, e.g., whole ugali, rice, githeri/corn, wheat sorghum, millet, or any	No	2.9	97.1	0.49(0.12-1.74)	0.263
	Yes	5.7	94.3		
Consumed legumes, e.g., red kidney beans, chickpeas, lentils or any	No	8.6	91.4	0.46(0.21-0.99)	0.043
	Yes	17.0	83.0		
Consumed dark grey leafy vegetables any locally, kale, spinach, nightshade,	No	1.1	98.9	0.33(0.05-2.01)	0.207
	Yes	3.4	96.6		
Consumed tomatoes, carrots, sweet potatoes e.tc?	No	1.7	98.3	0.29(0.07-1.25)	0.079
	Yes	5.7	94.3		
Consumed eggs from chicken, duck	No	19.0	81.0	0.70(0.38-1.29)	0.257
	Yes	25.0	75.0		
Consumed dairy (milk, yogurt, cheese)	No	12.6	87.4	0.41(0.21-0.79)	0.006
	Yes	26.1	73.9	.	
Consumed red meat (beef, pork, goat meat)	No	24.7	75.3	0.87(0.49-1.57)	0.654
	Yes	27.3	72.7		
Consume white meat (chicken, turkey, rabbit, etc.)	No	35.6	64.4	0. 76(0.45-1.29)	0.312
		42.0	58.0		
Consumed sweets, such as cookies, biscuit)	No	38.5	61.5	1.15(0.68-1.96)	0.604
	Yes	35.2	64.8		
Consumed spices (turmeric, cinnamon, etc.)	No	69.2	30.8	0.81(0.48-1.37)	0.433
	Yes	63.6	36.4		

4.4.6 Association between Nutrition Status, Diet, and Maternal Depression among Pregnant Women in Urban Low-income

Nutritional status was compared between pregnant women with depression and those without depression, to find out which factors pose more risk for depression among pregnant women. The results revealed that there was a statistically significant association between poor nutrition status as assessed by MUAC and maternal depression [OR 0.27; (95% 0.11-0.63); p< *0.001*]. Maternal depression was statistically associated with poor intake of brain food essentials, with [OR 0.41(95% 0.26-0.74); *p= 0.002*]. Poor nutrition status by MUAC was significantly statistically associated with poor intake of brain food essentials [OR 2.631 (95% 1.15-6.00); *p= 0.018*]*;* this could be also a two way round, where depression can also poor nutrition status. Maternal depression was statistically significantly associated with lower-income levels [OR 0.39(95% 0.23-0.66); *p<0*.001]. Moreover, brain food essentials were also statistically significantly associated with low-income levels [OR 1.74 (95% 1.00-3.03), *p< 0.046* (table 4.4).

Table 4.4: Association between nutrition status, dietary intake and maternal depression among pregnant women in urban low-income Nairobi-Kenya EPDS cut-off >13.

	Category	Depression		O.R(95% C.I)	P-Value
		No N=174 %	Yes N=88 %		
Brain Essential	Poor	51.4	48.6	0.41(0.26.74)	0.002
	Good	71.9	28.1		
Income level	<10,000	35.1	58.8	0.39(0.23-0.66)	<0.001
	>10,000	64.9	42.0		
Variable	**Category**	**MUAC**		**O.R(95% C.I)**	**P-Value**
		<23 N=26 %	**>23 N=236 %**		
Depression	Yes	18.2	81.8	0.27(0.11-0.63)	0.001
	No	5.7	95.3		
Brain essentials	Poor	17.1	82.9	2.631(1.15-6.00)	0.018
	Good	7.3	92.7		
Variable	**Category**	**Brain Food Essentials**		**O.R(95% C.I)**	**P-Value**
		Poor N=70 %	**Good N=192 %**		
Income levels	<10,000	52.9	39.1	1.74(1.00-3.03)	0.046
	>10,000	47.1	60.9		

4.4.7 Main Predictors for Maternal Depression

Multiple regressions were performed to find out which factors contribute more to depression. Standardized beta revealed nutrition status by MUAC to be statistically significantly associated with maternal depression compared to other factors (see table 4.5).

Table 4.5: Main contributing factors to maternal depression among pregnant women in urban low-income Nairobi-Kenya

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.146	4.505		4.694	.000
	Age	.034	.088	.028	.385	.701
	Income level	.000	.000	-.171	-2.746	.006
	MUAC	-.476	.165	-.233	-2.890	.004
	BMI	.231	.137	.133	1.691	.092
	Brain Food Essential	-.389	.204	-.120	-1.904	.058
	Number of children under 18 in the household	-.557	.482	-.110	-1.156	.249
	Number of household members	.393	.468	.078	.841	.401

a. Dependent Variable: Depression by EPDS.

4.5 Discussion

4.5.1 Maternal Depression Prevalence among Pregnant Women in Urban Low-income Nairobi-Kenya

A third (33.6%) of the study women had clinical maternal depression as assessed by EPDS. This prevalence rate is comparable with the available estimates for maternal depression in developing countries; with a range between 15% and 57% (Surkan et al., 2011). A study by De Oliveira et al. (2017) in South Florida found prevalent of (37.5%) among Hispanic pregnant women in South Florida; education level, health status, and living with a partner were significant predictors of maternal depression. Unlike our study, these factors were not significantly associated with maternal depression.

4.5.2 Nutritional Status among Pregnant Women in Urban Low-income Nairobi-Kenya

The study results revealed that poor nutrition status was statistically significantly associated with maternal depression. Our study findings are not so different from other studies that documented poor nutritional status among pregnant women. The survey by Serbesa et al. (2019) in Ethiopia determined the magnitude of malnutrition and associated factors among pregnant and revealed that 30.3% of pregnant women were underweight,

the risk factor for undernutrition was maternal age of women that was statistically significantly associated with poor nutritional status.

A study by Barker et al. (2013) in England tested whether prenatal maternal depression symptoms predicted poor prenatal nutrition. Results revealed that higher depressive symptoms during pregnancy were related to higher levels of poor nutrition. A cohort study of pregnant women by Chatzi et al. (2011), in Greece, investigated dietary patterns and depression during pregnancy. Result instituted that, high adherence to a health-conscious diet, high in vegetables, fruit, pulses, nuts, dairy products, fish and olive oil, was associated with lower EPDS scores β-coefficient = -1·75, P = 0·02 (Chatzi et al., 2011). These results demonstrate that poor diet quality during pregnancy exposes women to maternal depression.

4.5.3 Dietary Intake of Pregnant Women in Urban Low-income Nairobi-Kenya

The study findings from 24-hour dietary recall revealed inadequate dietary intake of food among pregnant women. Most pregnant women did not meet their daily nutritional requirements for various nutrients. These findings are similar to other research findings. A study by Napier et al., (2019) in South Africa, KwaZulu Natal, determined the nutritional status and food intake of pregnant women; the results indicated that except for carbohydrates and vitamin A, all the nutrients consumed by the women were lower than the recommended daily amounts; the fruits and vegetable intake were half of the recommended daily amount. Another study in Nigeria by Lindsay et al. (2012) revealed a high prevalence of nutrient deficiencies, including iron, folate, vitamin D, and vitamin A. These missing nutrients are crucial for brain health (Lindsay et al., 2012). A study by Almurshed et al. in Saudi Arabia found that, the nutrient intake for pregnant women was below the recommended dietary allowances (RDA) for energy 51.8%; VitaminB1, 93.9% ; 82.5% for calcium and 98.2% for iron (Almurshed et al., 2007); the results reveal inadequate intake of nutrients among pregnant women, and these nutrients are essentials for brain health in which the deficiencies may lead to mood disorders.

4.5.4. Brain Food Essentials Intake among Pregnant Women in Urban Low-income Nairobi-Kenya

The study results revealed a 26.7 % of pregnant women with inadequate intake of brain food essentials. The study established also a statistically significant association between brain food essentials and income levels. These results compare well with other studies conducted on a similar topic. A study by Singh et al., in Columbia evaluated the prevalence of nutritional deficits in pregnant teenagers and assessed the associations among micronutrient dietary intake, stress, and depression. Results revealed that more than 50% of pregnant teenagers had an inadequate intake of folate, vitamin A, vitamin E, iron, zinc, calcium, magnesium, and phosphorous (excluding dietary supplement) (Singh et al., 2017). Additionally, in the same study >20% of participants had an inadequate intake of thiamin, riboflavin, niacin, vitamin B6, vitamin B12, vitamin C, copper, and selenium elements which are the brain food essentials (Leung & Kaplan, 2009; Sparling et al., 2017; Rechenberg & Humphries, 2013). Another study by (Paskulin et al., 2017) in southern Brazil found that, low intakes of unhealthy foods and high intakes of refined sugars during pregnancy were related to an increased prevalence of maternal mental disorder.

4.6 Conclusion

The study findings have established an association between nutritional factors with maternal depression. These factors include poor nutritional status, poor diet, which is associated with maternal depression. Low-income levels contribute poor nutrition because lack of money prevents mothers from accessing varieties food hence poor diet. These findings lead to the recommendation that nutrition can play a critical role in addressing maternal mental disorders and improving the nutritional status of mothers. Additionally, maternal dietary intake assessments during pregnancy need to be integrated as fundamental components of antenatal care because ANCs visits provide a window of opportunity to promote good nutrition for mental health. Finally, there is a need to disseminate appropriate nutritional education to young mothers with a low educational background because they may be disadvantaged, especially during the first and second trimesters.

CHAPTER FIVE: RESULTS

Nutritional Knowledge, Attitude, and Practices among Pregnant Women in Urban low-income Nairobi Kenya

Beatrice A. Madeghe1 & Wambui Kogi-Makau1 & Sophia Ngala1 & Manasi Kumar

5.1 Abstract

Background: Pregnancy is the most demanding period nutritionally in a woman's life. Nutrition during pregnancy and after childbirth requires substantial attention; however, pregnant women's nutritional knowledge, attitudes, and practices are not well-rooted. The objective of this study was to assess nutritional knowledge, attitude, and practices among pregnant women in order to establish if women need nutritional intervention in urban low-income Nairobi, Kenya.

Methods: This was a cross-sectional study, that determined the Knowledge, attitude and practices among 262 pregnant women, aged 18 years and older, who attended antenatal clinics at Kangemi and Riruta health centers. Data were obtained from pregnant women by using an interview administered questionnaire. The independent variables were categorized to analyze the association between independent and outcome variables among pregnant women. A Chi-square was used to test the associations. Variables that were associated with a P-value <0.05 were considered to be significant.

Results: The findings show that the educational level among pregnant women with lower level of education at primary and less were statistically significantly associated with poor nutritional knowledge p <0.001. The gestational age women during the first trimester were statistically significantly associated with poor nutritional Knowledge P= 0.022. Moreover, income level of 5000 Kes and below-equivalent of 50USD was statistically significantly associated with a negative nutritional attitude P <0.00. Education level primary and below was significantly associated with negative nutritional attitude p =0.002.

Conclusion: These results demonstrate a gap in nutritional knowledge, attitude and practice among pregnant women. There is a need to focus on disseminating appropriate nutritional education and dietary counseling early in pregnancy, specifically to young mothers with a low educational background because they may particularly be disadvantaged.

Keywords: Nutritional Knowledge, Attitude, Practice, Pregnancy

5.2 Introduction

Nutrition is fundamental for human well-being and growth throughout the entire lifespan (Tenaw et al., 2018;Zelalem et al., 2018). Maternal malnutrition is a concern in many countries (Ravaoarisoa et al., 2018). Poor dietary practices cause nutritional deficiencies; it is documented that most dietary inadequacies are a result of eating habits, and these patterns are higher during pregnancy compared to any other stage of the life cycle (Nana & Zema, 2018). A well-balanced diet is essential for the proper functioning of the body system, especially during pregnancy. Research evidence shows that maternal malnutrition is still way too high across Southcentral, Southeast Asia, and Sub-Sahara Africa; the overall prevalence of malnutrition among pregnant women in Africa is about 23.5% **(**Desyibelew & Dadi, 2019).

Worldwide maternal malnutrition contributes to 800 000 neonatal deaths due to stunting, wasting, and micronutrient deficiencies (Bhutta et al., 2013). Chronic energy deficiency, inadequate weight gain, and poor micronutrient status are common during pregnancy, and many women in Africa suffer from these disorders (Serbesa, Iffa & Geleto, 2019). Pregnant women must get all the essential nutrients to help them gain sufficient weight (Nana & Zema, 2018). Pregnant women are vulnerable to nutrient deficiencies because their nutritional needs have been elevated due to increased demand during pregnancy compared to women who are not pregnant or lactating (Rechenberg & Humphries, 2013). Research evidence has reveals that some women restrict their food consumption during pregnancy for different reasons, including smaller infants, to avoid birth difficulties (Nana & Zema, 2018). With this understanding, the objective of this study is to determine nutritional knowledge, attitudes, and practices among pregnant women in urban low-income Nairobi, Kenya.

5.3 Materials and Methods

This was a cross-sectional study, that determined the Knowledge, attitude and practice among 262 pregnant women, aged 18 years and older, who attended antenatal clinics at Kangemi and Riruta health centers. In this cross-section study data was collected at one point in time. Obtained ethical approval from Kenyatta National Hospital and the

University of Nairobi Ethical and Research Committee (KNH/UoN-ERC Ref: P56/02/2018). Assessed socio-demographic characteristics of women by using the questionnaire, nutritional knowledge, attitude, and practice was assessed using a knowledge test tool. The study took place in two public health facilities in two urban low-income settlements at Kangemi and Kawangware. These two slums Kangemi in Kenya are both located on the outskirts of the Nairobi city center, and are among the biggest growing slums in Nairobi, Kenya. Eligibility criteria included pregnant women aged 18 years and older, who visited ANCs for antenatal check-up in Kawangware and Kangemi, pregnant women who were at 12 week - 25 weeks pregnancy. Excluded were pregnant women whose expected date of delivery was within eight weeks after the screening date, Women who appear to have a disturbed mental state inhibiting correct information collection.

This cross-sectional study was part of the baseline assessment of a longitudinal cohort study, which targeted depressed pregnant women for intervention. Sample size was calculated using Sample size estimation for longitudinal designs (Diggle et al., 2002) in (Diggle, 2013). Approximately 50 subjects (depressed pregnant women) were needed from each site. To obtain the above sample size, consecutive sampling was used where every pregnant woman who came for antenatal checkup during the study period and met the inclusion criteria were screened, a total of 262 pregnant women completed the data. The study purpose was explained to them that - participation is voluntary, and refusal to participate will involve no penalty of benefits to which one is entitled at the clinic. The participants were assured about their privacy and confidentiality after obtaining a written informed consent signed by the respondent based on willingness to participate before the interviews commenced.

5.3.1 Data Collection

Socio-Demographic characteristics: Data was obtained from pregnant women by using an interview administered questionnaire; Women responded to a socio-demographic questionnaire, which included age, marital status, maternal education level, employment status, husband occupation, monetary decision-makers, and family monthly income.

Knowledge, attitude, and practice assessment: Nutritional knowledge, attitude, and practice were assessed using a knowledge test tool. The knowledge test included the test items which reveal women's understanding about nutrition. Women were supposed to respond to "yes", if they agree to the statement about nutrition knowledge, and respond to "no", if they don't agree with the statement about nutrition on the knowledge test. Women were classified as knowledgeable if they give the correct respondents in the knowledge test with a total score of >75% (out of 100%) on the knowledge test questions. Similarly, women were classified to have a positive attitude if the correct responses with a score of >75% (out of 100%) on the attitude test as described in (Zelalem, Mikyas & Erdaw, 2018). Similarly, women were considered to have good practice if respondents score ≥70% (out of 100%) on the practice test questions. These interviews were conducted in a convenient location around the clinic agreed by the participants. Interviews lasted for 30–50 minutes. The study analyzed the data of 262 pregnant women who had enrolled and completed the baseline data for the study period between March to April 2019.

5.3.2 Statistical Analysis

The data were analyzed using SPSS for windows version 22. A descriptive analysis of variables, socio-demographic details characteristics was undertaken. Descriptive statistics such as percentage means and standard deviation summarized the socio-demographic data. The independent variables were categorized to analyze the association between independent and outcome variables. Nutritional knowledge, attitude, and practice were analyzed and were compared using the Chi-square tests. Those variables that were associated with a P- a value of <0.05 were considered to be significant.

5.4 Results

5.4.1 Socio-demographics Characteristics among Pregnant Women from Urban Low-income

The mean age of pregnant women was 25.3±5.0, with an age range of 18 to 42. The majority of the study women (82%) were married, with 29.8 % having less than high school education and 14% having tertiary level education. About 79.4% of the women had no employment but depended on their partners or parents; only 20.6% were employed.

Slightly less than half of the women (43%) were first-time mothers, while 70% were in their second trimester during baseline assessment. Almost all the women (98%) owned a personal phone, and slightly less than three-quarters owned a television (73%). The mean income level was 10845.8±5005.6 Kenyan shillings (KES) per month, and almost half of the women (49.6%) lived on an income of less than 15,000 KES, equivalent to 150 USD per month, while two-fifths of the women (38.9%) had their husbands make decisions on household finances. (See table 3.1 in chapter three1).

5.4.2 Nutritional Knowledge among Pregnant Women in Urban Low-income in Nairobi Kenya

The percentage score was obtained by adding the correct answers to the nutrition knowledge test tool. The results demonstrated that 69.1% of pregnant women had good nutritional knowledge, as indicated by a score >75 on the knowledge test. Rest of the pregnant women, 30.9% of women did not have adequate nutritional knowledge about diet during their current pregnancy as indicated by a score <75 in the knowledge questionnaire (see figure 5.1).

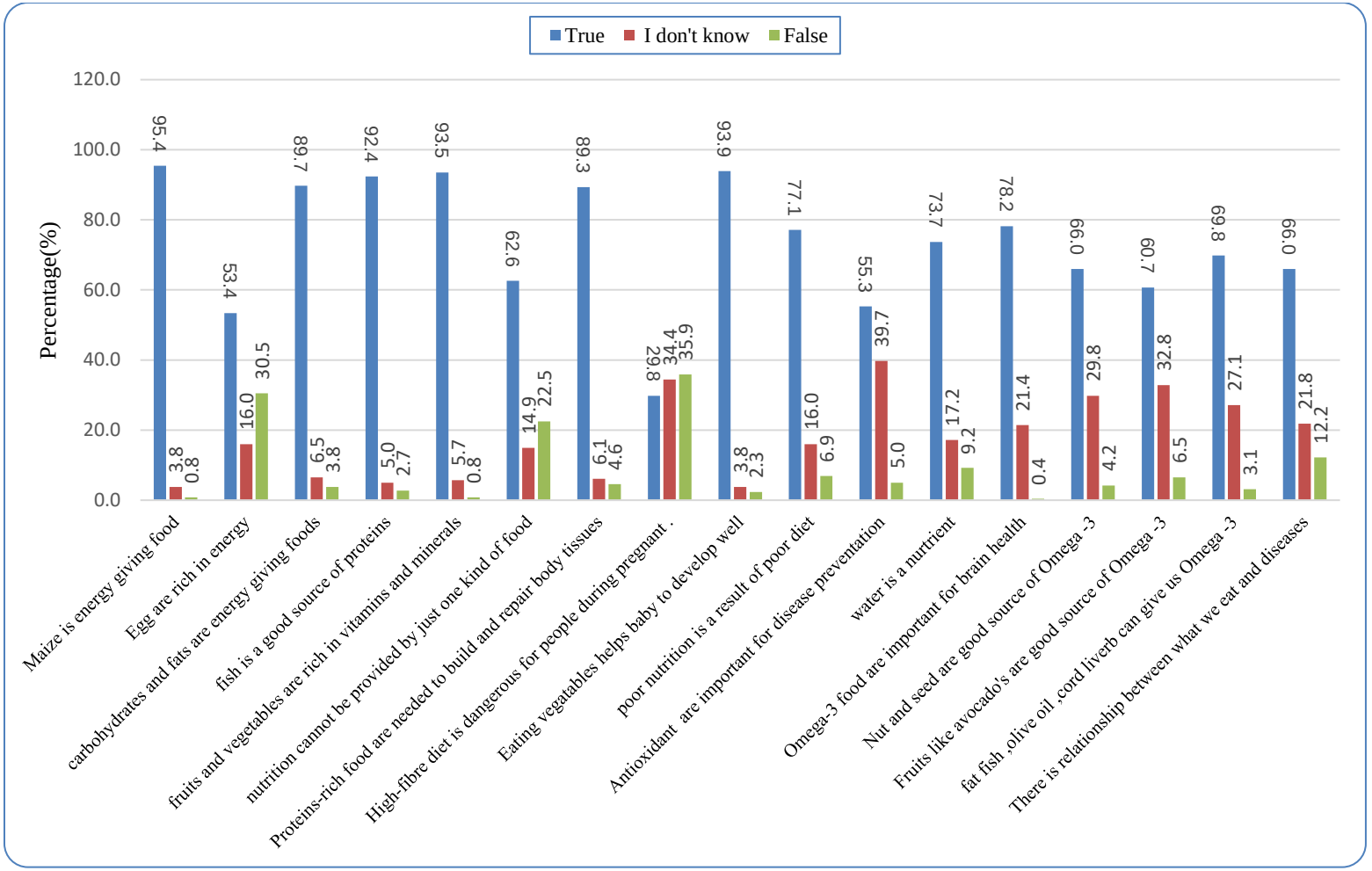


Figure 5.1: Nutritional knowledge among pregnant women in urban low income in Nairobi Kenya

Nutritional knowledge: Chi-square was used to test whether there is any significant difference in knowledge between women by socio - demographic characteristics. The results revealed that gestational age (first trimester) was statistically significantly associated with poor nutritional knowledge, *p= 0.022*. Educational level of primary level and below was also statistically significantly associated with poor nutritional knowledge *p- value <0.001*. Maternal depression was not associated with maternal knowledge.

Table 5.1: Nutritional knowledge and associated factors among pregnant women

Variable	Category	Knowledge		χ^2	d.f.	p-value
		No (N=81) %	Yes (N=181) %			
Age	18-24 Years	31.3	68.7	0.02	1	0.878
	25-42 Years	30.5	69.5			
Marital Status	Single/ Lives Alone	29.2	70.8	0.08	1	0.772
	Married/ Live with a Partner	31.3	68.7			
Gestational Age	First Trimester	54.2	45.8	7.67	2	0.022
	Second Trimester	26.9	73.1			
	Third Trimester	33.9	66.1			
Employment	No	32.2	67.8	0.79	1	0.373
	Yes	25.9	74.1			
Education Level	Primary and below	55.1	44.9	31.44	2	<0.001
	Secondary	22.3	77.7			
	Tertiary	13.9	86.1			
Decision Maker	Both	26.4	73.6	2.01	2	0.366
	Husband	35.3	64.7			
	Others	32.0	68.0			
Number of children under 18 years	None	25.0	75.0	5.98	3	0.113
	One	38.7	61.3			
	Two	26.5	73.5			
	3 and Above	42.9	57.1			
Income per month	5000 Ksh and Below	32.3	67.7	4.67	3	0.198
	5,001-10,000 Ksh.	36.2	63.8			
	10,001-15,000 Ksh	26.1	73.9			
	15,001 Ksh and Above	18.7	81.3			
Depression level	Not Depressed	28.9	71.1	0.85	1	0.357
	Depressed	34.4	65.6			
MUAC	<23	21.4	78.6	2.11	1	0.147
	>23	32.7	67.3			

5.4.3 Nutritional Attitude among Pregnant Women in Urban Low-income

The nutritional attitude was assessed among pregnant women; the attitude was divided into two, those who agreed to positive behavior and those who disagreed. Those who agreed were given a score of one. Those who opposed were given a score of zero, and the total percentage was obtained. The results revealed that only 24.8% of women had a positive attitude about nutrition during pregnancy. The rest, 75.2% of women, had a negative attitude about their nutrition, as indicated by a score <75 in the attitude questionnaire (see Table 5.2).

Table 5.2: Nutritional attitude among pregnant women in urban low income

Attitudes questions	Strongly disagree %	Dis-agree %	Agree %	Strongly agree %
Preparing a balanced meal is time -consuming.	23.7	47.7	24.0	4.6
It is important for mothers to know about preparing a balanced meal	15.7	8.4	57.3	28.6
It is not vital to eat a balanced meal if already you are pregnant	30.2	38.5	19.5	11.8
A nutritious meal can come on one's own small garden.	5.7	16.4	62.2	15.6
I should eat fruits only when I feel like	27.9	38.2	30.5	3.4
Vegetables must be over-cooked to kill microbes	38.9	36.6	19.8	4.6
Self-view of nutritional status is important	4.6	14.5	50.0	30.9
Hygiene is more important than food nutrition	8.0	32.1	42.7	17.2
Taking supplements is better than eating food.	33.2	48.1	16.4	2.3
Processed food is generally better than raw foods.	43.9	40.5	13.7	1.9
It is not easy to maintain good nutrition for a poor family	14.5	32.1	44.3	9.2
Eating a variety of food in moderation is a key to balanced nutrition	6.1	16.0	53.4	24.4

Nutritional attitude: Chi-square was used to test whether there is any significant difference in attitude between women by socio-demographic characteristics. Results revealed that participants' educational level was statistically significantly associated with a nutritional attitude, whereas women with primary education and below were more likely to have a negative nutritional attitude, with-*p-value= 0.002*. Likewise, low income level was also associated with a negative nutritional attitude, where women with an income level

of 5000 KES and below (the equivalent of 50 USD per month) were more likely to have a negative nutritional attitude *p-value <0.001* (see table 5.3).

Table 5.3: Nutritional attitudes and associated factors among pregnant women

Variable	Category	Attitude		χ^2	d.f.	p-value
		Negative N (197) %	Positive N (65) %			
Age	18-24 Years	75.4	24.6	0.01	1	0.944
	25-42 Years	75.0	25.0			
Marital Status	Single/ Lives Alone	79.2	20.8	0.50	1	0.480
	Married/ Live with a Partner	74.3	25.7			
Gestational Age	First Trimester	66.7	33.3	1.35	2	0.510
	Second Trimester	76.9	23.1			
	Third Trimester	73.2	26.8			
Employment	No	75.0	25.0	0.02	1	0.888
	Yes	75.9	24.1			
Education Level	Primary and below	85.9	14.1	12.29	2	0.002
	Secondary	74.3	25.7			
	Tertiary	55.6	44.4			
Decision Maker	Both	73.6	26.4	0.36	2	0.836
	Husband	75.5	24.5			
	Others	78.0	22.0			
Number of children under 18 years	None	68.8	31.3	6.71	3	0.082
	One	85.0	15.0			
	Two	73.5	26.5			
	3 and Above	76.2	23.8			
Income per month	5000 Ksh and Below	93.5	6.5	22.57	3	<0.001
	5,001-10,000 Ksh.	73.1	26.9			
	10,001-15,000 Ksh	84.1	15.9			
	15,001 Ksh and Above	46.9	53.1			
Depression level	Not Depressed	74.1	25.9	0.29	1	0.590
	Depressed	77.1	22.9			
MUAC	<23	69.0	31.0	1.01	1	0.314
	>23	76.4	23.6			

5.4.4 Nutrition Practices

Nutritional practice was assessed using the practice test questionnaire. The practice assessed was to determine whether pregnant women were avoiding any food during the current pregnancy; whether women were following any dietary regime/pattern during the current pregnancy; or whether women had the habits of eating snacks between meals, whether women were skipping any meals; whether women were taking additional meal, and the number of additional meals and finally whether women were taking the iron supplements. The results revealed that only 15.3% of pregnant women had good nutritional practices during their current pregnancy as indicated by a score ≥70 and the rest had poor nutrition practice during the current pregnancy as indicated by a score of <70 in the practice questions. There is no statistically significant between nutritional practice with any socio demographic characteristics.

Table 5.4: Nutritional practices among pregnant women in urban low income Nairobi Kenya.

S/N	Questions	Responses
1.	Avid any food or diet in the current pregnancy	1. Yes 2. No
2.	Reasons for avoiding Religion, Culture,	1. Big baby, 2. Labor difficult, 3. Others (Discomfort, Dislike etc), 4. 4. N/A
3.	Dietary procedure during current pregnancy	1. Yes 2. No
4.	Missing/skip meals during pregnancy	1. Yes 2. No
5.	Types of meal skipped/missed	1. Breakfast, 2. Lunch, 3. Snack, 4. Dinner, 5. N/A
6.	Taking additional meal	1. Yes 2. No
7.	Number of additional meals	1. One, 2. Two. 3. Three or More, 4. N/A
8.	Took iron supplement	1. Yes 2. No
9.	Habits of eating snacks between meals	1. Yes 2. No

5.5 Discussion

Results revealed a gap in nutritional knowledge; attitude and practice that need improvement. Pregnant women, and lactating women needs to be educated on how they should eat especially during perinatal periods, because their nutritional needs are elevated, and can leads to maternal malnutrition. Research evidence shows that, education plays a prominent role on the nutritional status of pregnant women and lactating mothers (Tenaw et al., 2018). These results compare well with others studies conducted on the same topic. A study by (Diddana, 2019) in Ethiopia, examined the factors associated with dietary practice and nutritional status of pregnancy women, results revealed that 54.8% of pregnant women had poor dietary practice and 19.5% were undernourished, pregnant women in first trimester were significantly associated with poor dietary practice. A community based cross sectional study conducted by (Nana & Zema, 2018), in Ethiopia assessed dietary practices and associated factors during pregnancy and revealed that, only 39.3% of the study participants had good dietary practices and the rest 60.7% of pregnant women reported poor dietary practices, 61.4% of the study participants had good dietary knowledge while 38.6% had poor dietary knowledge. This evidence demonstrates that perinatal women need individualized nutritional education counselling to improve their health. A study in Swaziland by Sakhile et al. (2014), assessed nutritional knowledge, attitude and practice among pregnant women and found that the mean scores percentage of nutritional knowledge (67%), attitude (67%), and practices (51%). Educational level, employment status, income, and religion were statistically significantly associated with nutritional practices (Sakhile et al., 2014).

5.6 Conclusion

The study finding led to the conclusion that, there is a lack of correct information about nutritional knowledge, attitude, and practice among pregnant women in low urban income, which requires intervention. These findings lead to the recommendations to disseminate appropriate nutritional knowledge to young mothers with a low educational background because they may be particularly disadvantaged. In addition, educational interventions need to be implemented in our primary health facilities, specifically during antenatal care visits – individualized nutrition education and individualized dietary counseling are recommended to reach women who may be at high risk.

CHAPTER SIX: RESULTS

Efficacy of dietary intervention and psychosocial management for depression care among pregnant women in urban low income Nairobi Kenya

Beatrice A. Madeghe1 & Wambui Kogi-Makau1 & Sophia Ngala1 & Manasi Kumar

6.1 Abstract

Introduction: Poor nutrition is a potential risk factor for depression, and maternal dietary intake during pregnancy has emerged as a possible intervention area to prevent mental disorders in women. In addition, the Thinking Healthy Cognitive Behavioral Therapy has been recommended by World Health Organization for perinatal depression in low-income settlements. Therefore, the main objective of this paper was to examine the efficacy of dietary intervention and Thinking Healthy (Cognitive Behavioral Therapy) for depression care among depressed pregnant women in the urban low-income settlement in Nairobi-Kenya.

Methods: The study took place in two urban low-income settlements at Kangemi health centers and Riruta Health center Kawangware in Nairobi Kenya. A longitudinal cohort design was used for the intervention study. The cohort involved depressed pregnant women who were followed up with an intervention from the second/third trimester to the fourth month postpartum. At baseline eligible were pregnant women 18 years and older, women who had a score of 10 and above on the Edinburgh Postnatal Depression Scale, the score indicating depression of moderate intensity to various severities, pregnant women who resided at Kangemi and Kawangware for the next 12 months. Excluded were pregnant women who appeared to have a disturbed mental state inhibiting correct information. The sample size estimation for longitudinal designs by Diggle et al. was used to calculate the sample size, where a hundred depressed pregnant women were required for the study. All pregnant women who had depression scores of 10 and above were asked to take part in the intervention study.

The two health centers were randomized, one to be the intervention group and another the comparison group. The intervention group had depressed pregnant women who received the combined dietary intervention and Thinking Healthy - Cognitive Behavioral Therapy, and the comparison group comprised depressed pregnant women who received the usual enhanced care, which was, general nutrition education, health talks, and reading materials. Both groups were followed up longitudinally from the second /third trimester to a fourth month postpartum to detect the change of interest. Demographic data; age, marital status, education level, occupation, and family income, were reported for each subject. Descriptive statistics were used to obtain percentages, means, and standard deviation. Inferential statistics were used to draw associations between independent and outcome variables. An odds ratio with a 95% confidence interval (CI) was used to test the associations. Variables with $p < 0.05$ were considered significant. Between-group comparisons were made by intention-to-treat, for the primary outcome measure (EPDS score) as a continuous variable and as a categorical defined by score ranges and secondary outcomes. Comparing groups

was done at every time point, and comparisons were performed between baseline and specific follow-ups, using one-way ANOVA. The longitudinal continuous outcome variables across the time points were analyzed using multiple generalized regressions to understand the effect of variation due to follow-up time.

Results: A total of 85 pregnant women completed the study, and their data analyzed of which 43 pregnant women from Kangemi (intervention) and 42 from Kawangware (comparison). Findings revealed a mean age difference between the groups, the intervention group had older women than the comparison group $p = 0.001$. There was a statistically significant difference in mean EPDS scores between Kawangware, and Kangemi, where Kangemi women had higher depression scores than Kawangware women $p = 0.01$. After the intervention, there was clinically significant depression remission as indicated by EPDS scores < 6 in both groups, baseline at 16.8. ±3.4 and endpoint assessment 4.4±2.2 for the intervention group, and the comparison group from baseline 15.4±3.5 to 4.4±2.6. Multiple generalized regressions results reveal that the follow-up time with the intervention was statistically significantly associated with depression remission $P = 0.000$. Pearson's correlation revealed a strong positive correlation in weight gain among pregnant women by BMI change over time from baseline to endpoint assessment $p=0.00$. There was positive neonatal weight gain from birth to fourteen weeks postpartum $p=0.0$. There was improved Brain food essentials adherence in the intervention group $p=0.00$. Results revealed an improved nutritional attitude and practice.

Conclusion: The findings revealed that both interventions were beneficial for perinatal women to recover from depression. But combined dietary intervention and Thinking Healthy- Cognitive-behavioral therapy was more efficacious in improving depression, nutrition, and neonatal outcome than general nutrition alone. Cognitive-behavioral therapy was instrumental for women to get over their depression, better manage stress, and take up nutrition intervention positively. The study results led to recommend combined nutrition-enhanced mental health forms of counseling for depressed women.

Keywords: depression, dietary intervention, Thinking Health Programme

6.2 Introduction

Research studies have revealed that nutritional deficiencies contribute to an increased burden of mental health disorders (Rechenberg & Humphries 2013; Leung &Kaplan, 2013; Kennedy, 2016). Nutrition and lifestyle basis have been identified as the biological factor for mental illnesses (Lukose et al., 2014). The factor that is given increasing consideration is inadequate nutrition, among other theories about the causes of depression (Pina-Camacho et al., 2015). It has been found that patients who suffer from depression have altered levels of monoamine neurotransmitters (Bodner and wiser 2015; Kennedy, 2016). The research evidence on the pathophysiology of depression has focused on the monoamine neurotransmitters, and three different mechanisms have been identified in which depression occurs, these include: - low dopamine, serotonin, and norepinephrine levels in the brain; second is due to neuro-membranes, which have been altered and the polyunsaturated fatty acids impact on the membranes; third is hormones, specifically hormonal changes which occur during and after pregnancy (Leung & Kaplan, 2009).

Both of these pathways are affected by particular nutrients and may be corrected by nutritional approaches (Reichenberg & Humphries, 2013). Based on the best available current research, five dietary recommendations have been identified to prevent depression which include the following recommendations: - Following traditional dietary patterns; High intake of wholegrain cereals, fruits, vegetables, legumes, seeds, and nuts; Increasing consumption of foods rich in omega-3; Eating wholesome, nutritious foods instead of an unhealthy diet; and restricting the intake of processed foods, and that a mixture of nourishing dietary may decrease the risk of developing depression (Jacka et al., 2017).

In addition, the Thinking Healthy Program is the psychological management for perinatal depression is endorsed by WHO as an evidence-based intervention for perinatal depression; Thinking Healthy Program (THP) is based on the principles of Cognitive Behavioral Therapy (CBT), a step by step form of talking therapy that aims to alter the cycle of unhealthy thinking leading to unhelpful emotions and the resulting undesirable actions to bring about a change in the mother's symptoms and functioning (Chowdhary et al., 2014; WHO, 2015). With this knowledge, the objective of this paper was to examine the efficacy

of dietary intervention and the Thinking Healthy Cognitive Behavioral Therapy for depression care among depressed pregnant women in urban low-income Nairobi- Kenya. The intervention aims to positively impact women's mental health, nutrition status, and newborn outcomes.

6.3 Materials and Methods

6.3.1 Study Sites

The study took place in two low-income settlements' health centers at Kangemi and Riruta Health center – Kawangware municipal Health centers in Nairobi Kenya. The sites were chosen purposely because; these health centers receive a high volume of pregnant women, who are seen in the antenatal clinic, and the fact that in low-income settlements like these, socioeconomic deprivation indicators such as unemployment, low income, and low education have been cited as risk factors for mental health disorders. Kangemi is a slum in Kenya located on the outskirts of the Nairobi city center. It is bordered on the north by the middle-class neighborhoods of Loresho and Kibagare and Westlands on its west. Its southern border connects with Kawangware, another large slum, and its eastern border connects to Mountain View. It is on the road connecting Nairobi with Naivasha road. Riruta Health Centre is a Government health center located in Kawangware Sub-location, Kawangware location, Dagoretti Division, Dagoretti Constituency in Nairobi County.

The study design was a longitudinal cohort intervention study, which involved depressed pregnant women, who were followed up with an intervention from the second/third trimester to four months postpartum. In a longitudinal study, the data is collected repeatedly from the same sample over an extended period to detect the change of interest. Eligibility criteria included pregnant women aged 18 years and older, pregnant women who had an EPDS score of 10 and above, a score indicating depression of moderate intensity to different severities; pregnant women who were in their second to the third trimester, and who resided at Kangemi and Kawangware for next 12 months, and provide informed consent and spoke Kiswahili or English. Excluded were women who appeared to have a disturbed mental state inhibiting correct information collection and women who were not likely to be in the locality in the following 12 months. The sample size was calculated using

sample size estimation for longitudinal designs by the formula (Diggle et al., 2002) in (Diggle, 2013), approximately 50 subjects depressed women were needed in each group, a total of one hundred women were needed for this study. Simple random sampling was used to randomize the two study sites to allocate intervention and comparison groups. It was agreed that upon coin tossing, the coin head would be the intervention. The result of the toss revealed Kangemi in the head. Therefore, Kangemi was the intervention group and Kawangware comparison group.

6.3.2 The Research the Team

The research team consisted of the candidate whose was the principal researcher, with a Master degree in Public health (nutrition and non-communicable diseases), One Clinical Psychologist- Master level, with a role to offer psychosocial intervention and screening of depression. One Dietician – KMTC Diploma, with a role to offer the dietary intervention and as research assistant. Two Dietician – KMTC Diploma were data collectors. Ten community health volunteers (CHVs) at KSCE level. their role was to follow-up on women in the implementation of the intervention. The study started with five days of training the community health workers. They were trained on how to offer Thinking Health Cognitive behavioral therapy and dietary counseling to perinatal depression who are depressed. A dietitian and a clinical Psychologist delivered the training.

The piloting of the tool was done in Kibera South at the antenatal Clinic. Research assistants were familiarized with the tools and trained in conducting interviews and data collection. All the study tools were piloted. At baseline tools piloted included, demographic characteristics, depression screening, MUAC and BMI, 24hr recall for dietary intake, brain food essential checklist, Knowledge, attitude and practice questionnaire. There after all women who were found with depression as indicated by EPDS scores of 10 and above were invited to come the following day for counselling, then the psychosocial management- thinking healthy cognitive behavioral therapy was offered, basic nutrition education and dietary counselling was also offered based on the nutritional status and weight gain, the results were feasible and acceptable. The report was share with the main supervisor, thereafter the actual data collection started.

After baseline screening, all pregnant women who had an EPDS score of 10 and above were asked to participate in the intervention study. Contacts of every woman were taken at baseline, and they were informed that they would be contacted at the start of the intervention study. All eligible pregnant women were notified through a mobile call to come for the introduction meeting.

6.3.3 The Intervention

The intervention offered was (Thinking Healthy - Cognitive Behavior therapy- TPH), and the dietary intervention (basic nutrition education and diet counseling) offered to depressed pregnant women, to examine its efficacy in reducing depression, improving nutrition health, and neonatal outcomes. The intervention was guided by the Thinking Health Cognitive Behavioral Therapy (TPH) structure, because we were dealing with depression among pregnant women, and the primary outcome was depression recovery. We employed a similar format and design as the THP for perinatal depression but adapted it for Kenya context. The number of sessions typically varies between 6, 12 and16 sessions, and sessions are delivered weekly or coordinated with routine antenatal appointments (Fuhr, D., et al 2019); (WHO,2015). Therefore, in this study we offered 12 session which ended following women with intervention from second/third trimester to four months. The study and did not based on the 6th month aligned to exclusive breastfeeding period.

6.3.4 Psychosocial Management- (Thinking Healthy -Cognitive Behavioral Therapy)

Cognitive-behavioral therapy (CBT) is a type of psychotherapeutic treatment. It is a (step by step) form of talking therapy to change the sequence of harmful thinking to help thinking. It is based on the principles of Cognitive Behavioral Therapy, which assumes that problems start with a negative thought which affects the feelings and results in undesirable actions (WHO), 2015). The program is fully documented through a comprehensive set of manuals and includes culturally appropriate pictorial illustrations aimed at helping mothers reflect on their thinking processes and at encouraging family support. The sessions are organized into five modules covering the period from the third trimester of pregnancy to 1 year postnatal. Each module focuses on three key areas—the mother's personal health, the

mother-infant relationship, and the psychosocial support of significant others. In total, 16 home-based sessions are offered to mothers (WHO, 2015).

Table 6.1: Adaptation Thinking Healthy Program (THP)

Theory	Based on principles of Cognitive Behavior Therapy (CBT). We adapted Cognitive–behavioral therapy and called Psychosocial Management-Thinking healthy. We used words like stress or burdened to avoid labels such as depression.
Delivering agent	Clinical Psychologist (Master-level) and Trained Dietician (Diplomas KMTC), Community health volunteer workers (CHV'S) under the supervisor helped with individual women who needed follow-up. The CHVs Completed the Kenya Secondary Education KCSE,
Structure of intervention	In group women received 12 sessions for the intervention, organized in 4 modules: there were 3 introduction sessions; 4 weekly sessions for (Module 1 – Preparing for the Baby). Fortnightly sessions for Module 2 – The baby's arrival). Monthly session for (Modules 3 and 4– Early, Middle, and Late Infancy) and one closing session. Total of 12 sessions. Each session was divided into three lessons, one for psychosocial management offered in groups and 90 minutes, and one group of nutrition session offered in 45 minutes. Followed by 1 hour for discussion and individual help. Each module of psychosocial intervention incorporated nutrition module. The interventions were rolled out, Most of the intervention concept were delivered in the first module one covered almost and the other sessions were the followed-ups of what was taught in the first module and its application.
Structure of Areas covered	Active listening and tasks of thinking healthy were done in 3 steps. Step 1: identifying unhealthy (unhelpful) thinking; step 2: replacing unhealthy thinking with healthy thinking; step 3: practicing healthy thinking and behaviors. Homework is given for each session. Each module covers 3 areas – the mother's mood and personal health; the mother-infant relationship; the relationship of a mother with important people around her.
Tools	Thinking Healthy A manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015. For nutrition, the Guidelines are based on the national healthy living pyramid of Kenya, My Plate for Mom material, Nutrition manual- Applied basic nutrition resource toolkit for trainers from the Ministry of Public Health and sanitation- Kenya. Each session activity was printed material for mothers to refer.
Training of CHVs	5-day training workshop includes a training video, conducting, sessions; and discussions. Thinking Healthy manual and Applied basic nutrition resource toolkit for trainers was used
Additional features **Follow-up and assessments**	Use of pictures in addition to words; Groups used methods such as picture story-telling to help discussions about the causes and effects of typical problems in mothers and infants, and devised strategies for prevention, (THP manual) Assessments were done at baseline the entry point approximately 12 – 25 weeks, and was done three months after baseline, and followed up to fourteen weeks postpartum to detect the changes of interest.

6.3.5 Intervention Sessions

Pregnant women received 12 sessions organized in 4 modules of thinking healthy, which incorporated five nutrition modules: these modules were offered simultaneously with psychosocial management. The comparison group received enhanced usual care without Thinking Healthy -Cognitive Behavioral Therapy. The comparison group received twelve sessions also, provided in the same structure **(**Thinking Healthy A manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015).

Table 6.2: Thinking healthy – Modules

Module	Coverage
Module 1 Preparing for the Baby:	Pregnant women were taught to think healthily using principles of cognitive behavior therapy, in this module thinking healthy was around the topics of preparation for the baby, Mother's personal health, Mother's relationship with the baby, Mother 's relationship with people around were covered). The sessions were offered weekly continuously for a month. One day in a week was chosen and women came for intervention sessions. The session was conducted for 45 minutes, (three a day, One-hour discussion time, and individual help). In this module most of the intervention concepts were covered including the nutrition sessions, the other modules were follow-up
Module 2 – The baby's arrival:	These were fortnightly sessions, where women were taught to think healthy after the baby has arrived in the areas of- Mother's personal healthy when the baby has arrived, Mother 's relationship with the baby, Mother 's relationship with people around her.
Module 3: Early infancy	Women were taught to think healthily after the baby has arrived during early infancy first month to four-month. Thinking healthy in the areas of- Mother 's personal health, Mother 's relationship with the baby, Mother 's relationship with people around her. Nutrition the Follow-up nutrition module, and exclusive breastfeeding
and Module 4: Middle infancy –	Women were taught to think healthily after the baby has arrived during the early infancy first month to the fourth month. Thinking healthy in the areas of- Mother 's personal health, Mother 's relationship with the baby, Mother's relationship with people around her. Nutrition the Follow-up nutrition module, and exclusive breastfeeding

6.3.6 Dietary Intervention

For dietary intervention, pregnant women received basic nutrition education and diet counseling, delivered by a dietitian. Nutrition education**:** involved teaching the client about the importance of nutrition, providing educational materials that reinforce messages about

healthy eating, teaching skills essential for making a dietary change, and providing information on how to sustain behavior change. Dietary counseling in this study, it refers to a process where a registered dietitian, works with an individual to assess his or her usual dietary intake and identify areas where change is needed. The nutrition counselor provides information, educational materials, support, and follow-up to help the individual make and maintain the needed dietary changes, with a goal to improve the individual's overall health. Nutrition education was given based on the Kenya National Guidelines for Healthy Diets (Ministry of Health, 2017), and an emphasis was given on brain food essentials (Rechenberg & Humphries 2013; Leung &Kaplan, 2013; Gómez-Pinilla, 2010). Applied Basic nutrition resource toolkit for trainers, from the Ministry of Public Health and sanitation- Kenya was used for teaching. The national healthy living pyramid of Kenya, and My Plate for Mom materials. Brain food essential are nutrients known as cofactors in the synthesis of neurotransmitters associated with reduced risk of depression (food rich in omega-3 fatty acids, magnesium, zinc, iron, and antioxidants) that have beneficial effects on neurological function.

6.3.7 Nutrition Counselling

Pregnant women received diet instructions from a dietician, to increase their intake of vegetables (6 servings per day/ 3cups), fruits (2–3 servings per day), wholegrain cereals (3 servings per day), protein (lean meat, poultry, eggs, legumes; 3 servings per day), dairy (3 servings per day), fish (3 servings per week), nuts and seeds pumpkin seeds (3 tablespoons per day), cod liver oil (1 tablespoon per day), spices (turmeric and cinnamon; 1 teaspoon most days). Women were instructed to decrease refined carbohydrates, sugar, fatty, and soft drinks/ sodas. Pregnant women were also provided a sample meal plan and recipes.

Table 6.3: Nutrition module

Module	Coverage
Nutrition Module 1	Thinking health about nutrition, how should I eat when I'm pregnant woman, My Health plate, Basic- applied nutrition, selects, prepare cook and eat health. Benefits of healthy eating, the healthy eating pyramid, the effects of poor nutrition
Nutrition Module 2	**Brain Food Essential** **Omega 3 fatty acids (**fish, groundnuts, pumpkin seeds, Sunflower seeds, lean meats, organ meats, margarine, and eggs**):** Omega-3 fatty acids are building blocks for healthy brain function and development **Magnesium (**kale, spinach, pumpkin seeds, nuts, black beans, avocado, brown rice/ugali. fish, white beans). Fights stress and depression, and produces crucial for the production of energy and neural transmitter **B vitamins B_6, B_9, B_{12} (**whole grains, legumes, meat, eggs, fish, green leafy vegetables): B vitamins deficiency (specifically B12) is linked to depression. **Zinc** (Pumpkin seeds, spinach, terere, saga, fish, beef). Boost the immune system and in the brain, helps to control neuro impulses. **Iron** (red meat, liver, kidney beans, lentils, nightshades, chickpeas, tomatoes**,**). Regulate brain function. **Antioxidant vitamins** (these are natural substances that may prevent or delay some types of cell damage example includes vitamins C and E, selenium, and carotenoids, such as beta-carotene)
Nutrition module 3	Best methods for cooking food to retain nutrients, tools to use when measuring serving amount; serving size recommendations: cereals, grains, tuber, & roots; serving size recommendations: vegetables & fruit; Importance of eating raw foods
Nutrition module 4	Thinking health about nutrition after the baby arrives; what should I eat when I'm breastfeeding, the Importance of exclusive breast-feeding the healthy eating pyramid, brain food; the Benefits of healthy eating when breastfeeding, the effects of poor nutrition for the mother and baby
Nutrition module5	Animal and plant protein; serving size recommendations: dairy products; Fats and oils, sugar and salt, Water

6.3.8 Intervention Process

The intervention was offered in group sessions. Trained CHVs helped with mobilizing the women to come for the intervention and follow-up with intervention in the group of women assigned to them. The intervention sessions were offered at Kangemi PCEA community hall in Kangemi and for the comparison group at Dagorethi community hall at Kawangware- in Nairobi, Kenya. The intervention groups were divided into two sub-groups for easy management, for the Kangemi group was divided into two groups of 12

who came to PCEA hall on Tuesday and Thursday. For comparison, Kawangware group women were also divided into two group of 12 where pregnant women came to Dagoreth community hall on Wednesday and the other half on Friday. Group meetings were used instead of home visits. This is because women were not comfortable being visited at home. Due to the slum situation, one room was not possible to accommodate visitors and preferred group meetings. The sessions were extended because of additional nutritional activities. Most of the intervention's concepts were covered in the first four weeks of intervention after the introduction, then follow-up with other modules was done. Every session that women attended they were provided with a healthy snack and a 200 Kes to buy the fruits and vegetables. Since the intervention happen in their community, there was no much transport required.

Recruitment flow chart

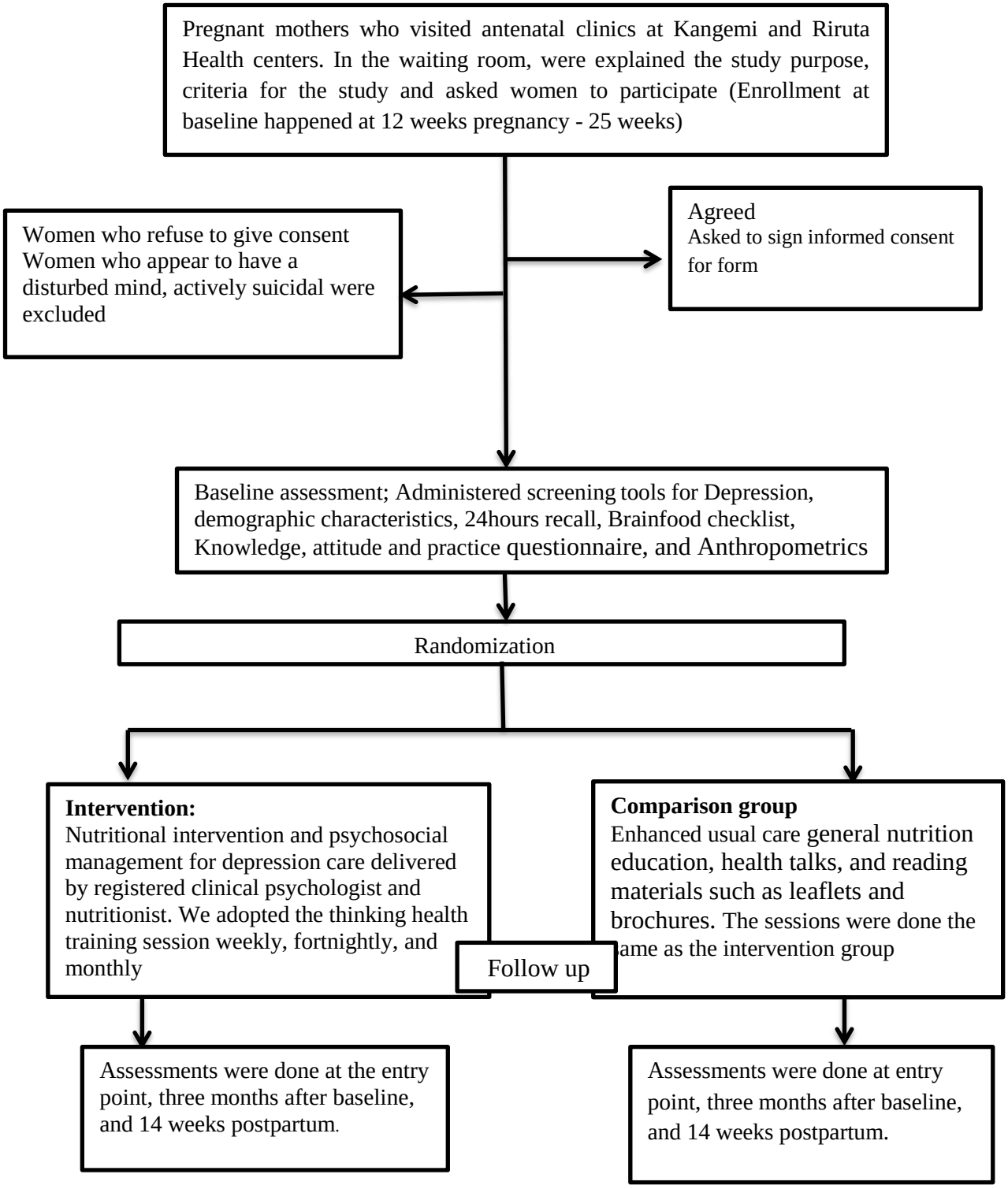


Figure 6.1: Recruitment flow chart.

Timelines: Enrollment in the study happened at baseline, between March and April 2019. Pregnant women were captured at baseline (approximately at 12 weeks - 25 weeks of pregnancy). In this study, the start date was when the first participant was enrolled at baseline. The intervention was rolled out in May 2019, when the pregnant women were in second/third-trimester pregnancy, almost 20 weeks to 33 weeks of pregnancy. The assessments were done in between and follow-up to the fourth month postpartum. The study was completed at the end of November 2019

6.3.9 Efficacy of the Intervention

The expected primary outcome was the retrieval from depression. In this study, if the dietary intervention and psychosocial management (CBT) can reduce the depression levels to the non-clinical range of depression by an EPDS score below 6 or reduce depression levels by 7 points out of an individual's total score at baseline is the efficacy of the intervention. Secondary outcomes include; nutritional status improvement (no malnutrition indicator BMI< 18.5). Improved neonatal outcome birth weight not less than 2.5 kg birth weight and positive weight gain in children; improved intake of brain food. Improved Knowledge, attitude, and practice; specifically, brain food essentials and their relation to diseases.

Primary Outcome Measures: Remission of depression (i.e., recovery from depression; to no longer having significant depressive symptoms (EPDS score below six or seven-point reduction from the baseline score). The changing and statistical significance of EPDS means score for depression for each group (intervention and comparison).

Secondary Outcome Measures: Positive weight gain measured by BMI< 18.5). Improved neonatal outcome positive growth from birth to four-month postpartum improved dietary intake, specifically brain food essentials, and Improved Knowledge, attitude and practice about food and disease and Behavior change.

6.3.10 Data Analysis

The filled questionnaire was checked for completeness, errors, and discrepancies. This was followed by data entry, cleaning, and analysis using SSPS version 22. Descriptive analysis such as percentages, means, and standard deviation were used to summarize the demographic data, Age, Marital status, Education level, Socioeconomic status, occupation, family income, which was reported for each subject. Comparisons between the intervention group and the comparison group were conducted to assess the degree of comparability. Data were analyzed by intention to treat, between-group comparisons Descriptive statistics for the primary outcome measure (EPDS score) as a continuous variable and as a categorical (proportion of patients in the clinical range of depression (defined by score ranges) and normal (defined by score ranges) variable was obtained as well for secondary outcomes.

The strength of association between the independent predictors and the specific outcomes was at a significance level of $p < 0.05$. The distribution of different variables (i.e., both the primary and secondary outcomes) was compared between and within groups. Between groups, comparisons were made at every time point (i.e., at baseline, at three months after baseline, and 14 weeks postpartum). Baseline and specific follow-ups within groups, comparisons were performed using one-way ANOVA. The longitudinal continuous outcome variables across the time points were analyzed using multiple generalized regressions to understand the effect of variation due to groups (between-groups effect) and follow-up time.

6.4 Results

At baseline 262 pregnant women were screened from the two public health facilities to obtain a total of 123 depressed pregnant women with EPDS score of 10 and above. These 123 pregnant women were invited and agreed to participate in the intervention study. After randomization of health centers, 53 pregnant women from Kangemi were the intervention group, and 70 pregnant women from Kawangware were the comparison group. These data from 123 pregnant women were pooled and analyzed using to test whether there is any

significant difference between interventions and comparison group, a t-test was used for comparison.

An exploratory data analysis technique was used to uncover the distribution structure of the study variables as well as identify outliers using descriptive statistics**.** The data was tested for normality and there were no outliers. Results revealed a significant group difference in mean age between Kangemi and Kawangware women, where the Kangemi women were older that Kawangware woman $p<0.001$. There was significant group difference in mean EPDS scores between Kawangware, and Kangemi, where Kangemi women had higher depression scores than Kawangware women $p=0.01$. There was significance on decision makers, where both partners in Kangemi were involved in decision making $p<0.001$ (table 6.4).

Table 6.4: Baseline characteristics of pregnant women in urban low income, Nairobi Kenya

Variable	Category	Overall N=123	Health Centre		Group Differences p-value
			Kangemi (N=53) %	Kawangware (N=70) %	
Health Centre	Kangemi	43.1	-	-	-
	Kawangware	56.9	-	-	-
Age category	18-24 Years	44.7	29.1	70.9	0.005
	25-42 Years	55.3	54.4	45.6	
Age Years	Mean±SD	26.2±5.5	28.0±5.7	24.8±4.9	0.001
Marital Status	Single/ Lives Alone	15.4	42.1	57.9	0.925
	Married/ Live with a Partner	84.6	43.3	56.7	
Employment	No	72.4	46.1	53.9	0.281
	Yes	27.6	35.3	64.7	
Education Level	Primary and below	30.1	54.1	45.9	0.090
	Secondary	52.8	33.8	66.2	
	Tertiary	17.1	52.4	47.6	
Decision Maker	Both	42.3	61.5	38.5	0.001
	Husband	38.2	23.4	76.6	
	Others	19.5	41.7	58.3	
Number of children under 18 years	None	41.5	33.3	66.7	0.279
	One	27.6	47.1	52.9	
	Two	21.1	50.0	50.0	
	3 and Above	9.8	58.3	41.7	
Income	5000 Ksh and Below	11.4	42.9	57.1	0.566
	5,001-10,000 Ksh.	48.8	40.0	60.0	
	10,001-15,000 Ksh	26.0	40.6	59.4	
	15,001 Ksh and Above	13.8	58.8	41.2	
Baseline EPDS	Mean±SD	15.5±3.4	16.4±3.4	14.8±3.3	0.011
Baseline BMI	Mean±SD	26.3±4.5	25.6±4.6	26.7±4.5	0.192

6.4.1 Baseline Characteristics of Lost to follow-up Participants

Thirty-eight (38) depressed pregnant women were lost to follow (drop-out) in total for both sites, where 10 women were lost to follow from Kangemi, and 28 women were lost to follow were from Kawangware. These are the pregnant women who did not show up and did not complete intervention sessions, because of various reasons including travel to their home villages, and did not complete the study. There high drop-out was in Kawangware than Kangemi; this could be because the Kangemi group was more engaged with intervention activities than Kawangeware. However, since the study required 100 participants, the intervention completion rate was 85% which is acceptable. When comparing between the completed cases and the lost to follow cases, more women completed the study than he drop-outs cases $p = 0.012$, most the pregnant women in Kangemi were not employed $P = 0.016$. There was significant group difference in depression levels between the drop out and completed cases as indicated by EPDS mean scores $P > 0.001$(table 6.5).

Table 6.5: Baseline Characteristics of Lost to follow-up participants

Variable	Category	Lost to Follow-up		Group Differences P value
		Drop-out N=38 %	Completed N=85 %	
Health Centre	Kangemi (53)	10(18.9%)	43(81.1%)	0.012
	Kawangware (70)	28(40.0%)	42(60.0%)	
Age category	18-24 Years	34.5	65.5	0.431
	25-42 Years	27.9	72.1	
Age Years	Mean±SD	26.3±6.3	26.1±5.1	0.843
Marital Status	Single/ Lives Alone	31.6	68.4	0.944
	Married/ Live with a Partner	30.8	69.2	
Employment	No	24.7	75.3	0.016
	Yes	47.1	52.9	
Education Level	Primary and below	32.4	67.6	0.912
	Secondary	29.2	70.8	
	Tertiary	33.3	66.7	
Decision Maker	Both	21.2	78.8	0.069
	Husband	42.6	57.4	
	Others	29.2	70.8	
Number of children under 18 years	None	31.4	68.6	0.136
	One	17.6	82.4	
	Two	38.5	61.5	
	3 and Above	50.0	50.0	
Income	5000 Ksh and Below	21.4	78.6	0.856
	5,001-10,000 Ksh.	33.3	66.7	
	10,001-15,000 Ksh	31.3	68.8	
	15,001 Ksh and Above	29.4	70.6	
Baseline EPDS	Mean±SD	14.1±2.8	16.1±3.5	0.001
Baseline BMI	Mean±SD	25.9±4.0	26.4±4.7	0.629

6.4.2 Complete cases comparisons of demographic characteristics between intervention group and comparison group n urban low-income Nairobi Kenya

A total of 85 pregnant women completed the study, where 43 pregnant women were in the intervention group and 42 pregnant women in the comparison group. Data from 85 pregnant women who completed data were pooled and analyzed at baseline. There was a significant age group difference between the two groups where the Comparison group

Kawangware women had younger women than women in the intervention group (Kangemi). There was significant difference in mean age where the intervention group had Mean±SD of 28.0±5.3, and for the comparison group was 24.2±4.1, indicating that the pregnant women in the intervention group were older that the comparison group $P < 0.001$. There were no significant differences between groups on other factors.

Table 6.6: Baseline Complete cases comparisons between intervention group and comparison group by sociodemographic characteristics.

Variable	Category	Overall N=85	Health Centre		Group Differences P value
			Kangemi N=43 %	Kawangware N=42 %	
Health Centre	Kangemi (Intervention)	50.6	-	-	-
	Kawangware (Comparison)	49.4	-	-	-
Age category	18-24 Years	42.4	36.1	63.9	0.022
	25-42 Years	57.6	61.2	38.8	
Age Years	Mean±SD	26.1 ±5.1	28.0±5.3	24.2±4.1	<0.001
Marital Status	Single/ Lives Alone	15.3	53.8%)	46.2	0.799
	Married/ Live with a Partner	84.7	50.0	50.0	
Employment	No	78.8	50.7	49.3	0.955
	Yes	21.2	50.0	50.0	
Education Level	Primary and below	29.4	60.0	40.0	0.358
	Secondary	54.1	43.5	56.5	
	Tertiary	16.5	57.1	42.9	
Decision Maker	Both	48.2	65.9	34.1	0.005
	Husband	31.8	25.9	74.1	
	Others	20.0	52.9	47.1	
Number of children under 18 years	None	41.2	40.0	60.0	0.217
	One	32.9	53.6	46.4	
	Two	18.8	56.3	43.8	
	3 and Above	7.1	83.3	16.7	
Income	5000 Ksh and Below	12.9	54.5	5.5	0.272
	5,001-10,000 Ksh.	47.1	47.5	52.5	
	10,001-15,000 Ksh	25.9	40.9	59.1	
	15,001 Ksh and Above	14.1	75.0	5.0	
	No	35.3	56.7	43.3	
Baseline EPDS	Mean±SD		16.8±3.4	15.4±3.5	0.077
Baseline BMI	Mean±SD		26.0±4.9	26.7±4.7	0.502

6.4.3 Perinatal Depression

A total of 85 pregnant women completed the Edinburgh Postnatal Depression Scale (EPDS) screening at baseline and completed the follow-up assessments. The study results revealed a clinically significant depression decrease in both groups indicated by EPDS change from baseline to final assessments (see figure 6.2).

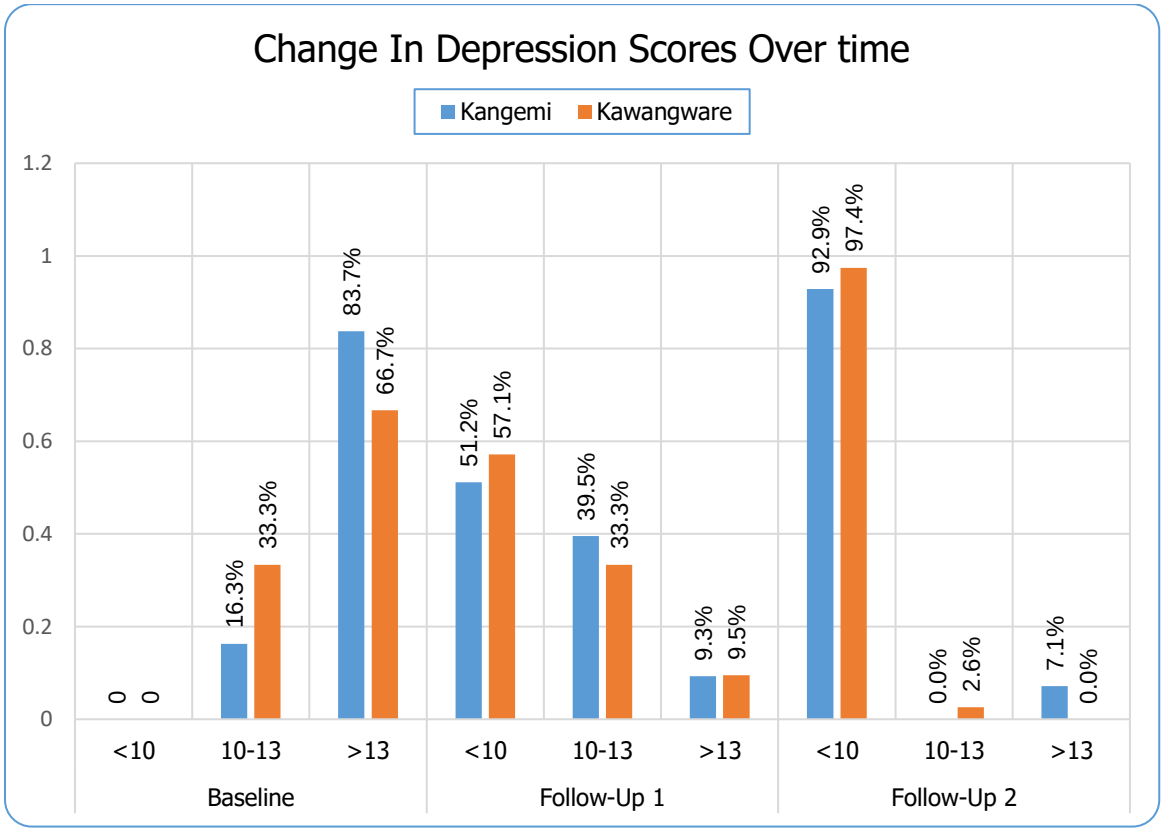


Figure 6.2: Depression change over time between intervention and comparison group.

The mean scores were compared between the intervention group and the comparison group from baseline and endpoint assessments. Results revealed clinically significant depression remission in both groups as indicated by EPDS mean scores at baseline Mean±SD 16.8. ±3.4 to 4.4±2.2 in the intervention group and a comparison group from 15.4±3.5 to 4.4±2.6. **ANOVA** test was done to compare between and within groups whether there were significant differences between the two groups results revealed no significant differences in EPDS between the two groups (see figure 3).

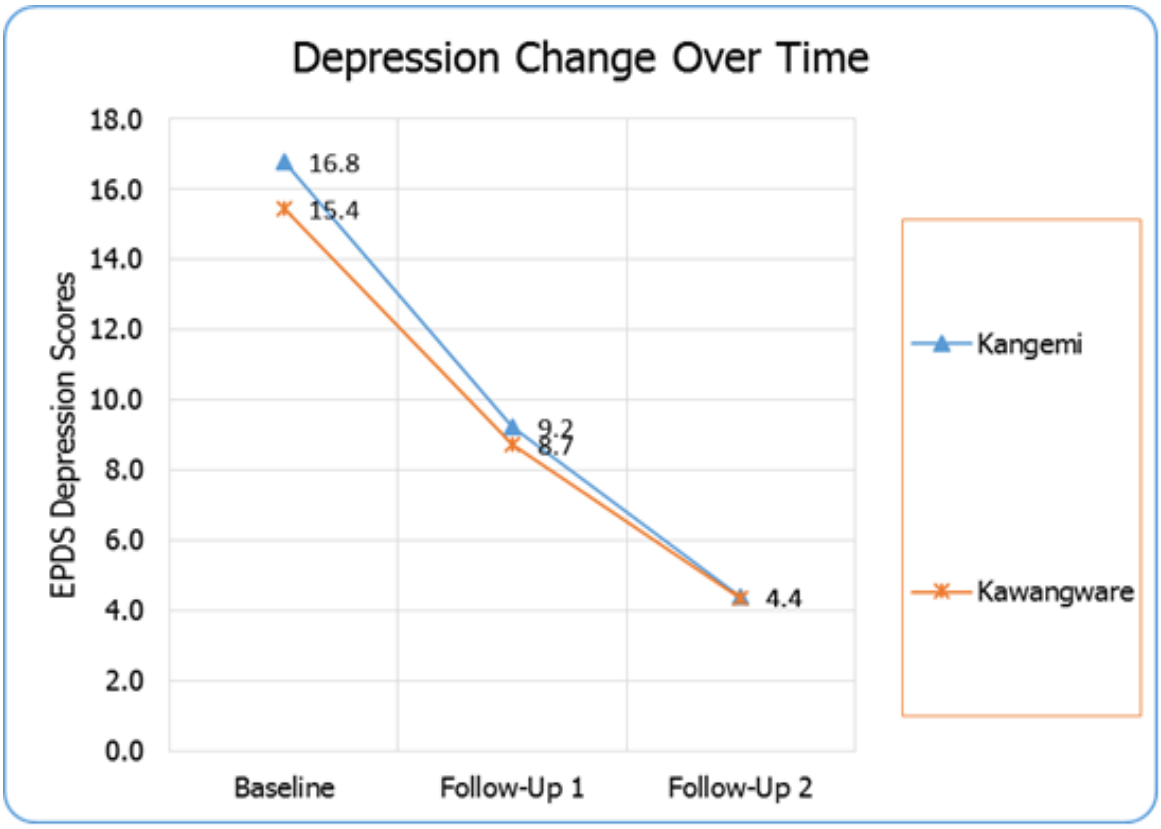


Figure 6.3: EPDS mean scores change over time between intervention and comparison group.

6.4.4 Factors Associated with Maternal Depression Change over Time

The longitudinal continuous outcome variables across the time points were analyzed using multiple generalized regressions to understand the effect of variation between-groups effect and within-group effect due to follow-up time. The results reveal that the follow-up time with the intervention dietary intervention and psychosocial management- cognitive behavioral therapy in the intervention group was statistically significantly associated with depression remission as indicated by EPDS score < 6, p = 0.000. The same happened in the comparison group. In addition, the follow-up time, which involved enhanced usual care, was statistically significantly associated with depression remission by EPDS score <6, P =0.00. in the comparison group. Other factors were not statistically associated with depression reduction by EPDS scores (see table 7).

Table 6.7: Factors associated with change over time.

Parameter	Category	β	S.E.	95% Confidence Interval		Sig.
				Lower	Upper	
Facility	Kawangware	-0.817	0.804	-2.393	0.758	0.309
	Kangemi					
Time	Follow-up 2	-11.736	0.530	-12.775	-10.697	<0.001
	Follow-up 1	-7.129	0.377	-7.869	-6.390	<0.001
	Baseline					
Age category	25-42 Years	-0.144	0.558	-1.238	0.949	0.796
	18-24 Years					
Gestational Age	Third Trimester	1.146	1.045	-0.902	3.194	0.273
	Second Trimester	1.440	1.057	-0.631	3.511	0.173
Decision Maker	Others	0.163	0.790	-1.384	1.711	0.836
	Husband	-0.654	0.759	-2.142	0.834	0.389
	Both	.				

Effect Size on depression scores

Effect size tells how meaningful the relationship between variables or the difference between groups is. It indicates the practical significance of a research outcome. A large effect size means that a research finding has practical significance, while a small effect size indicates limited practical applications. These findings reveal that following up women with an intervention have practical significance in reducing women depression.

Table 6.8: Effect Size on depression scores.

Depression Scores	Time	Effect Size(d)	95% C.I.
Intervention (Kangemi)	T1-T2	2.18	1.68 to 2.68
	T2-T3	1.32	0.85 to 1.77
	T1-T3	3.15	2.53 to 3.77
Control (kawangware)	T1-T2	1.85	1.40 to 2.28
	T2-T3	1.33	0.87 to 1.80
	T1-T3	3.36	2.77 to 3.95

6.4.5 Nutritional Status among Pregnant Women by BMI

Pre-Pregnant weight among pregnant women in urban low-income settlement Nairobi Kenya

Anthropometrical measurements were used to collected data on the Nutritional status for the mothers; (MUAC) was used as indicators for nutrition status, and the results reported in chapter four. Body Mass Index (BMI) was used to determine weight gain among pregnant women. According to Gilmore, & Redman, (2015), Institute of Medicine (2009),Gestational Weight Gain Guidelines. Body Mass Index is known to be a better indicator of maternal nutritional status than is weight alone. Weight and height are useful is women know their pre-pregnant weight, if the woman show-up after 10 weeks gestation, the BMI can still be calculated from measured height and weight and weight gain can still be advised based on best estimate of pre-pregnancy BMI to guide weight gain recommended for each trimester. Therefore, Body Mass Index (BMI) was used to determine weight gain among pregnant women. In BMI is a person's weight in kilograms divided by the square of height in meters.

Table 6.9: Pregnancy weight gain, using pre-pregnancy Body Mass Index.

Pre-pregnancy BMI (kg/m^2)	Total weight gain range (kg)	Rates of weight gain 2nd and 3rd trimester (mean range in kg/week)[1]
Underweight (< 18.5)	12.5–18	0.51 (0.44–0.58)
Healthy weight (18.5–24.9)	11.5–16	0.42 (0.35–0.50)
Overweight (25.0–29.9)	7–11.5	0.28 (0.23–0.33)
Obese (≥ 30.0)	5–9	0.22 (0.17–0.27)

Reference: Institute of Medicine 2009 Gestational Weight Gain Guidelines
IOM and NRC 2009.

The women's pre-pregnancy BMI was assessed according to the height measured and pre-pregnant weight estimate reported by the women before they became pregnant. Results showing that most pregnant women had healthy weight before they became Pregnant; only (1.9 %) of women had BMI <18.5 and 17(6.5%) women BMI >30, an indicator that they entered pregnant with unhealthy weight (see figure 6.4).

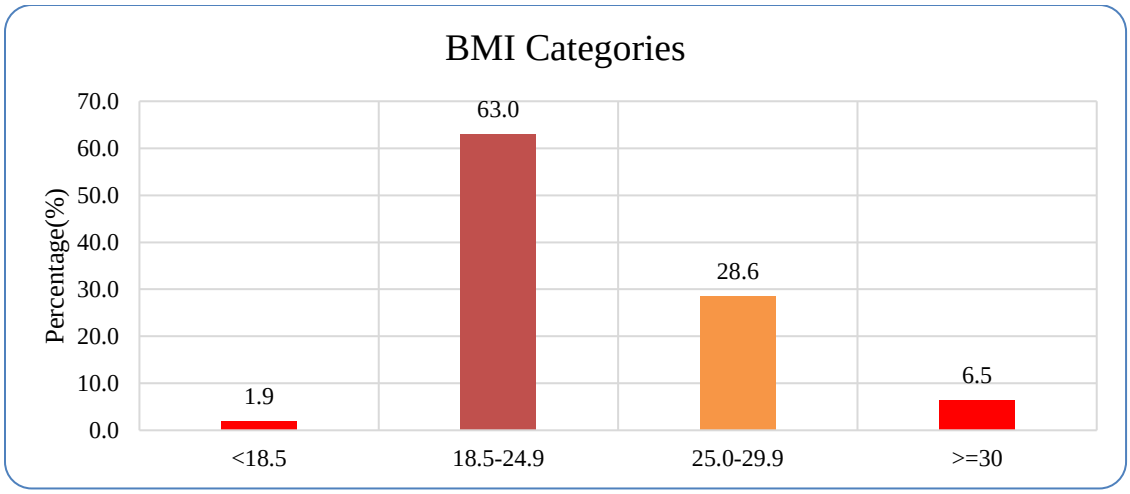


Figure 6.4: Estimated pre-pregnant weight among pregnant women in urban low income settlement Nairobi Kenya (N=262).

6.4.6 Baseline assessment of BMI among Pregnant Women by BMI

The BMI was assessed at baseline, at three months after baseline, and at fourteen weeks postpartum. The assessment of weight gain was important for this study to monitor how women gain weight to guide the counselling sessions on how they should eat. The weight was measured using a digital scale and the height was measured using a wall-mounted stadiometer (see table 6.10).

Table 6.10: Weight change over time among pregnant.

Mean	**Intervention N=43**	**Comparison n=42**	**Total N=85**	**p-value**
	Maternal Nutritional Status (BMI) 1 (%)			
<18.5 (Under Weight)	2.3	0.0	1.2	
18.5-24.9 (Normal)	41.9	33.3	37.6	
25.0-29.9 (Over Weight)	44.2	50.0	47.1	0.618
>=30 (Obese)	11.6	16.7	14.1	
	Maternal Nutritional Status (BMI) -2 (%)			
<18.5 (Under Weight)	0	0	0	
18.5-24.9 (Normal)	23.8	31.7	27.7	
25.0-29.9 (Over Weight)	59.5	39.0	49.4	0.151
>=30 (Obese)	16.7	29.3	22.9	
	Maternal Nutritional Status (BMI) -3 (%)			
<18.5 (Under Weight)	2.4	2.4	2.4	
18.5-24.9 (Normal)	26.8	26.8	26.8	0.994
25.0-29.9 (Over Weight)	48.8	46.3	47.6	
>=30 (Obese)	22.0	24.4	23.2	

BMI Changes overtime: Pearson's correlation was performed to find out the correlation of BMI change over time, results revealed a strong positive correlation r = 0.627 indicating overall a significant weight gain between weight1 and weight2 p=0.00, hence weight1 and weight3 and all significant p=0.00. The intervention group was better than the comparison group (see table 6.11 and figure 6.5).

Table 6.11: BMI Changes overtime among depressed pregnant women at Kangemi and Kawangware.

	Mean	Std. deviation	Std. Error Mean	Correlation (p-value)	r^2
BMI1	26.4454	4.69807	.51568	0.792	0.627
BMI2	27.5382	4.42909	.48616	(0.000)	
BMI2	27.3146	4.45110	.49154	0.865	0.748
BMI3	26.618	4.74261	.52373	(0.000)	
BMI1	26.7185	4.67922	.51673	0.822	0.672
BMI3	27.1918	4.74261	.52373	(0.000)	

The BMI mean scores were compared between the intervention group and the comparison group. Results indicates weight change over time as indicated by BMI for both groups, indicating overall weight gain between weight 1 and weight 2, and weight drop after delivery, in the intervention group, which is normal because the baby is out, while the comparison group also show positive weight gain between weight one and weight two, drop after delivery, between weight two and weight 3. Although the weight gain is due fetus growth, but also show that women are eating well hence gaining weight as the fetus grow, the intervention group gained more weight between weight one and weight two (see figure 6.5).

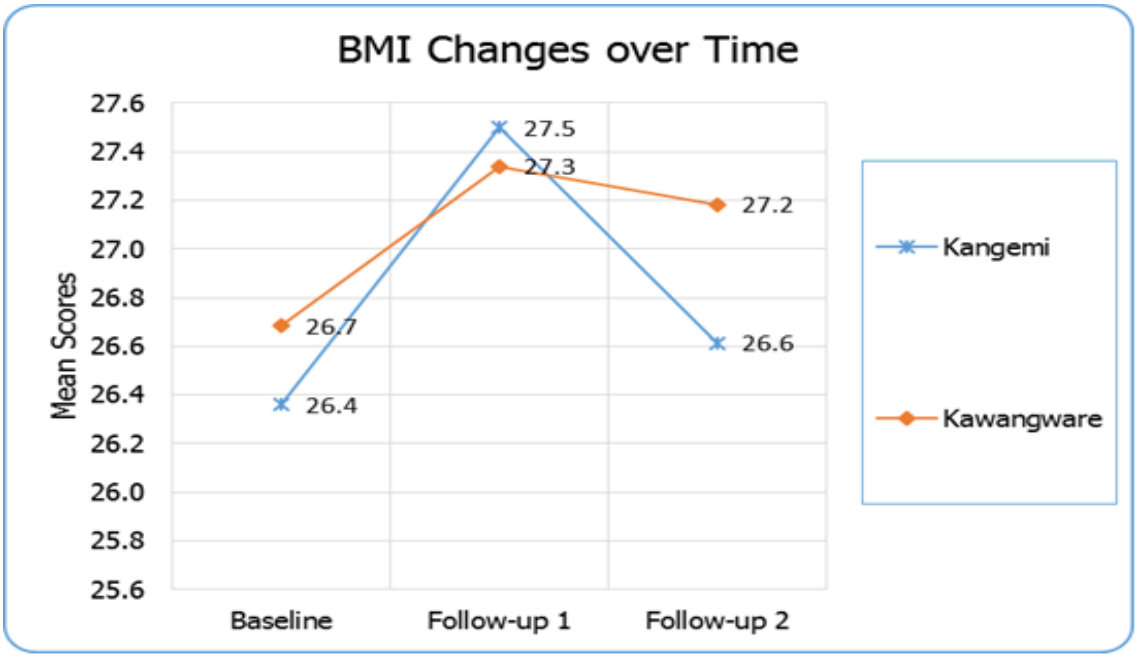


Figure 6.5: BMI Changes overtime among depressed pregnant women at Kangemi and Kawangware.

6.4.7 Neonatal Outcomes

After delivery, data on neonatal outcomes were obtained from the mother's clinic card and the baby's clinic card. Information about preterm birth and the birth weight of neonates was recorded. Weight gain among neonatal was followed up to three months and a half (14 weeks) postpartum to detect the developmental milestone (growth). A statistically significant increase in weight gain from birth to 14 weeks postpartum p=0.00. The intervention group was better than the comparison group. About 92% of pregnant women in the intervention group and 97.6% in the comparison group gave birth to healthy infants with average birth weight. Only 7.1% of pregnant women in the intervention group and 2.4% of pregnant women in the comparison group had babies with low birth weight (table 6.12).

Table 6.12: Infant weight change over time.

Mean	Intervention N=43	Comparison n=42	Total N=85	p-value
		Child Weight		
Mean Child Birth Weight (Kg)	2.9±0.02	2.9±0.062	2.9±0.33	0.872
Mean Child Weight – Week 6 (Kg)	5.1±0.59	4.7±0.59	4.9±0.63	0.001
Mean Child Weight – Week 14 (Kg)	6.8±0.50	6.1±0.75	6.4.±0.73	0.000
Mean Weight increase from Birth to Week 14	4.98±0.34	4.6±0.46	4.8±0.44	0.000
Birth Weight <2.5 Kg (%)	7.1	2.4	4.8	0.616
Birth Weight >=2.5 kg (%)	92.9	97.6	95.2	

The mean weight gain among infants was compared between the intervention group and the comparison group. For the intervention group, the mean infant birth weight in (kilograms) was 2.9±0.06, Mean Child Weight at week 6 was 4.7±0.59, and Mean Child Weight at week 14 was 6.1±0.75. For the comparison group, the mean infant birth weight in (kilograms) was2.9±0.02, the mean child weight at week 6 was 5.1±0.59, and the mean Child Weight at week 14 was 6.8±0.50. The intervention group babies had better weight gain than comparison group babies (see figure 6.6).

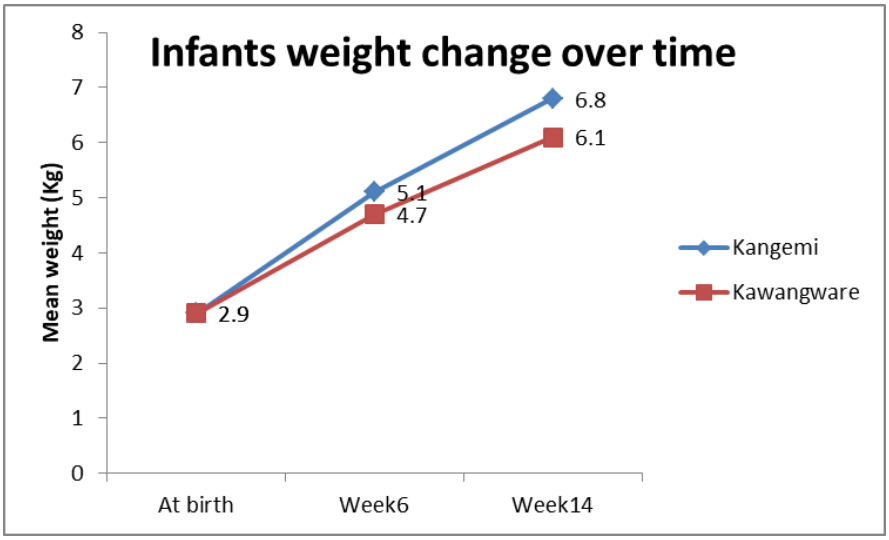


Figure 6. 6: Infant weight change over time.

6.4.8 Brain Food Essential Intake among pregnant women in urban low income

The intake of Brain Food Essentials was compared between the intervention group and the comparison group at baseline. The results reveal a significant difference in the consumption of (Lean meat, fish, and cod liver oil) p= 0.014, whereas the comparison group- Kawangware had more women who did not consume this type of food. There was a significant group difference in the consumption of (Eggs from chicken, duck, or any other egg, whereas the intervention group- Kangemi had more women who did not consume this type of food p= 0.036 (table 6.13).

Table 6.13: Baseline Comparison (Brain Food Essentials Intake) between Intervention and comparison group.

Variable	Category	Health Centre		Group Differences P-value
		Intervention N=43	Comparison N=42	
Fish, lean meat, organ meat, eggs, sardine, and cod liver oil	No	16.7	83.3	0.014
	Yes	56.2	43.8	
Groundnuts, pumpkin seeds, sunflower seeds, or flax seeds	No	52.4	47.6	0.829
	Yes	48.8	51.2	
Seed oils, olive oils, margarine, and butter	No	64.0	36.0	0.153
	Yes	45.0	55.0	
Grain whole e.g. whole ugali meal, rice, whole grain githeri/ wheat sorghum, millet, or any other grain or food made from these, etc.	No	66.7	33.3	1.000
	Yes	50.0	50.0	
Legumes e.g. red kidney beans, chickpeas, lentils and black beans, lima beans, include any other local.	No	63.6	36.4	0.520
	Yes	48.6	51.4	
Dark green leafy vegetables including wild form + locally available vitamin A rich leaves such as amaranth, cassava leaves, kales spinach, nightshade, mushrooms	No	33.3	66.7	0.616
	Yes	51.2	48.8	
Other vegetables e.g. tomatoes, carrots, sweet potatoes orange color/eggplants and e.tc.	No	0.0	100.0	0.055
	Yes	53.1	46.9	
Eggs from chicken, duck or any other egg.	No	73.7	26.3	0.036
	Yes	43.9	56.1	
Dairy (milk, yogurt, cheese).	No	52.4	47.6	1.000
	Yes	50.0	50.0	
	No	60.0	40.0	0.342

Red meat including meat (beef, veal, pork, goat meat) or meat product (ham, sausages, cured meat, e.tc.)	Yes	46.7	53.3	
White meat (chicken, turkey, rabbit, etc.)	No	56.8	43.2	0.384
	Yes	45.8	54.2	
Sweets or pastries (not homemade) such as cakes, cookies, biscuits)	No	46.9	53.1	0.658
	Yes	52.8	47.2	
Spices (black pepper, turmeric, ginger, etc.)	No	48.1	51.9	0.654
	Yes	54.8	45.2	

6.4.9 Brain Food Essentials Intake between comparison and intervention final assessments

Brain food intake was evaluated after the intervention. Results revealed significant differences between groups. The intervention group reported that they were consuming almost all the food items that they were advised to consume; there was high consumption of brain food essentials of most food groups, in the intervention than in the comparison group $p < 0.001$. This could be explained by the reason that women in the intervention were consistently advised to consume the brain food essential (table 6.14).

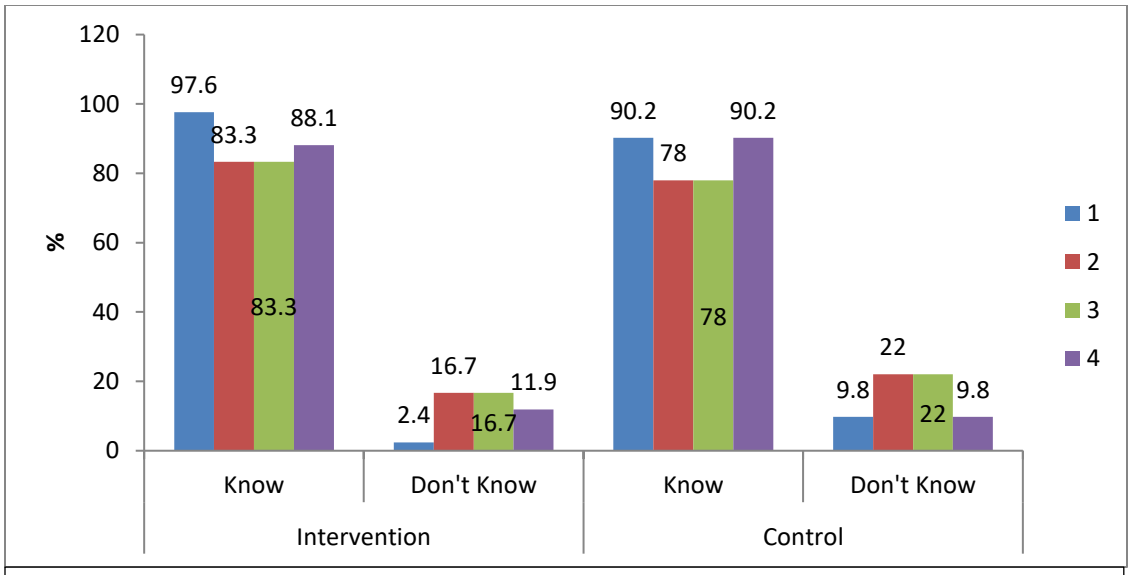
Table 6.14: Brain Food Essentials Intake between Intervention and comparison group

Variable	Category	Health Centre		Group Differences
		Intervention N=43	Comparison N=42	
Fish, lean meat, organ meat, eggs, sardine, and cod liver	No	0.0	100	0.000
	Yes	58.9	41.1	
Groundnuts, pumpkin seeds, sunflower seeds, or flax seeds	No	0.0	100	0.000
	Yes	64.2	35.8	
Seed oils, olive oils, margarine and butter	No	0.0	100	0.002
	Yes	55.8	44.2	
Grain whole e.g. whole ugali meal, rice, whole grain githeri/wheat/ sorghum, millet or food made from these etc.	No	0.0	100	0.116
	Yes	52.4	47.6	
Legumes e.g. red kidney beans, chick peas, lentils and black beans, lima beans, include any other local.	No	0.0	100	0.055
	Yes	53.1	46.9	
Dark grey leafy vegetables including wild locally available vitamin A rich leaves such as amaranth, cassava leaves, kales, spinach, night shade, mushrooms	No	0.0	100	0.116
	Yes	52.4	47.6	
Other vegetables e.g. tomatoes, vegetables, carrots, sweet potatoes with orange color inside egg plants and e.tc.	No	0.0	100	0.055
	Yes	53.1	46.9	
Eggs from chicken, duck or any other egg.	No	0.0	100	0.012
	Yes	54.4	45.6	
Dairy (milk, yoghurt, cheese).	No	0.0	100	0.000
	Yes	57.3	42.7	
Red meat including meat (beef, veal, pork, goat meat) or meat product (ham, sausages, cured meat, e.tc.)	No	0.0	100	0.000
	Yes	57.3	42.7	
White meat (chicken, turkey, rabbit)	No	0.0	100	0.000
	Yes	63.2	36.8	
Spices (turmeric, cinnamon etc.)	No	0.0	100	0.000
	Yes	78.2	21.8	

6.4.10 Knowledge Attitude and Practice Changes Over Time with the Intervention

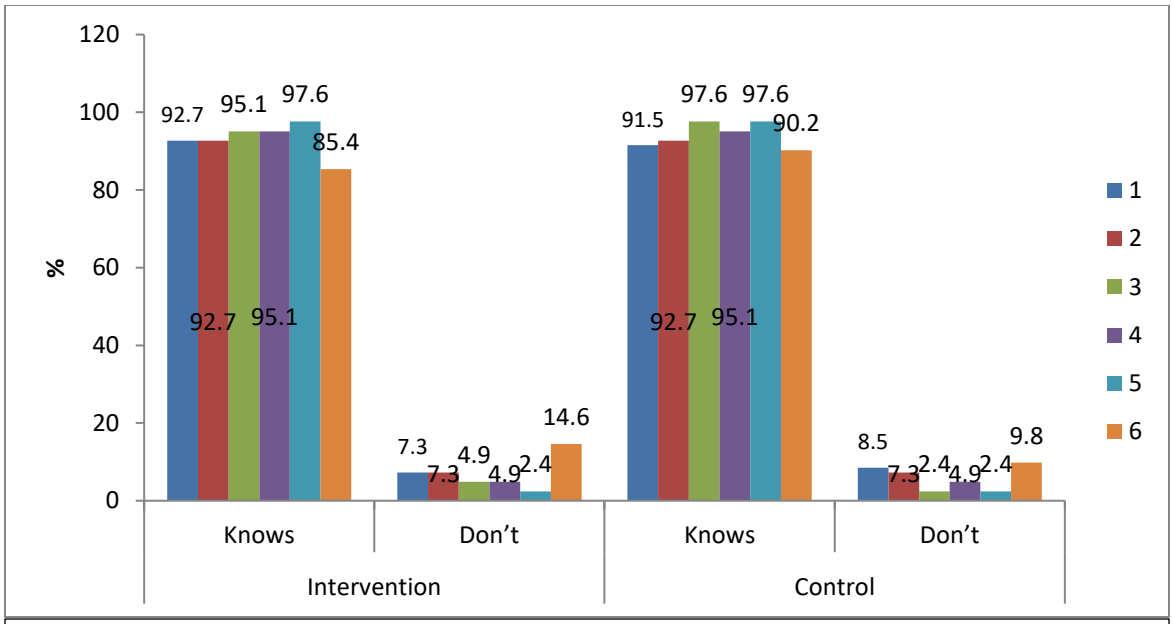
The nutritional knowledge, nutrition attitude, and nutrition practice was assessed to determine the levels of understanding of nutrition among pregnant women. Results at baseline revealed that the lower educational level of pregnant women at primary education and less than primary levels was statistically significantly associated with poor nutritional knowledge. Younger women age was statistically significantly associated with poor nutritional Knowledge. Furthermore, lower income levels were statistically significantly associated with a negative nutritional attitude. After the intervention follow-ups, where pregnant women, were given received nutritional education, nutritional counselling and psychosocial counseling, there was a greater improvement in their eating habits, knowledge, attitude, and practices.

Although behavior change is a continuous process and cannot be measured simultaneously, the final assessment revealed some improvement in how women understand nutrition, Attitudes towards a health or nutrition related problem – Perceived susceptibility, perceived severity, and benefits of good nutrition. The results revealed that women were positive in their daily practices. Pregnant women/lactating women in both groups had improved nutritional knowledge, attitude and practice. The final assessment was basically to evaluate on the knowledge that women learned about pregnancy nutrition, and breastfeeding, under-nutrition, and nutrient deficiencies, to see the improvements in women's nutritional knowledge as indicated in figures below.



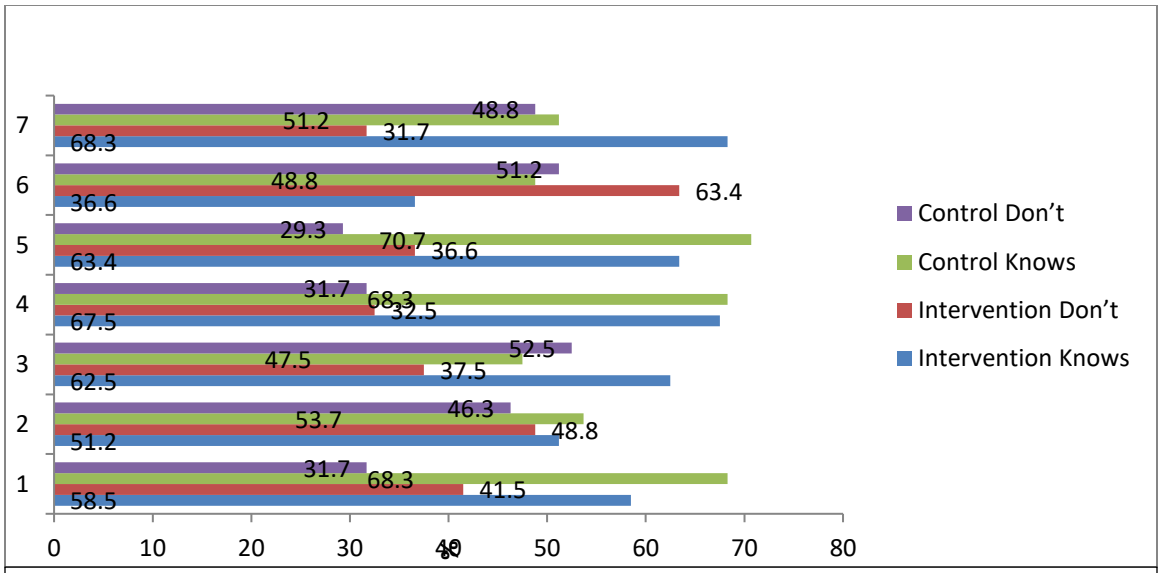
1) How should a pregnant woman eat? ; 2) Types of supplements, or tablets during pregnancy, do you know them? ; 3) Why it is so important to take folic acid sup during pregnancy? ; 4) Health risks for low birth weights?

Figure 6.7: Women's nutrition knowledge during pregnancy and breastfeeding.



1) Signs of not having enough food; 2) Reasons for undernourished; 3) Reasons of not getting enough food; 4) How can find out if the baby is growing well or not; 5) If the baby is not gaining weight, what does that mean; 6)What should we do to prevent undernutrition

Figure 6.8: Knowledge about Under-nutrition among pregnant women.



1) How to recognize someone who has anemia? 2) What are the health risks for infants due to a lack of iron? 3) What are the risks for pregnant women of a lack of iron? 4) What causes anemia? 5) How can anemia be prevented? 6) Can you list examples of foods rich in iron?; 7) Certain foods help the body absorb and use iron, mention those foods; 8) Some beverages decrease iron absorption when taken with meals. Which ones?

Figure 6.9: Knowledge about Iron Deficiency among pregnant women in urban low income.

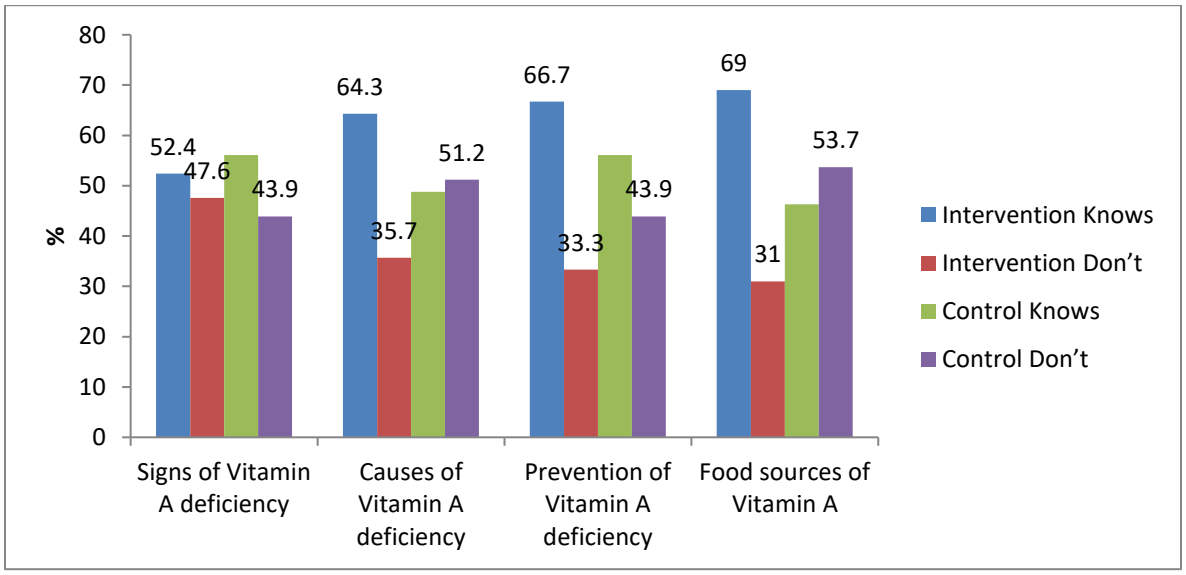


Figure 6.10: Knowledge about Vitamin A among pregnant women in urban low income.

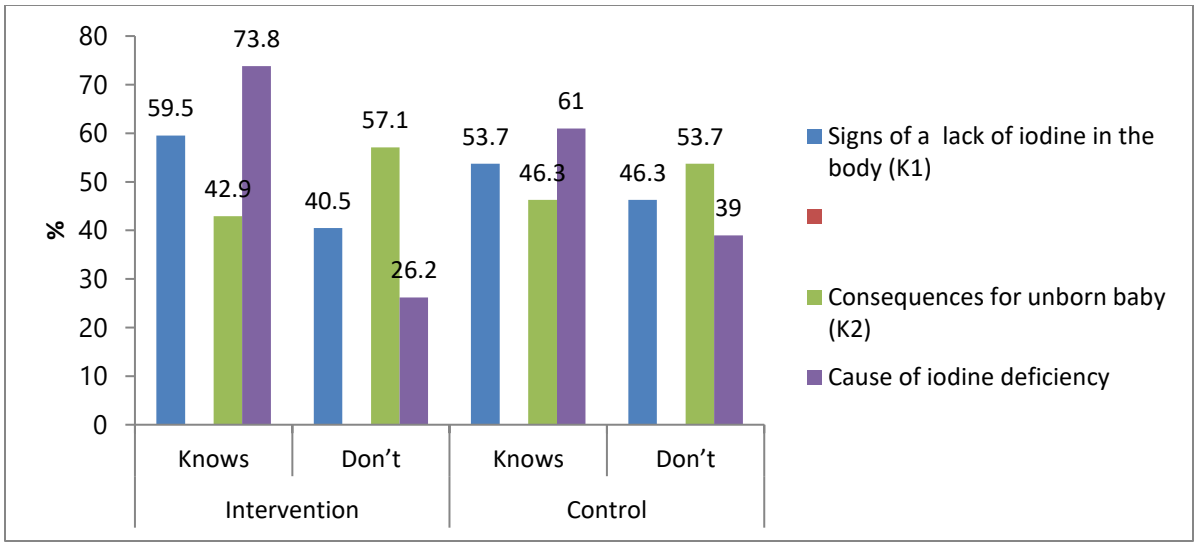


Figure 6.11: Knowledge about Iodine among pregnant women in urban low income.

6.4.11: Feedback from participants and Satisfaction Level with the Intervention

Women were asked to give feedback about how they thought about the intervention study that they have gone through. Feedback from the women revealed that women were very happy about the intervention and they felt that they were really helped to get out of their depression. Some women reported that, if it wasn't for this program that came on their way they could have committed suicide because of too much stress. All women were grateful about having an opportunity to attend this intervention study and wished for it to continue. Community Health worker Volunteers (CHWVs) were also very grateful for this program, they reported that at present and days to come, they now know better how to help women who suffer depression and malnutrition.

CHV3 *"We have now a new approach to help women to think positively around their health issues, around eating health to improve health. "Since 1989, when I started the community work with HIV program then we started talking to these mothers; you know those years of HIV going to the field was not easy, it was like-how can I put it?". "Because even if you go to talk to these mothers you just talk to her and doesn't even want to pay attention to you; it was hard to talk to mothers. It is called discrimination, so we are grateful to this program of using thinking health approach that we able to extend our knowledge and help women to become health thinkers".*

CHV4 *"Dealing with the community is not an easy thing; so, if you see that a mother has accepted to listen to you and told you what they go through, it means a lot. I am very proud to see these mothers, there are some I didn't know if they can be helped; there was one who was in a very bad situation, even her husband never wanted to see her, but when I just see them let me tell you it's a joy"*

We women in the intervention group also opted not to break the group but continue with it under the community health volunteers. CHV5: "*We are here to help each other; do not stay with that problem, we should sit together and talk, and I beseech among this whole group, that all of us should not leave the group, we can do something to continue with a group; even if it is a merry-go-round, even if it is something that we are doing let us do it so that we can help each other; in terms of opinions, business, or other issues, would you like".*

6.5 Discussion

This study establishes the efficacy of dietary intervention and Thinking health Cognitive Behavioral therapy in improving women's mental health and physical health. For the intervention group, pregnant women practiced eating healthily, planning a balanced diet, and a focus on brain food essentials such as intake of folate, iron, zinc, calcium, magnesium, and phosphorous thiamin, riboflavin, niacin, vitamin B6, vitamin B12, vitamin C, copper, and omega -3 foods. Cognitive Behavioral therapy was necessary for altering the negative thoughts that cause depressed mood to a positive mindset; therefore, this intervention was beneficial to help women think positively and better take nutrition advice and counseling. Findings for the comparison group reveal that simple intervention involving general nutrition knowledge and group support, where pregnant women come together and discuss common issues that they go through and with simple support from professionals, can help depressed pregnant women get through their depression. The study findings compare well with finding reported by the previous studies. The SMILES trial in Australia; investigated the efficacy of a dietary improvement program for the treatment of major depressive episodes for 12-weeks. The diet intervention group had a sample size of

n = 33, and the control had *n* = 34. The results of this trial revealed that the dietary support group demonstrated more remarkable improvement between baseline and 12 weeks on the depression scale than the social support control group $p < 0.001$ (Jacka et al., 2017).

A randomized controlled trial by Francis et al. (2019) in New Zealand examined whether a brief, 3-week diet intervention can improve depression, among young adults with elevated depression (n=38) diet change groups and n=38 habitual diet group. Results indicated that the diet change group was significantly lower than the regular diet group following 3- weeks of diet improvement (Francis et al., 2019). Similarly, a prospective cohort by Teo et al. 2018 examined the associations of dietary patterns during the confinement period in a multi-ethnic Asian cohort with postpartum depression. Results revealed that Traditional-Indian- Confinement diet and Soup- Vegetables-Fruits diet was positively associated with reduced depression symptoms (Teo et al., 2018).

A prospective cohort study of pregnant women by Chatzi L., et al. 2015, in Greece; investigate whether dietary patterns during pregnancy are related to postpartum depression (n = 529). Results revealed that high adherence to a healthy diet, characterized by vegetables, fruit, pulses, nuts, dairy products, fish, and olive oil, was associated with lower EPDS scores, P = 0·02. Moreover, a randomized controlled trial by Naem et al. (2014) in Alexandria assessed dietary intake of zinc and other macronutrients among pregnant women (n=100). Results revealed that Zinc deficiency was identified among 53.5% of the sample, and the iron intakes were below 50% of the Recommended Dietary Allowances (RDA). Protein intake was less than 70% of the RDA. A high deficient in zinc and iron was associated with depression.

Another study by Poorrezaeian M, et al., 2017, in the South of Tehran- Iran, determined the relationship between the Dietary Diversity Score (DDS) and stress and depression in women (n=360. Results revealed that a one-unit increase in dietary diversity score was associated with a 39% reduction in the risk of severe depression. In contrast, some studies did not find any association between diet and perinatal depression, A study by Nathanson et al. (2018), in Australia examined the association between consumption of food groups,

quality diet during pregnancy, and postnatal depressive (n = 253), results revealed that There were no relationship between fruit, vegetable, or fish intake in pregnancy and postnatal depressive symptoms (Nathanson et al., 2018). Furthermore, a prospective cohort by Teo et al. (2018) examined the associations of dietary patterns between Traditional-Chinese-Confinement diet and Eat-Out diet with postpartum depression during the confinement period in Asian cohort with postpartum depression. Results revealed that. There was no association observed between the Traditional- Chinese-Confinement diet and the Eat-Out diet with maternal mental health.

According to World Health Organization, the Thinking Healthy Programme is recommended to treat perinatal depression in resource-limited settings(WHO, 2015).Similar to our study, other studies have investigated how the Thinking Healthy Programme (THP) helps with stress management in improving health, and many other associated health benefits (Chowdhary et al., 2014). Evidences from randomized controlled trials in India and Pakistan were conducted to estimate the effectiveness of THP on maternal outcomes across the two settings. Participants were pregnant women aged ≥18 years with depression (Patient Health Questionnaire (PHQ-9) score≥10). The primary outcomes were symptom severity and remission of depression for 6-month follow-up. Results revealed that participants in the intervention arm had lower symptom severity as indicated by PHQ-9 score-adjusted mean difference -0.78 (95%1.47,-0.09) and higher odds of remission (Vanobberghen et al., 2020). These studies demonstrated the effectiveness, acceptability, and feasibility of THPP, which can be scaled-up within a stepped-care approach by engaging with the existing health care systems and the communities to address the treatment gap for perinatal depression in resource-limited settings.

Another single-blind, randomized controlled trial recruited pregnant women aged ≥18 years attending antenatal clinics, with depression score ≥10 on the PHQ9. Participants were randomly allocated (1:1) to THPP plus enhanced usual care (EUC). Primary outcomes were severity of depressive symptoms (PHQ-9 score) and remission (PHQ-9 score). Findings revealed that there was higher depression remission at six months in the THPP plus EUC versus enhanced usual care EUC alone. THPP had a moderate effect on symptom severity

and remission from perinatal depression over the six-month post-natal period (Fur et al., 2018), these results concur with our finding which found depression remission after the intervention. The strength of this study was the fact that it was a longitudinal design which has allowed determination of the causal relationship between the exposure and the outcome and the inclusion of a comparison group. This study also had a high follow-up rate and minimized technical error of measurement by carrying out standardization exercises. in the high-income setting.

6.6 Conclusion

The results of the intervention led to the conclusion that, both interventions resulted to depression remission, but combined dietary intervention and psychosocial intervention was more efficacious in reducing depression levels and improving women's nutritional status and neonatal outcomes. Cognitive behavior therapy was valuable and can help depressed pregnant women get rid of the negative thought to positive thoughts for mood stability, and enabled better intake of nutrition education and dietary counseling. The findings recommend integrating nutritional enhanced mental health counseling to support women with depression.

CHAPTER SEVEN: GENERAL DISCUSSION, CONCLUSSIONS, AND RECOMMENDATIONS

7.1 Introduction

The interest of this study at baseline was to determine the association between maternal depression, the nutrition status of pregnant women, and their diet quality. In addition, determine pregnant women's nutritional knowledge, attitude, and practice to detect if there is a gap and whether women need nutritional intervention. The results of the baseline assessments informed the need for an intervention to examine the efficacy of dietary and psychosocial intervention for depression care among pregnant women in urban low-income Nairobi – Kenya. This study revealed an association between maternal depression, poor nutritional status, and inadequate dietary intake (brain food essentials). Moreover, the study revealed a gap in pregnant women's nutritional knowledge, attitude, and practice that need to be addressed. This is the first study in Kenya that associated the nutrition status, dietary quality, and perinatal /maternal depression; and examined the efficacy of dietary intervention and psychosocial management – cognitive behavior therapy for depression care among pregnant women in the low urban income of Nairobi, Kenya.

7.1.1 General Discussion

The study results revealed the presence of depression among pregnant women and the prevalence's are high. Many pregnant women experiences depression sometimes never recognized when they came for health care. During pregnancy nutritional needs are increased and many women suffer malnutrition because they are not meeting the dietary recommendations, because they are not getting enough hence deficiencies. The results of this study compare well with the literature available on the role of socio-economics status, which has been pointed as a risk factor for depression. When people don't have enough to eat, and they cannot afford to eat varieties of food because of financial struggles, they end up with nutritional deficiencies, which contribute to depression.

Inadequate consumption of brain food essential was revealed by the study and was statistically significantly associated with maternal depression. The reasons for this could be a lack of nutritional knowledge, not knowing how to make healthy choices, and the

lower educational level could contribute to inadequate intake of brain food essentials. The reasons could be that most women were young and first-time mothers who did not know how to eat well, or it could also be due to low socio-economic status, where women cannot buy varieties of food. Financial struggles could be another reason, not knowing how to use the small budget available to choose healthy food. The intervention study was useful to help women understand the importance of good nutrition during pregnancy and lactation and how to make good choices with a small budget. They also learned the mechanisms linking nutrition and maternal depression and the different types of brain food essentials available locally to help carb the deficiencies.

The intervention finding revealed a statistically significant reduction of depression to non-clinical depression levels, as indicated by an EPDS mean score of less than six in both groups after the intervention. The possible reasons, for the depression retrieval in some women could be explained by natural recovery. When the pregnancy is still small, women get stressed, thinking about how they will go through the whole process of pregnancy to birth, but when the pregnancy advances, the women get used to it and overcome their depression. Moreover, when women give birth to healthy babies, they become happy with their babies and overcome their depression.

Another explanation for depression retrieval could be that, the interventions involving cognitive behavior therapy and talking therapy could be the reasons for significant depression retrieval. The group therapy where pregnant women came together, talking about what causes distress and how to deal with the issues, could be enough for them to feel comfortable hence depression retrieval. In additional dietary intervention, education and dietary counseling resulted in dietary changes, eating healthy, making good food choices, and eating enough, which has resulted in the recovery of nutrients deficiencies in the brain, hence mood stabilization. In the comparison group, the depression retrieval could be because depressed pregnant women needed just a support group, a platform where they could talk about their problems and support each other in their journey of becoming mothers. Or it could be that the simple intervention that includes general nutrition education and simple counseling was sufficient to improve their dietary intake, healthy

eating, reduced deficiencies, and hence reduced the depression level among pregnant women. There was no statistically significant difference between the intervention and comparison groups. The usual enhanced care (general nutrition education, dietary counseling, and follow-up in sessions) effectively reduced depression among women. The comparison group women were very active in discussing issues, and they asked so many questions about health issues; hence these women learned so much and may have benefited equally as the intervention group.

Furthermore, these results inform that simple intervention involving talking therapy, or group support for pregnant women, can be helpful for pregnant women to ease their life pressure, function better, and have confidence. That they are not alone in whatever they are going through. When pregnant women are given correct information about their health and their babies, they can take up the information and act to behavior change. For example, women understood the risk and severity of poor nutrition to their health and their babies; women understood how susceptible they are to nutrition deficiencies and perinatal depression. This understanding helped women act and follow all the health advice given to them. After the intervention, there was a significant increase in brain food essential uptake in the intervention group compared to the comparison group.

The results indicated an overall weight gain among pregnant women. Most women gave birth to healthy babies, and among infants, there was significant weight gain from birth to 14 weeks postpartum; indicating that women were eating well, and fetus were growing, and women gained weight, this shows that, nutrition is important in pregnancy, for physical health and mental health. Research indicates that depression and an unhealthy diet during pregnancy are connected and have consequences for the mother's heath and the child's outcome. Therefore, there is a need to integrate nutrition interventions during perinatal periods because it is a period when nutrition has a significant impact on mothers and their newborns and reduces complications during pregnancy and death during childbirth.

The Semi-mental nutritional intervention was necessary for depressed pregnant women because people suffering from depression have negative thoughts; the healthy thinking program facilitated better understanding and uptake of the nutrition intervention. Cognitive behavior therapy was beneficial to help perinatal women identify their problems, identify the solution/ identify alternatives, and practice how to deal with their problems. Therefore, early identification of perinatal depression and intervention is important in reducing perinatal depression and ending the growing rates of depression. In this study, the semi-mental nutritional intervention has shown better results in positive thinking, reduced depression, and improved nutritional health. This intervention can serve as a preventive measure for depression and better child outcomes.

7.2 Lesson Learned and Future Research and Practices

First, depression is prevalent among pregnant women. Most women who come to the antenatal clinic have depressive symptoms, are non-symptomatic, and cannot be recognized without screening. This is because mental disorders are not well understood; if no screening takes, these women cannot be noticed and cannot access mental health services. Therefore, incorporating screening of perinatal depression at the primary health during antenatal care clinic visits would be beneficial for women with depression to be diagnosed and access help.

Second, nutrition education and counseling, targeting maternal diet during pregnancy provided for a period of time, and some follow-ups, can improve multiple maternal and neonatal health indicators and is effective, even for short period. However, for pregnant women with severe depression, the standard nutrition counseling may not work because the mental status of pregnant women is disturbed. Therefore (the semi-mental nutrition intervention) is required, which combines both nutritional and psychosocial management.
Third, in this study, the community health volunteer workers were instrumental and can be trained and empowered to deliver simple nutrition education, diet counseling, and psychological management for depressed pregnant women with minimal supervision. Although they were not the ones who offered the intervention fully, they have mastered the intervention concepts so well and can continue to offer the intervention in the future to

women in the community who suffer depression. These findings are of importance to public health on using the community health volunteers to tackle the treatment gap of perinatal depression in urban resource low-income settlement Kenya.

Fourth, according to World Health Organization, thinking healthy program - Psychological interventions was designed to be delivered away from the medical environment. It was designed to be offered by non-specialist health workers, community health workers in this case, who routinely see mothers at home during pregnancy and after childbirth are recommended, because the families around them can trust them (WHO, 2015). The results of this study revealed that in the Kenyan context, it was not possible to visit mothers in their home, because in the slums setting, people live in one room, and many people live in one plot; Women refused to be visited in their home, but preferred the community meetings. Home visits contributes to stigma around people being visited by community health workers at home; when neighbors see the community health workers visiting some people's home, they start speculating about a person visited to have a bad disease which causes the community health workers to visit them, so the victims are being stigmatized and are discriminated, and isolated in the community.

The community meeting program worked so well where depressed pregnant women came together as a group in one common place within the community, and discussed the common issue they were facing in the intervention sessions. Women were delighted, and they enjoyed those meetings. They were able to learn a lot in the calm environment also to ask questions. Therefore, interventions like this one can be very successful when women meet away from their home and away from health centers. The community health workers were instrumental in mobilizing the mothers who were identified with perinatal depression; they also supervised pregnant women to implement what we learned in the group meeting.

Fifth, the study results show that improving maternal nutrition is the most challenging strategy because addressing food deficits in low-income communities can be problematic. However, dietary interventions are the most appealing and potentially sustainable strategies to improve and maintain maternal nutrition. Therefore, identifying pregnant

women who need nutritional intervention is important. This includes assessing pregnant women's nutrition status and dietary intake to inform the development of the intervention required.

Sixth, currently published evidence on the dietary recommendation for the prevention of depression comprises the Mediterranean diet, Norwegian, and Japanese diets. There is a need to formulate a Kenyan diet for depression, including local Kenyan food, the good sources of the brain food essential nutrients from available local food. Research has demonstrated that proper nutrition has the ability to prevent disease or even treat and reverse chronic disease. However, it is all about behavior change. It depends on one's willingness of one to continue and make attempts toward change.

7.3 Conclusion

The findings of this study led to the conclusions that, maternal depression is widespread during pregnancy and lactation, and is more prevalent in resource-poor settings. The Situational context results revealed an association between poor nutritional status and maternal depression. The deficiencies caused by inadequate dietary intake and increased nutritional needs during pregnancy are key factor to women's susceptibility to maternal depression. Nutrition is fundamental to numerous aspects of brain functioning and good nutrition during perinatal period needs to be emphasized, including the consumption of brain food essentials. The result of the nutritional knowledge, attitude and practice enlightens a need to focus on disseminating appropriate nutritional knowledge to young mothers with a low educational background because they may be particularly disadvantaged. The promotion of nutrition for mental health is required.

The results of the intervention revealed that, dietary intervention and psychosocial management are effective for reducing depression among pregnant women and accessible strategies for addressing perinatal depression as well as improving nutritional status among perinatal women. Overlooking the mental health needs of women during pregnancy, may contributes to the mental health problems among women and future mental problems among the children. Additional studies are needed on dietary intervention and mental

health research to elucidate the association between diet and mental health, to illuminate their mechanisms of action. The dietary recommendations may provide additional and/or concurrent benefits for reducing other non-communicable diseases which are nutritionally related. Future research needs to explore how thinking health programs and dietary intervention can help reduce other chronic diseases such as diabetes, cancer, and malnutrition in children.

7.4 Policy Implication

Integration of Mental Health- Nutrition Counseling for Perinatal Women in Primary Care

Kenya Policy Briefs; University of Nairobi, Series 2 - Social Pillar

Link: **https://uonresearch.org/journal/index.php/kpb/issue/current**

Beatrice A. Madeghe, Wambui Kogi-Makau, Sophia Ngala and Manasi Kumar

Currently, the situation in Kenya, primary health facilities antenatal clinics, mainly a generalized health talk covering various issues concerning the health of pregnant women, are given to all women who come for an antenatal check-up in the waiting room as a group. This health talk includes general nutrition education or any other health issues present in the community that needs to be addressed, such as COVID-19. There is no screening for perinatal depression in the primary health care facilities and the antennal clinics in Kenya. Only the extreme cases of mental health issues are referred to the psychiatry doctor who visits the primary health center once a week, missing all other women who need help and are not symptomatic. There is no dietary screening for pregnant women or individualized dietary counseling for pregnant women. Only the extreme cases of malnutrition are referred to the nutritionist in the facility, missing other pregnant women who may be at high risk for malnutrition requiring careful dietary management. While general nutrition counseling may be helpful to pregnant women, for depressed women, general nutritional counseling may not work for them; they need integrated mental health nutrition counseling to stabilize their mood.

7.5 Recommendations

7.5.1 Short-terms

The findings of this study recommend to the Ministry of Health (MOH) to include the screening of perinatal depression in all primary health facilities for women during prenatal visits as a component of care during antenatal clinics visits. In addition, findings recommend dietary assessment done among pregnant women during the antenatal visit to identify women needing dietary monitoring. Furthermore, integrated nutritional, enhanced mental health counseling for women with depression needs to be developed because depressed pregnant women may not respond to the general nutrition counseling. The findings revealed that the nutrition care process is not usually part of standard practice for the treatment of depression. Therefore, in screening for depression, inadequate food intake or excessive intake needs to be included as standard nutritional diagnostic statements important in nutritional assessments and linked to depressive disorders.

There is a need to formulate a traditional Kenyan diet for depression, using local Kenyan food containing brain food essential nutrients for maternal depression. Alternatively, a food product can be developed from rich foods containing essential brain nutrients to reduce the nutritional deficiencies during the perinatal period, leading to depression. Moreover, the production of pamphlets, leaflets, posters, and very brief messages informing all women attending antenatal clinics about maternal depression, nutrition for mental health, when to seek medical help be given to all pregnant women. In addition, training of community health volunteer workers can be trained to deliver simple mental health interventions and nutritional intervention among the community members where they live, covering the treatment gap where mental health professionals and nutritionists are scarce and tend to concentrate in the hospital settings.

Practical recommendation to all pregnant women and lactating women, to apply the Thinking healthy cognitive behavior therapy principles to their own life and families, whenever they experience stress, they need think and identify the problem, how to think positively about the problem, and apply the principles and practice. For the nutritional part women to think health about eating healthy for themselves and their babies. All pregnant

women need to take seriously the healthy advice they get during antenatal visits, and do them practically in their homes to help themselves, their children, and the whole family.

7.5.2 Medium-term

The study findings recommend developing a policy that advocates screening for maternal depression and dietary assessments during pregnancy. There is a need for media campaigns on the increasing rates of maternal depression, how and where to access help. Nutrition for mental health needs to be promoted. The findings suggest a formative study to determine the need for a curriculum as this study did not involve curriculum assessment for possible inclusion of nutrition for mental health in the curriculum for all health personnel, MSc Nutrition, Public health, and nursing students to keep them abreast of the most recent evidence-based nutrition information on mental health. Global funding networks to promote mental health and nutrition research and periodic impact assessment and establish nutrition mental health research grants by the ministries, Non- Governmental Organizations, Academia developmental partners, and friends from the diaspora.

7.5. 3 Long-term Recommendations

Addressing poverty and food insecurity through various government institutions to improve nutrition security is the most sustainable and long-term recommendation of this studies to alleviate nutrition problems and associated nutritional diseases. This recommendation is in line with Kenya's vision 2030 and the Sustainable Developmental Goals (SDG1), aiming to end poverty in all its forms anywhere. (SDG2) aims to end hunger, achieve food security and improved nutrition, promote sustainable agriculture, and (SDG3 to ensure healthy lives and promote well-being for all ages. As demonstrated by nutritional deficiencies, malnutrition needs to be addressed to maintain good health and well-being (SDG 3). In addition, the links between mental illness and nutritional disorders during pregnancy and neurocognitive impacts on infant and child outcomes need to be addressed.

BIBLIOGRAPHY

Abasizadeh, S., Hemati, Z., & Deres, F. (2016). Prevalence of malnutrition during pregnancy and associated factors in women of Ardal County in 2012-2013, *3*(1), 19–25.

Accortt, E. E., Cheadle, A. C. D., & Schetter, C. D. (2014). *Prenatal Depression and Adverse Birth Outcomes : An Updated Systematic Review*. https://doi.org/10.1007/s10995-014-1637-2.

Akbaraly, T. N., Brunner, E. J., Ferrie, J. E., Marmot, M. G., Kivimaki, M., & Singh-Manoux, A. (2009). Dietary pattern and depressive symptoms in middle age. *British Journal of Psychiatry*, *195*(5), 408–413. https://doi.org/10.1192/bjp.bp.108.058925.

Albert, P. R. (2015). Why is depression more prevalent in women? *Journal of Psychiatry and Neuroscience*, *40*(4), 219–221. https://doi.org/10.1503/jpn.150205.

Alhojailan, I. (2012). Thematic Analysis: A Critical Review of its Process and Evaluation. WEI International European Academic Conference Proceedings – ScienceOpen.

Almurshed, K. S., Bani, I. A., Al-Kanhal, M. A., & Al-Amri, M. A. (2007). A study of maternal dietary intake during pregnancy in riyadh, saudi arabia. *Journal of Family & Community Medicine*, *14*(1), 9–13.

Ayano, G., Tesfaw, G., & Shumet, S. (2019). Prevalence and determinants of antenatal depression in Ethiopia: A systematic review and meta-analysis. *PLoS ONE*, *14*(2), 1–17. https://doi.org/10.1371/journal.pone.0211764.

Barker, E. D., Kirkham, N., Ng, J., & Jensen, S. K. G. (2013). Prenatal maternal depression symptoms and nutrition , and child cognitive function, 417–421. https://doi.org/10.1192/bjp.bp.113.129486.

Baskin, R., Hill, B., Jacka, F. N., O'Neil, A., & Skouteris, H. (2017). Antenatal dietary patterns and depressive symptoms during pregnancy and early post-partum. *Maternal & Child Nutrition*, *13*(1), e12218. https://doi.org/10.1111/mcn.12218.

Beck, K. L., Conlon, C. A., Kruger, R., & Coad, J. (2014). Dietary determinants of and possible solutions to iron deficiency for young women living in industrialized countries: A review. *Nutrients*, *6*(9), 3747–3776. https://doi.org/10.3390/nu6093747.

Bell, C. C. (1994). DSM-IV: Diagnostic and Statistical Manual of Mental Disorders. *JAMA: The Journal of the American Medical Association*, *272*(10), 828. https://doi.org/10.1001/jama.1994.03520100096046.

Benach, J., Friel, S., Houweling, T., Labonte, R., Muntaner, C., Schrecker, T., & Simpson, S. (2010). *A Conceptual Framework for Action on the Social Determinants of Health*. *World Health Organization Geneva*.

Biratu, A., & Haile, D. (2015). Prevalence of antenatal depression and associated factors among pregnant women in Addis Ababa, Ethiopia: a cross-sectional study. *Reproductive Health*, *12*(1), 99. https://doi.org/10.1186/s12978-015-0092-x.

Bitew, T., Hanlon, C., Kebede, E., Medhin, G., & Fekadu, A. (2016). Antenatal depressive symptoms and maternal health care utilisation : a population-based study of pregnant women in Ethiopia. *BMC Pregnancy and Childbirth*, 1–11. https://doi.org/10.1186/s12884-016-1099-1.

Bodnar, L. M., & Wisner, K. L. (2015). Nutrition and Depression: Implications for Improving Mental Health Among Childbearing-Aged Women; NIH Public Access, *58*(9), 679–685. https://doi.org/10.1016/j.biopsych.2005.05.009.Nutrition.

Bourre, J. M. (2005). Dietary omega-3 Fatty acids and psychiatry: mood, behaviour, stress, depression, dementia and aging. *The Journal of Nutrition, Health & Aging*, *9*(1), 31–38.

Bredström, A. (2019). Culture and Context in Mental Health Diagnosing: Scrutinizing the DSM-5 Revision. *Journal of Medical Humanities*, *40*(3), 347–363. https://doi.org/10.1007/s10912-017-9501-1.

Cabout, M., Brouwer, I. A., Visser, M., & Consortium, M. (2017). The MooDFOOD project : Prevention of depression through nutritional strategies, 94–103. https://doi.org/10.1111/nbu.12254.

Cairns, J., (2012). Promoting Mental Health through Healthy Eating and Nutritional Care. *Canadian Mental Health Association Ontario Jan Palmer,Clinical Inpatient Dietitian, Regional Mental Health Care*.

Chaparro, C., Oot, L., Sethuraman, K., & Vietnam Timor Leste, B. (2014). Overview of the Nutrition Situation in Seven Countries in Southeast Asia. *Washington, DC: FHI 360/FANTA*.

Chowdhary, N., Sikander, S., Atif, N., Singh, N., Ahmad, I., Fuhr, D. C., … Patel, V. (2014). The content and delivery of psychological interventions for perinatal depression by non-specialist health workers in low and middle income countries: A systematic review. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *28*(1), 113–133. https://doi.org/10.1016/j.bpobgyn.2013.08.013.

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of Postnatal Depression: Development of the 10-item Edinburgh Postnatal Depression scale. *British Journal of Psychiatry*, *150*(JUNE), 782–786. https://doi.org/10.1192/bjp.150.6.782.

Dadhich, J. P., & Faridi, M. M. A. (2013). Maternal and child nutrition. *Lancet*, *382*(9904), 1549. https://doi.org/10.1016/s0140-6736(13)62316-8.

Dadi, A. F., Miller, E. R., Bisetegn, T. A., & Mwanri, L. (2020). Global burden of antenatal depression and its association with adverse birth outcomes: An umbrella review. *BMC Public Health*, *20*(1). https://doi.org/10.1186/s12889-020-8293-9.

Dadi, A. F., Wolde, H. F., Baraki, A. G., & Akalu, T. Y. (2020). Epidemiology of antenatal depression in Africa: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *20*(1), 1–13. https://doi.org/10.1186/s12884-020-02929-5.

Dennis, C. L., Falah-Hassani, K., & Shiri, R. (2017). Prevalence of antenatal and postnatal anxiety: Systematic review and meta-analysis. *British Journal of Psychiatry*, *210*(5), 315–323. https://doi.org/10.1192/bjp.bp.116.187179.

Dennis, C., & McQueen, K. (2009). The relationship between infant-feeding outcomes and postpartum depression: a qualitative systematic review. *Pediatrics*, *123*(4), e736-51. https://doi.org/10.1542/peds.2008-1629.

Desyibelew, H. D., & Dadi, A. F. (2019). Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis. *PLoS ONE*, *14*(9), 1–19. https://doi.org/10.1371/journal.pone.0221712.

Diddana, T. Z. (2019). Factors associated with dietary practice and nutritional status of pregnant women in Dessie town, northeastern Ethiopia: A community-based cross-sectional study. *BMC Pregnancy and Childbirth*, *19*(1), 1–10. https://doi.org/10.1186/s12884-019-2649-0.

Diggle, P. (2013). *Analysis of longitudinal data*. (P. Diggle, P. J. Heagerty, K.-Y. Liang, & S. L. Zeger, Eds.) (2. ed., 1.). Oxford: Oxford University Press.

DSM-IV. (1994). *DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS* (Fourth Edi). Washington, DC: American Psychiatric Association.

Duko, B., Ayano, G., & Bedaso, A. (2019). Depression among pregnant women and associated factors in Hawassa city , Ethiopia : an institution-based cross-sectional study, *214*, 1–6.

Field, T. (2011). Postpartum Depression Effects on Early Interactions, Parenting, and Safety Practices: A Review, *33*(1), 1–9. https://doi.org/10.1016/j.infbeh.2009.10.005.

Fisher, J., de Mello, M. C., Patel, V., Rahman, A., Tran, T., Holton, S., & Holmesf, W. (2012). Prevalence and determinants of common perinatal mental disorders in women in low-and lower-middle-income countries: A systematic review. *Bulletin of the World Health Organization*, *90*(2), 139–149. https://doi.org/10.2471/BLT.11.091850.

Ford, E., Lee, S., Shakespeare, J., & Ayers, S. (2017). Diagnosis and management of perinatal depression and anxiety in general practice: a meta-synthesis of qualitative studies. *British Journal of General Practice*, *67*(661), e538–e546. https://doi.org/10.3399/bjgp17X691889.

Ford, T., Downey, L., Simpson, T., McPhee, G., Oliver, C., & Stough, C. (2018). The Effect of a High-Dose Vitamin B Multivitamin Supplement on the Relationship between Brain Metabolism and Blood Biomarkers of Oxidative Stress: A Randomized Control Trial. *Nutrients*, *10*(12), 1860. https://doi.org/10.3390/nu10121860.

Fowles, E. R., Stang, J., Bryant, M., & Kim, S. (2012). Stress, Depression, Social Support, and Eating Habits Reduce Diet Quality in the First Trimester in Low-Income Women: A Pilot Study. *Journal of the Academy of Nutrition and Dietetics*, *112*(10), 1619–1625. https://doi.org/10.1016/j.jand.2012.07.002.

Francis, H. M., Stevenson, R. J., Chambers, J. R., Gupta, D., Newey, B., & Lim, C. K. (2019). A brief diet intervention can reduce symptoms of depression in young adults – A randomised controlled trial. *PLOS ONE*, *14*(10), e0222768. https://doi.org/10.1371/journal.pone.0222768.

Gelaye, B., Rondon, M. B., Araya, R., & Williams, M. A. (2016). Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. *The Lancet Psychiatry*, *3*(10), 973–982. https://doi.org/10.1016/S2215-0366(16)30284-X.

Gernand, A. D., Schulze, K. J., Stewart, C. P., West, K. P., & Christian, P. (2016). Micronutrient deficiencies in pregnancy worldwide: health effects and prevention. *Nature Reviews Endocrinology*, *12*(5), 274–289. https://doi.org/10.1038/nrendo.2016.37.

Gibson, R. S. (2014). Enhancing the performance of food-based strategies to improve micronutrient status and associated health outcomes in young children from poor-resource households in low-income countries: challenges and solutions. In *Improving diets and nutrition: food-based approaches* (pp. 19–31). Wallingford: CABI. https://doi.org/10.1079/9781780642994.0019.

Gómez-pinilla, F. (2010). Brain foods : the effects of nutrients on brain function, *9*(7), 568–578. https://doi.org/10.1038/nrn2421.Brain.

Govender, D., Naidoo, S., & Taylor, M. (2020). Antenatal and Postpartum Depression: Prevalence and Associated Risk Factors among Adolescents' in KwaZulu-Natal, South Africa. *Depression Research and Treatment*, *2020*, 1–12. https://doi.org/10.1155/2020/5364521.

Guo, N., Bindt, C., Te Bonle, M., Appiah-Poku, J., Hinz, R., Barthel, D., … Tannich, E. (2013). Association of Antepartum and Postpartum Depression in Ghanaian and Ivorian Women With Febrile Illness in Their Offspring: A Prospective Birth Cohort Study. *American Journal of Epidemiology*, *178*(9), 1394–1402. https://doi.org/10.1093/aje/kwt142.

Hamulka, J., Wadolowska, L., Hoffmann, M., Kowalkowska, J., & Gutkowska, K. (2018). Effect of an education program on nutrition knowledge, attitudes toward nutrition, diet quality, lifestyle, and body composition in polish teenagers. The ABC of healthy eating project: Design, protocol, and methodology. *Nutrients*, *10*(10). https://doi.org/10.3390/nu10101439.

Hanlon, C. (2013). Maternal depression in low- and middle-income countries, (November 2012), 4–5. https://doi.org/10.1093/inthealth/ihs003.

Hasselmann, M. H., Werneck, G. L., & Silva, C. V. C. da. (2008). Symptoms of postpartum depression and early interruption of exclusive breastfeeding in the first two months of life. *Cadernos de Saúde Pública*, *24*(suppl 2), s341–s352. https://doi.org/10.1590/S0102-311X2008001400019.

Hatton, D. C., Harrison-Hohner, J., Coste, S., Dorato, V., Curet, L. B., & McCarron, D. A. (2005). Symptoms of postpartum depression and breastfeeding. *Journal of Human Lactation : Official Journal of International Lactation Consultant Association*, *21*(4), 444–449; quiz 450–454. https://doi.org/10.1177/0890334405280947.

Jacka, F N, Itsiopoulos, C., Parletta, N., Akbaraly, T. N., Opie, R. S., Itsiopoulos, C., & Parletta, N. (2017). Dietary recommendations for the prevention of depression Dietary recommendations for the prevention of depression, *8305*(August). https://doi.org/10.1179/1476830515Y.0000000043.

Jacka, Felice N., Kremer, P. J., Leslie, E. R., Berk, M., Patton, G. C., Toumbourou, J. W., & Williams, J. W. (2010). Associations Between Diet Quality and Depressed Mood in Adolescents: Results from the Australian Healthy Neighbourhoods Study. *Australian & New Zealand Journal of Psychiatry*, *44*(5), 435–442. https://doi.org/10.3109/00048670903571598.

Jacka, Felice N, O 'neil, A., Opie, R., Itsiopoulos, C., Cotton, S., Mohebbi, M., Berk, M. (2017). A randomised controlled trial of dietary improvement for adults with major depression (the "SMILES" trial). https://doi.org/10.1186/s12916-017-0791-y.

Jans, L. A. W., Giltay, E. J., & Willem Van Der Does, A. J. (2010). The efficacy of n-3 fatty acids DHA and EPA (fish oil) for perinatal depression. *British Journal of Nutrition*, *104*(11), 1577–1585. https://doi.org/10.1017/S0007114510004125.

Jones & Bartlett. (2003). Health Belief Model (Chapter Fo). Jones and Bartlett Publishers.

Joshi, D., Shrestha, S., & Shrestha, N. (2019). Understanding the antepartum depressive symptoms and its risk factors among the pregnant women visiting public health facilities of Nepal. *PLOS ONE*, *14*(4), e0214992. https://doi.org/10.1371/journal.pone.0214992.

Kaur Jaswinder, B. M. G. . (2014). Role of dietary factors in psychiatry. *Delhi Psychiatry Journal Vol 1 No 2*.

Kennedy, D. O. (2016). B vitamins and the brain: Mechanisms, dose and efficacy—A review. *Nutrients*, *8*(2). https://doi.org/10.3390/nu8020068

Kenya Ministry of Health/WHO/UNICEF. Maternal Infant and Young Child Nutrition; Policy guidelines (2013). Kenya.

Kimani-Murage, E. W., Muthuri, S. K., Oti, S. O., Mutua, M. K., van de Vijver, S., & Kyobutungi, C. (2015). Evidence of a Double Burden of Malnutrition in Urban Poor Settings in Nairobi, Kenya. *PLOS ONE*, *10*(6), e0129943. https://doi.org/10.1371/journal.pone.0129943

Lai, J. S., Hiles, S., Bisquera, A., Hure, A. J., McEvoy, M., & Attia, J. (2014). A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. *The American Journal of Clinical Nutrition*, *99*(1), 181–197. https://doi.org/10.3945/ajcn.113.069880

Larson, L. M., & Yousafzai, A. K. (2017). Review Article A meta-analysis of nutrition interventions on mental development of children under-two in low- and middle-income countries, 1–30. https://doi.org/10.1111/mcn.12229

Lartey, A. (2018). Maternal and child nutrition in Sub-Saharan Africa : challenges and interventions, (2008), 105–108. https://doi.org/10.1017/S0029665108006083.

Leo, J., & Lacasse, J. R. (2008). The Media and the Chemical Imbalance Theory of Depression. *Society*, *45*(1), 35–45. https://doi.org/10.1007/s12115-007-9047-3.

Leung, B. M. Y., & Kaplan, B. J. (2009a). Perinatal Depression: Prevalence, Risks, and the Nutrition Link-A Review of the Literature. *Journal of the American Dietetic Association*, *109*(9), 1566–1575. https://doi.org/10.1016/j.jada.2009.06.368.

Leung, B. M. Y., Kaplan, B. J., Field, C. J., Tough, S., Eliasziw, M., Gomez, M. F., … Singhal, N. (2013). Prenatal micronutrient supplementation and postpartum depressive symptoms in a pregnancy cohort. *BMC Pregnancy and Childbirth*, *13*. https://doi.org/10.1186/1471-2393-13-2.

Lim, S. Y., Kim, E. J., Kim, A., Lee, H. J., Choi, H. J., & Yang, S. J. (2016). Nutritional Factors Affecting Mental Health. *Clinical Nutrition Research*, *5*(3), 143. https://doi.org/10.7762/cnr.2016.5.3.143.

Lindsay, K. L., Gibney, E. R., & Mcauliffe, F. M. (2012). Maternal nutrition among women from Sub-Saharan Africa, with a focus on Nigeria, and potential implications for pregnancy outcomes among immigrant populations in developed countries. *Journal of Human Nutrition and Dietetics*, *25*(6), 534–546. https://doi.org/10.1111/j.1365-277X.2012.01253.x.

Lindsay, Karen L., Buss, C., Wadhwa, P. D., & Entringer, S. (2017). The Interplay between Maternal Nutrition and Stress during Pregnancy: Issues and Considerations. *Annals of Nutrition and Metabolism*, *70*(3), 191–200. https://doi.org/10.1159/000457136.

Linnet Ongeri, M. K. (2015). Translation of EPDS Questionnaire into iswahili: Understanding the Cross-Cultural and Translation Issues in Mental Health Research. *Journal of Pregnancy and Child Health*, *02*(01), 1–10. https://doi.org/10.4172/2376-127X.1000134.

Liu, J., Zhao, S. R., & Reyes, T. (2015). Neurological and Epigenetic Implications of Nutritional Deficiencies on Psychopathology : Conceptualization and Review of Evidence, 18129–18148. https://doi.org/10.3390/ijms160818129.

Lodebo, M., Birhanu, D., Abdu, S., & Yohannes, T. (2020). Magnitude of Antenatal Depression and Associated Factors among Pregnant Women in West Badewacho Woreda, Hadiyya Zone, South Ethiopia: Community Based Cross Sectional Study. *Depression Research and Treatment*, *2020*. https://doi.org/10.1155/2020/2950536.

Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. (2000). Molecular Cell Biology. 4th edition: W. H. Freeman; 2000. Section 21.4, Neurotransmitters, Synapses, and Impulse Transmission. *New York*.

Louise M Howard, Peter Piot, Alan Stein. (2018). No health without "mental health." *Journal of Public Health (United Kingdom)*, *40*(2), 444. https://doi.org/10.1093/pubmed/fdx182.

Lu, C., Black, M. M., & Richter, L. M. (2016). Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level. *The Lancet Global Health*, *4*(12), e916–e922. https://doi.org/10.1016/S2214-109X(16)30266-2.

Lukose, A., Ramthal, A., Thomas, T., Bosch, R., Kurpad, A. V, Duggan, C., & Srinivasan, K. (2014). Nutritional Factors Associated with Antenatal Depressive Symptoms in the Early Stage of Pregnancy Among Urban South Indian Women, 161–170. https://doi.org/10.1007/s10995-013-1249-2.

Madeghe, B. A., Kimani, V. N., Vander Stoep, A., Nicodimos, S., & Kumar, M. (2016a). Postpartum depression and infant feeding practices in a low income urban settlement in Nairobi-Kenya. *BMC Research Notes*, *9*(1), 506. https://doi.org/10.1186/s13104-016-2307-9.

Madlala, S. S., & Kassier, S. M. (2018). Antenatal and postpartum depression: Effects on infant and young child health and feeding practices. *South African Journal of Clinical Nutrition*, *31*(1), 1–7. https://doi.org/10.1080/16070658.2017.1333753.

Masuku, S. K. S., & Lan, S. J. J. (2014). Nutritional knowledge, attitude, and practices among pregnant and lactating women living with HIV in the manzini region of Swaziland. *Journal of Health, Population and Nutrition*, *32*(2), 261–269.

Mediterranean Food Alliance, & Oldways Preservation Trust. (2012). Rate Your Med Diet Score.

Ministry of Health. (2017). *National Guidelines for Healthy Diets and Physical Activity*. Nairobi.

Mochache, K., Mathai, M., Gachuno, O., Vander Stoep, A., & Kumar, M. (2018). Depression during pregnancy and preterm delivery: a prospective cohort study among women attending antenatal clinic at Pumwani Maternity Hospital. *Annals of General Psychiatry*, *17*(1), 31. https://doi.org/10.1186/s12991-018-0202-6.

Naem, N. E., El-Sayed, N. M., Nossier, S. A., & Abu Zeid, A. A. (2014). Zinc status and dietary intake of pregnant women, Alexandria, Egypt. *Journal of the Egyptian Public Health Association*, *89*(1), 35–41. https://doi.org/10.1097/01.EPX.0000443987.44261.9b.

Naghashpour, M., Shakerinejad, G., & Lourizadeh, M. R. (2014). Nutrition Education Based on Health Belief Model Improves Dietary Calcium Intake among Female Students of Junior High Schools, *32*(3), 420–429.

Nana, A., & Zema, T. (2018). Dietary practices and associated factors during pregnancy in northwestern Ethiopia, 1–8.

Napier, C., Warriner, K., Sibiya, M. N., & Reddy, P. (2019). Nutritional status and dietary diversity of pregnant women in rural KwaZulu-Natal, South Africa. *Health SA = SA Gesondheid*, *24*, 1114. https://doi.org/10.4102/hsag.v24i0.1114.

Nathanson, R., Hill, B., Skouteris, H., & Bailey, C. (2018). Antenatal diet and postpartum depressive symptoms: A prospective study. *Midwifery*, *62*, 69–76. https://doi.org/10.1016/j.midw.2018.03.015.

National Nutrition Action Plan. (n.d.). *Republic of Kenya, Ministry of Public health and Sanitation* (Vol. 1). Kenya.

Neggers, Y. (2016). Epidemiology of Malnutrition:Maternal and Child Malnutrition. *Journal of Gynecology & Neonatal Biology*, *2*(2), 1–5. https://doi.org/10.15436/2380-5595.16.1104.

O'Neil Adrienne, Itsiopoulos, C., Helen, S., S, O. R., Skye, M., Briony, H., & N, J. F. (2014). Preventing mental health problems in offspring by targeting dietary intake of pregnant women, 1–7.

Ogbo, F. A., Eastwood, J., Hendry, A., Jalaludin, B., Agho, K. E., Barnett, B., & Page, A. (2018). Determinants of antenatal depression and postnatal depression in Australia, 1–11. https://doi.org/10.1186/s12888-018-1598-x.

Oliveira, G. De, Cianelli, R., Gattamorta, K., Kowalski, N., & Peragallo, N. (2017). Social Determinants of Depression Among Hispanic Women, *23*(1), 28–36. https://doi.org/10.1177/1078390316669230.Social.

Opie, R. S., Neil, A. O., Itsiopoulos, C., & Jacka, F. N. (2017). Review Article The impact of whole-of-diet interventions on depression and anxiety : a systematic review of randomised controlled trials, *18*(11), 2074–2093. https://doi.org/10.1017/S1368980014002614.

Osok, J., Kigamwa, P., Huang, K. Y., Grote, N., & Kumar, M. (2018). Adversities and mental health needs of pregnant adolescents in Kenya: Identifying interpersonal, practical, and cultural barriers to care. *BMC Women's Health*, *18*(1), 1–18. https://doi.org/10.1186/s12905-018-0581-5.

Osok, J., Kigamwa, P., Stoep, A. Vander, Huang, K. Y., & Kumar, M. (2018). Depression and its psychosocial risk factors in pregnant Kenyan adolescents: A cross-sectional study in a community health Centre of Nairobi. *BMC Psychiatry*, *18*(1), 1–10. https://doi.org/10.1186/s12888-018-1706-y.

Paskulin, T. A., Drehmer, M., Olinto, M. T., Hoffmann, J. F., Pinheiro, P., Schmidt, M. I., & Nunes, M. A. (2017). Association between dietary patterns and mental disorders in pregnant women in Southern Brazil, 208–215. https://doi.org/10.1590/1516-4446-2016-2016.

Patel, V., Saxena, S., Lund, C., Thornicroft, G., Baingana, F., Bolton, P., … UnÜtzer, Jü. (2018). The Lancet Commission on global mental health and sustainable development. *The Lancet*, *392*(10157), 1553–1598. https://doi.org/10.1016/S0140-6736(18)31612-X.

Piao, M., Cong, X., Lu, Y., Feng, C., & Ge, P. (2018). The Role of Zinc in Mood Disorders. *Neuropsychiatry*, *07*(04). https://doi.org/10.4172/Neuropsychiatry.1000225.

Pina-Camacho, L., Jensen, S. K., Gaysina, D., & Barker, E. D. (2015). Maternal depression symptoms, unhealthy diet and child emotional-behavioural dysregulation. *Psychological Medicine*, *45*(9), 1851–1860. https://doi.org/10.1017/S0033291714002955.

Poorrezaeian, M., Siassi, F., Milajerdi, A., Qorbani, M., Karimi, J., Sohrabi-Kabi, R., … Sotoudeh, G. (2017). Depression is related to dietary diversity score in women: a cross-sectional study from a developing country. *Annals of General Psychiatry*, *16*(1), 39. https://doi.org/10.1186/s12991-017-0162-2.

Psychiatry, G., Abebe, A., Tesfaw, G., Mulat, H., & Hibdye, G. (2019). Postpartum depression and associated factors among mothers in Bahir Dar Town , Northwest Ethiopia. *Annals of General Psychiatry*, 1–8. https://doi.org/10.1186/s12991-019-0244-4.

Qiao, Y., Wang, J., Li, J., & Wang, J. (2012). Effects of depressive and anxiety symptoms during pregnancy on pregnant, obstetric and neonatal outcomes: A follow-up study. *Journal of Obstetrics and Gynaecology*, *32*(3), 237–240. https://doi.org/10.3109/01443615.2011.647736.

Rahman, A., Fisher, J., Bower, P., Luchters, S., Tran, T., Yasamy, M. T., Waheed, W. (2013). Interventions sur les troubles mentaux périnataux communs des femmes dans les pays à faible et moyen revenus: Une étude systématique et une méta-analyse. *Bulletin of the World Health Organization*, *91*(8), 593–601. https://doi.org/10.2471/BLT.12.109819.

Rahman, A., Patel, V., Maselko, J., & Kirkwood, B. (2008). The neglected ‘ m ’ in MCH programmes – why mental health of mothers is important for child nutrition, *13*(4), 579–583. https://doi.org/10.1111/j.1365-3156.2008.02036.x.

Rashid, A., & Mohd, R. (2017). Poor social support as a risk factor for antenatal depressive symptoms among women attending public antennal clinics in, 1–8. https://doi.org/10.1186/s12978-017-0404-4.

Rechenberg, K., & Humphries, D. (2013). nutritional interventions in depression and Perinatal depression, *86*, 127–137.

Reimers, A., & Ljung, H. (2019). The emerging role of omega-3 fatty acids as a therapeutic option in neuropsychiatric disorders. *Therapeutic Advances in Psychopharmacology*, *9*, 204512531985890. https://doi.org/10.1177/2045125319858901.

Rocha, A. D. S., Teixeira, C. S. S., Coelho, C. G., Alves, F. J. O., & Machado, D. B. (2021). The relationship between nutritional deficiencies and mental health. *Revista Chilena de Nutricion*, *48*(1), 103–108. https://doi.org/10.4067/S0717-75182021000100103.

Saeed, A., Raana, T., Saeed, A. M., & Humayun, A. (2016). Effect of antenatal depression on maternal dietary intake and neonatal outcome : a prospective cohort. *Nutrition Journal*, 1–9. https://doi.org/10.1186/s12937-016-0184-7.

Salam, R., Syed, B., Syed, S., Das, J., Zagre, N., Rayco-Solon, P., & Bhutta, Z. (2015). Maternal nutrition: how is Eastern and Southern Africa faring and what needs to be done? *African Health Sciences*, *15*(2), 532. https://doi.org/10.4314/ahs.v15i2.28.

Salvador Castell, G., Serra-Majem, L., & Ribas-Barba, L. (2015). What and how much do we eat? 24-hour dietary recall method. *Nutricion Hospitalaria*, *31 Suppl 3*, 46–48. https://doi.org/10.3305/nh.2015.31.sup3.8750.

Serbesa, M. L., Iffa, M. T., & Geleto, M. (2019). Factors associated with malnutrition among pregnant women and lactating mothers in Miesso Health Center , Ethiopia, 1–5.

Sheeba, B., Nath, A., Metgud, C. S., Krishna, M., Venkatesh, S., Vindhya, J., … Murthy, S. (2019). Prenatal Depression and Its Associated Risk Factors Among Pregnant Women in Bangalore : A Hospital Based Prevalence Study, *7*(May), 1–9. https://doi.org/10.3389/fpubh.2019.00108.

Shidhaye, P. (2014). Maternal depression: A hidden burden in developing countries. *Annals of Medical and Health Sciences Research*, *4*(4), 463. https://doi.org/10.4103/2141-9248.139268.

Singh, A., Trumpff, C., Genkinger, J., Davis, A., Spann, M., Werner, E., & Monk, C. (2017). Micronutrient dietary intake in Latina pregnant adolescents and its association with level of depression, stress, and social support. *Nutrients*, *9*(11), 1–16. https://doi.org/10.3390/nu9111212.

Sorsdahl, K., Slopen, N., Siefert, K., Seedat, S., Stein, D. J., & Williams, D. R. (2011). Household food insufficiency and mental health in South Africa. *Journal of Epidemiology and Community Health*, *65*(5), 426–431. https://doi.org/10.1136/jech.2009.091462.

Sparling, T. M., Cheng, B., Deeney, M., Santoso, M. V., Pfeiffer, E., Emerson, J. A., … Kadiyala, S. (2021). Global Mental Health and Nutrition: Moving Toward a Convergent Research Agenda. *Frontiers in Public Health*, *9*(October), 1–7. https://doi.org/10.3389/fpubh.2021.722290.

Sparling, T. M., Nesbitt, R. C., Henschke, N., & Gabrysch, S. (2017). Nutrients and perinatal depression: a systematic review. *Journal of Nutritional Science*. https://doi.org/10.1017/jns.2017.58.

Stang, J., & Story, M. (2005). Chapter 5 NUTRITION EDUCATION AND COUNSELING, 55–61.

Stein, A., Pearson, R. M., Goodman, S. H., Rapa, E., Rahman, A., McCallum, M., … Pariante, C. M. (2014). Effects of perinatal mental disorders on the fetus and child. *The Lancet*, *384*(9956), 1800–1819. https://doi.org/10.1016/S0140-6736(14)61277-0.

Stewart, R. C. (2007). Maternal depression and infant growth: a review of recent evidence. *Maternal & Child Nutrition*, *3*(2), 94–107. https://doi.org/10.1111/j.1740-8709.2007.00088.x.

Surkan, P. J., Kennedy, C. E., Hurley, M., & Black, M. M. (2011). Maternal depression and early childhood growth in developing countries : systematic review and meta-analysis, (May), 607–615. https://doi.org/10.2471/BLT.11.088187.

Swaminathan, S., Hemalatha, R., Pandey, A., Kassebaum, N. J., Laxmaiah, A., Longvah, T., … Dandona, L. (2019). The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. *The Lancet Child and Adolescent Health*, *3*(12), 855–870. https://doi.org/10.1016/S2352-4642(19)30273-1.

Tefera, T. B., Erena, A. N., Kuti, K. A., & Hussen, M. A. (2015). Perinatal depression and associated factors among reproductive aged group women at Goba and Robe Town of Bale Zone , Oromia Region , South East Ethiopia. ???, 1–9. https://doi.org/10.1186/s40748-015-0013-6.

Tenaw, Z., Arega, M., & Tachbele, E. (2018). Nutritional knowledge , attitude and practices among pregnant women who attend antenatal care at public hospitals of Addis Ababa , Ethiopia, *10*(July), 81–89. https://doi.org/10.5897/IJNM2017.0289.

Teo, C., Chia, A.-R., Colega, M., Chen, L.-W., Fok, D., Pang, W., … Chong, M. (2018). Prospective Associations of Maternal Dietary Patterns and Postpartum Mental Health in a Multi-Ethnic Asian Cohort: The Growing up in Singapore towards Healthy Outcomes (GUSTO) Study. *Nutrients*, *10*(3), 299. https://doi.org/10.3390/nu10030299.

Tesfaye, M., Hanlon, C., Wondimagegn, D., & Alem, A. (2010). Detecting postnatal common mental disorders in Addis Ababa, Ethiopia: Validation of the Edinburgh Postnatal Depression Scale and Kessler Scales. *Journal of Affective Disorders*, *122*(1–2), 102–108. https://doi.org/10.1016/j.jad.2009.06.020.

Tilahun, B., Mossie, T. B., Sibhatu, A. K., Dargie, A., & Ayele, A. D. (2017). Prevalence of Antenatal Depressive Symptoms and Associated Factors among Pregnant Women in Maichew , North Ethiopia : An Institution Based Study.

Tuncalp, Ö., Rogers, L. M., Lawrie, T. A., Barreix, M., Peña-Rosas, J. P., Bucagu, M., … Oladapo, O. T. (2020). WHO recommendations on antenatal nutrition: an update on multiple micronutrient supplements. *BMJ Global Health*, *5*(7), e003375. https://doi.org/10.1136/bmjgh-2020-003375.

UNICEF/WHO/WORLD. (2019). Levels and trends of malnutrition. Joint Malnutrition Estimates. *Asia-Pacific Population Journal*, 1–16. https://doi.org/10.18356/6ef1e09a-en.

USDA: Service, F. and N. (2010). Nutrition Education and Promotion : The Role of FNS in Helping Low-Income Families Make Healthier Eating and Lifestyle Choices A Report to Congress Nutrition Education and Promotion : The Role of FNS in Helping Low-income Families Make Healthier Eating an, (March).

Vanobberghen, F., Weiss, H. A., Fuhr, D. C., Sikander, S., Afonso, E., Ahmad, I., … Rahman, A. (2020). Effectiveness of the Thinking Healthy Programme for perinatal depression delivered through peers: Pooled analysis of two randomized controlled trials in India and Pakistan. *Journal of Affective Disorders*, *265*(November 2019), 660–668. https://doi.org/10.1016/j.jad.2019.11.110.

Vargas, C. De, Coll, N., Freitas, M., Garcia, D., Netsi, E., César, F., … Stein, A. (2017). Antenatal depressive symptoms among pregnant women : Evidence from a Southern Brazilian population-based cohort study. *Journal of Affective Disorders*, *209*(September 2016), 140–146. https://doi.org/10.1016/j.jad.2016.11.031.

Ververs, M. tesse, Antierens, A., Sackl, A., Staderini, N., & Captier, V. (2013). Which Anthropometric Indicators Identify a Pregnant Woman as Acutely Malnourished and Predict Adverse Birth Outcomes in the Humanitarian Context? *PLoS Currents*, (JUNE), 1–15. https://doi.org/10.1371/currents.dis.54a8b618c1bc031ea140e3f2934599c8.

WHO. (1993). The ICD-10 Classification of Mental and Behavioural Disorders, 1–267.

WHO. (2008). Maternal mental health and child health and development in low and middle income countries : report of the meeting, Geneva, Switzerland, 30 January - 1 February, 2008. World Health Organization.

WHO. (2012). DEPRESSION: A Global Public Health Concern Developed (pp. 6–8).

WHO. (2015). Thinking healthy: A manual for psychosocial management of perinatal depression. Community Health Workers Version. *World Health Organization*, *1*, 180.

WHO. (2017). Depression and Other Common Mental Disorders Global Health Estimates, *CC BY-NC-S*.

WHO, 1993. (n.d.). The ICD-10 Classification of Mental and Behavioural Disorders, 1–267.

Woldetsadik, A. M., Ayele, A. N., Roba, A. E., & Haile, G. F. (2019). Prevalence of common mental disorder and associated factors among pregnant women in South-East Ethiopia , 2017 : a community based cross-sectional study, 1–8.

Women & Delivery. (2012). Maternal Depression : The potential role of nutrition in prevention and treatment. *British Medical Bulletin*, *101*(Technical brief), 1–16.

World Health Organization. (2008). *Maternal mental health and child health and development in low and middle income countries: Report of the meeting held in Geneva, Switzerland*. *World Health Organization*. https://doi.org/10.1111/j.1365-3156.2008.02198.x.

World Health Organization. (2015). Thinking healthy: A manual for psychosocial management of perinatal depression. *World Health Organization*, *1*, 180.

World Health Organization. (2012). DEPRESSION: A Global Public Health Concern Developed (pp. 6–8).

World Health Organization. (2015). Thinking Healthy: A manual for psychosocial management of perinatal depression. Community Health Workers Version..

Yator, O., Mathai, M., Vander Stoep, A., Rao, D., & Kumar, M. (2016). Risk factors for postpartum depression in women living with HIV attending prevention of mother-to-child transmission clinic at Kenyatta National Hospital, Nairobi. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, *28*(7), 884–889. https://doi.org/10.1080/09540121.2016.1160026.

Young, M. F., Oaks, B. M., Tandon, S., Martorell, R., Dewey, K. G., & Wendt, A. S. (2019). Maternal hemoglobin concentrations across pregnancy and maternal and child health: a systematic review and meta-analysis. *Annals of the New York Academy of Sciences*, *1450*(1), 47–68. https://doi.org/10.1111/nyas.14093.

Young, S. N. (2007). Folate and depression-a neglected problem. *Journal of Psychiatry & Neuroscience : JPN*, *32*(2), 80–82.

Zeng, Y., Cui, Y., & Li, J. (2015). Prevalence and predictors of antenatal depressive symptoms among Chinese women in their third trimester : a cross-sectional survey, 1–7. https://doi.org/10.1186/s12888-015-0452-7.

APPENDICES

Appendix 1: Consent Explanation Form

Study title: Efficacy of dietary intervention and psychosocial management for depression care among perinatal women in urban low- income Nairobi Kenya

INVESTIGATOR: Beatrice Madeghe
Doctoral student
Department of Food Science and Nutrition
University of Nairobi

My name is Beatrice Madeghe, PhD Student in the field of applied human nutrition, Department of Food Science and Nutrition Technology; University of Nairobi, Kabete Campus. I wish to conduct a research study; efficacy of dietary intervention and psychosocial management for depression care among pregnant women in urban low-income Nairobi Kenya. I would like to invite you to participate in a study that intends to improve the health of the mother and their infant's health through nutritional counseling and psychosocial management. It is very important that you understand the following general principles which apply to all participants in our study that;

- Participation is entirely voluntary
- Refusal to participate will involve no penalty of benefits to which you are entitled at this clinic.
- After you read/ listen to the explanation, please feel free to ask any questions that will allow you to clearly understand the nature of the study.
- All information obtained from this study will remain confidential and your privacy will be upheld. Identification will be by number only; no names will be used in this study or in its future publications.

Background Information

Depression is a common mental health disorder and is estimated to affect 350 million people worldwide(World Health Organization (WHO, 2012). Maternal depression is the most common complication of childbearing affecting approximately 10-15% of women and as such represents a considerable public health problem affecting women and their families. Maternal depression referred as perinatal is characterized by tearfulness, persistent sadness, loss of interest or pleasure in almost all daily activities, feelings of guilt, loss of appetite, and sleep disturbances as well as feelings of being inadequate and unable to cope with the infant, poor concentration and memory, fatigue and irritability.

Purpose of the research

The purpose of this study is to examine the efficacy of dietary intervention and psychosocial intervention in improving women's mental health maternal and physical health among pregnant women in a low-income settlement Nairobi Kenya.

Procedures

In this research, we shall ask you questions regarding your feelings, thoughts about yourself and we will ask about your eating style. We measured your weight and height to see how well you are doing. We will conduct series of thinking health session to help mother make good choices of their food to meet their requirement and how be positive in everything they do daily.

Risks

Follow up sessions can be tiresome. Therefore, we will make sure that the sessions will be enjoyable and funny that mothers look forward to it. A healthy snack will be given.

Benefits

The study is beneficial because women will learn how to follow dietary guideline to meet their nutrition requirements and how to solve their issues arising in their daily life in a thinking health way. Women learned how to change their bad lifestyle to better health living style for themselves and their families.

Compensation

There will be no payment for taking part in this study. But we will give them education and knowledge which will improve their life. A token of 200 will be given to women for every session they attend to buy fruits and vegetable.

For any concerns about this project, you may call Beatrice Madeghe at 0700684027.OR for any questions concerning your rights as a research subject you may contact the secretary of the KNH/UON Ethical and research committee, P.O. Box 20723-0020, Nairobi ,Tel 020726300-9.

Consent form

I……. hereby provide informed consent to take part in this study on the impact of nutrition education, diet, and lifestyle changes in improving maternal depression and physical health of perinatal women and birth outcome in a low-income settlement in Nairobi Kenya. The risks and benefits of participating in this study have fully been explained to me

Name of participant ……sign ……

Interviewer/investigator……sign……

Appendix 1b: Fomu ya Maelezo ya Idhini b

Kiambatisho 1: Fomu ya maelezo ya kukubali kushiriki katika utafiti

Kichwa cha utafiti: Matokeo ya elimu ya lishe bora na ushauri wa kisaikologia kupunguza matatizo ya unyogovu wa uzazi na kuimarishs afya ya kimwili kwa wamama wajawazito.
Mtafiti: Beatrice Madeghe
Mwanafunzi shahada ya uzanilifu
Kitengo cha chakula na lishe: Chuo kikuu cha Nairobi
Jina langu ni Beatrice Madeghe, Mwanafunzi washahada ya uzanilifu katika eneo la lishe ya binadamu, Idara ya Sayansi ya Chakula na teknolojia ya lishe; chuo kikuu cha Nairobi, kambi ya Kabete. Napenda kufanya utafiti wa utafiti; juu ya Matokeo ya elimu ya lishe bora na ushauri wa kisaikologia kupunguza matatizo ya unyogovu wa uzazi na afya ya kimwili kwa wamama wajawazito. Napenda kuwakaribisha kushiriki katika utafiti ambao utaimarisha afya ya mama na afya ya watoto wachanga kupitia ushauri wa afya ya lishe ili mama waweze kupata kiwango kinachihitajika kipindi cha ujauzito. Ni muhimu sana kuelewa kanuni zafuatayo zifuatazo kwa wahusika wote katika utafiti wetu kwamba:-

- Kushiriki ni kikamilifu kwa hiari
- Kukataa kushiriki sihusisha adhabu ya faida ambazo una haki katika kliniki hii.
- Baada ya kusoma / kusikiliza maelezo, tafadhali jisikie kuuliza maswali yoyote ambayo itawawezesha kuelewa vizuri hali ya utafiti.
- Taarifa zote zilizopatikana kutoka kwenye utafiti huu zitaendelea kuwa siri na faragha yako itasimamiwa. Utambulisho utakuwa kwa idadi tu; hakuna majina yatatumika katika utafiti huu au katika machapisho yake ya baadaye.

Utangulizi

Unyogovu ni ugonjwa wa kawaida wa afya ya akili na inakadiriwa kuathiri watu milioni 350 ulimwenguni kote (Shirika la Afya Duniani (WHO, 2012). Unyogovu wa uzazi ni matatizo ya kawaida ya kuzaa yanayoathiri takribani 10-15% ya wanawake na hivyo inawakilisha umma mkubwa shida ya afya inayoathiri wanawake na familia zao. Unyogovu wa uzazi unaojulikana kama perinatal inahusishwa na upotevu, huzuni

huendelea, kupoteza maslahi au furaha katika shughuli zote za kila siku, hisia za hatia, kupoteza hamu ya kula, na usumbufu wa usingizi
pamoja na hisia za kuwa kutosha na kushindwa kukabiliana na mtoto wachanga, ukolezi duni na kumbukumbu, uchovu na kushawishi.

Lengo la utafiti

Lengo la utafiti huu ni kutambua umuhimu wa elimu ya lishe, chakula katika kuboresha unyogovu wa uzazi na kuiarisha afya ya kimwili ya wanawake wajawazito na baadaya kujifungua, afya ya mtoto.

Taratibu

Katika utafiti huu, tutakuuliza maswali kuhusu hisia zako, mawazo juu yako mwenyewe na tutakuuliza kuhusu mtindo wako wa kula. Tutaweza pia kupima uzito wako na urefu ili uone jinsi unavyofanya vizuri. Tutafanya mfululizo wa kikao cha afya kufikiria kusaidia mama kufanya uchaguzi mzuri wa chakula chao ili kukidhi mahitaji yao na jinsi ya kuwa na chanya katika kila kitu cha kufanya kila siku.

Hatari

Kufuatilia vipindi vya masom vinaweza kuwa magumu. Utahakikisha kwamba vipindi vya kujifunza vinakuwa vifupi na vyakufurahishaambavyowakina mama watakuwa wakingojea kwa hamu kuhudhuria.

Faida

Utafiti huo una manufaa kwa mama kwa sababu watajifundisha jinsi ya kufuata mwongozo wa chakula bora ili kukidhi mahitaji yao ya lishe na jinsi ya kutatua matatizo yao yanayotokea katika maisha yao ya kila siku kwa njia ya kufikiri kwamtazamo wa kiafya. Wanawake wataweza kuimarisha afya yao wenyewe na watoto wao na familia kwa ujumla.

Fidia

Hakuna na malipo halisi ya kushiriki katika utafiti huu. Lakini tutawapa elimu na ujuzi

ambao utaboresha maisha yao. Pia tutawapa wamama shilingim mia mbili kwa kila kipindi anachohudhuria kuweza kununua matunda na mboga.

Kwa wasiwasi wowote kuhusu mradi huu, unaweza kupigia Beatrice Madeghe katika 0700684027.OR kwa maswali yoyote kuhusu haki zako kama somo la utafiti unaweza kuwasiliana na katibu wa kamati ya utafiti ilioko Hospitali ya Kenyatta,maadili na ya utafiti, P.O. BOX 20723-0020, Nairobi, Tel 020726300-9.

Fomu ya kibali

Mimi ..... .wapa kutoa ruhusa ya kushiriki katika utafiti huu juu ya athari za elimu ya lishe, mlo na mabadiliko ya mtindo wa maisha katika kuboresha unyogovu wa uzazi na afya ya kimwili ya wanawake wa kujifungua na matokeo ya kuzaliwa katika makazi ya chini ya Nairobi Kenya. Hatari na faida za kushiriki katika somo hili zimeelezewa kikamilifu

Jina la mshiriki ..... ishara .....

Mhojiano / uchunguzi ..... ishara .....

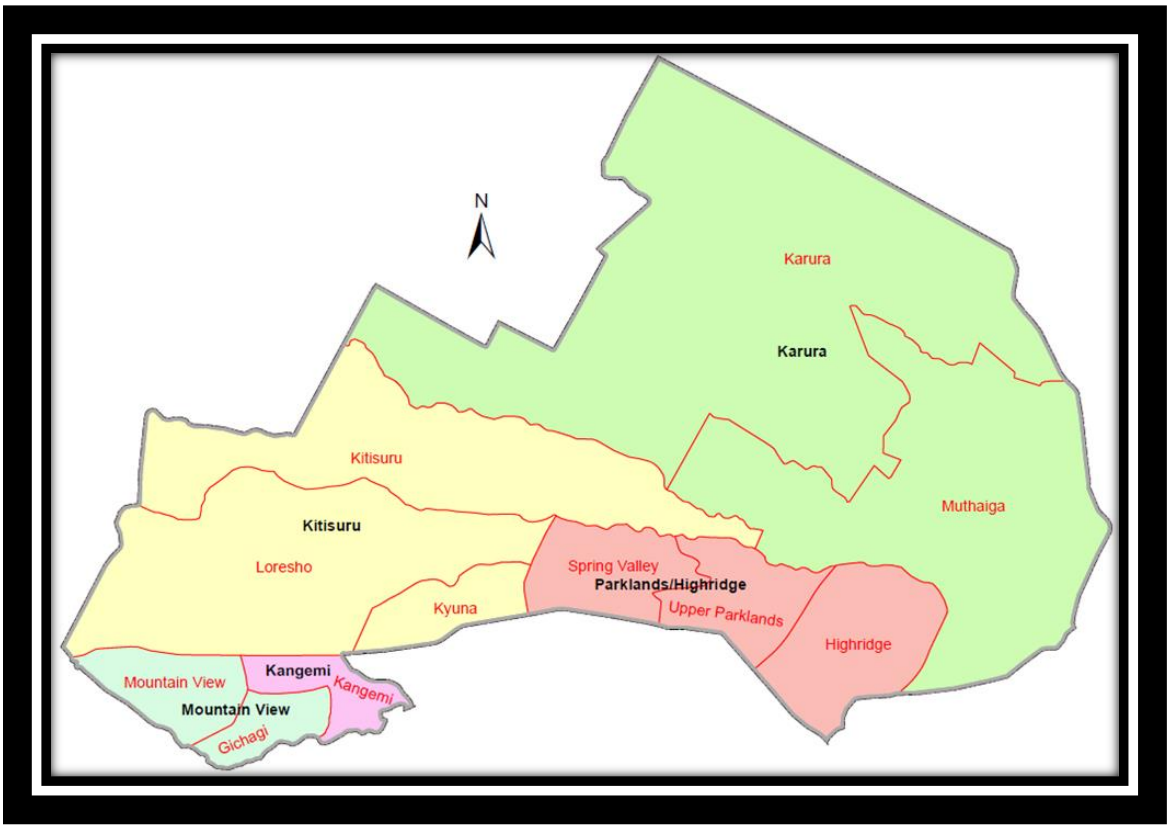
Appendix 2: Additional Method Description

Study Sites

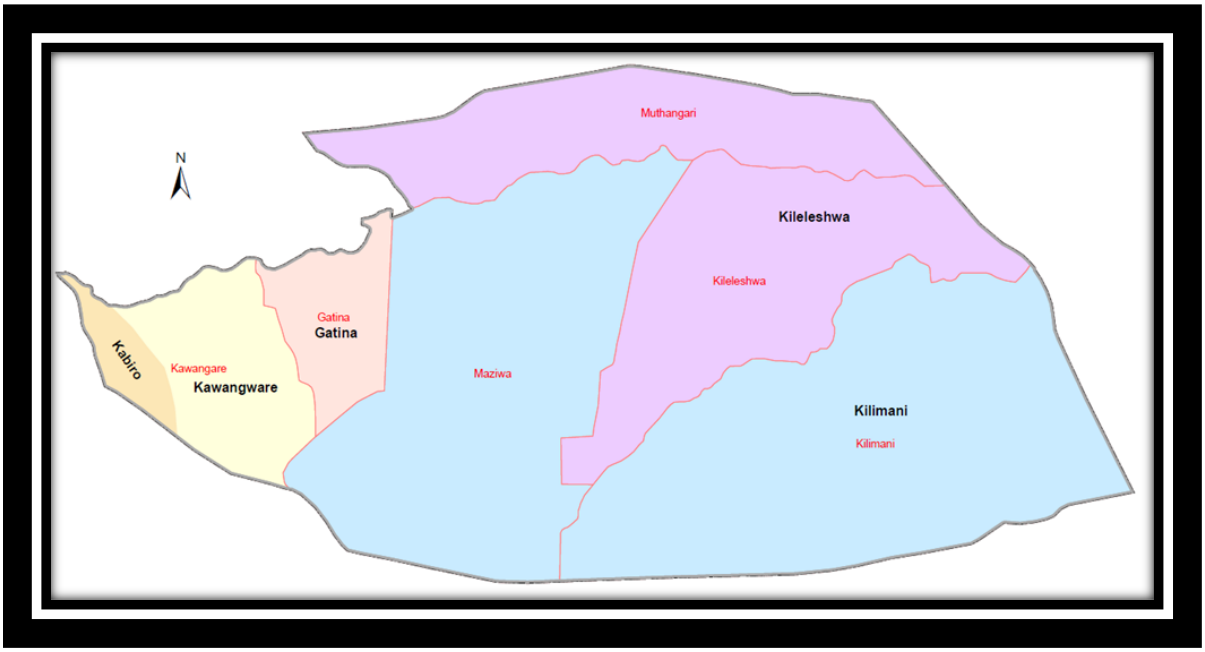
The study took place in two low income settlements; hospital based at Kangemi Health centre and Riruta Health centre – Kawangware (public Health centers). The screening took place at the antenatal clinic in both health centers. The intervention sessions were offered at Kangemi PCEA community hall, and for comparison group sessions were conducted at Dagoreth community hall at Kawangware. The sites Kangemi and Kawangware were chosen purposely because; these health centers receives high volume of pregnant women, who are being seen in the antenatal clinic and the fact that in low income settlement like these, Socioeconomic deprivation indicators such as unemployment, low income and low education have been cited as risk factors for mental health disorders. Kangemi is a slum in Kenya located on the outskirts of the Nairobi city center. It is bordered on the north by the middle-class neighborhoods of Loresho and Kibagare and Westlands on its west. Its southern border connects with Kawangware, another large slum and its eastern border connects to Mountain View. It is on the road connecting Nairobi with Naivasha road. Riruta Health Centre is a Government health center located in Kawangware Sub-location, Kawangware location, Dagoretti Division, Dagoretti Constituency in Nairobi County. (Map appendix 2)

Study population at baseline consisted sample of pregnant women of pregnant 18 Years and older. This group was chosen because nutritional status of pregnant women changes rapidly, and depression disorders may be detected, these women were recruited at the health center, antenatal clinics; it included pregnant women who came for antenatal clinic checkup. Pregnant women who provided informed consent. Pregnant women who were at 12 weeks to 25 weeks pregnancy, excluded were pregnant women whose expected date of delivery was within four weeks after the screening date, pregnant women who appeared to have a disturbed mental state inhibiting correct information collection; pregnant women who required immediate treatment.

Study sites: Map of Kangemi and Kangemi



Study sites: Map of Kawangware



Study Design

This study consists of two study design for baseline study and the intervention study. At baseline, a cross- sectional study design was used to obtain the baseline exposure data. In a cross-sectional design, data is collected from a population at a specific point in time. In this study the purpose of the baseline study was to explore the situational context, the association between the exposure and maternal depression. Collected data was socio-demographic characteristics of pregnant women, screening of maternal depression, assessments of nutrition status, diet intake 24hour recall, brain food essential check list and Nutrition, attitude and practice of pregnant women. These data cover objective one and two. This cross-sectional study employed mixed methods both quantitative and qualitative. For the qualitative, the Focus Group Discussion (FDG) was conducted with selected depressed pregnant women. The purpose of the FDG was to get a deeper understand and experiences of depression among pregnant women.

Study design 2: Intervention study**:** A longitudinal cohort intervention study design was conducted, which involved the cohort of depressed pregnant women who attended antenatal clinic in two public facilities, at Kangemi health center and Riruta health center Kawangware. In a longitudinal study data is collected repeatedly from the same sample over an extended period of time. In this study a cohort of depressed pregnant women were, followed up with an intervention from second /third trimester to fourth months postpartum. Depressed women who had EPDS scores of 10 and above, were asked to enroll in the intervention study, the two-study site were randomized where one site was the intervention group and site two was comparison group. The intervention groups consisted of depressed pregnant women who received dietary intervention and psychosocial management (Thinking healthy - Cognitive Behavioral Therapy). The comparison group involved depressed pregnant women who received enhanced usual care, the general nutrition education, health talks and reading materials. This study adopted the Thinking healthy - Cognitive Behavioral Therapy called psychosocial management in this study. Thinking health intervention has been recommended by WHO Mental Health Gap Action Programme for perinatal depression in low- and middle-income countries. The dietary intervention was basic nutrition education and diet counselling, with focus on brain food essentials. The intervention group received the combined intervention the comparison group received enhanced usual care (see chapter 6). Both groups were followed with the intervention up to fourth month postpartum.

For the intervention study, inclusion criteria were pregnant women 18 Years and older, pregnant women who had a score of 10 and above on the Edinburgh Postnatal Depression Scale, the score which indicated depression of moderate intensity to various severities; pregnant women who were in the 2nd to 3rd trimester after baseline assessments and resided at Kangemi and Kawangware for the next 12 months. Pregnant women who provide informed consent, who spoke Kiswahili or English. Excluded pregnant women who appeared to have a disturbed mental state inhibiting correct information, and women who were not likely to be in the locality in the following 12 months.

Sample Size Determination

Sample size was calculated using Sample size estimation for longitudinal designs with attrition, for comparison of two groups across time consistent difference across time. Number of subjects N in each of two groups was calculated by the formula (Diggle et al., 2002).

$$N = \frac{2(z\alpha + z\beta)2\ (1 + (n-1)\rho)}{n[(\mu 1-\mu 2)/\sigma]2}$$

Where: -

- $\sigma 2$ is the assumed common variance in the two groups
- $\mu 1-\mu 2$ is the difference in means of the two groups
- n is the number of time points
- ρ is the assumed correlation of the repeated measures

That is: -

- $z\alpha = 1.96$ 2-tailed .05 hypothesis test
- $z\beta = .842$ power = .8
- effect size $(\mu 1-\mu 2)/\sigma = .5$
- n = 2 time points
- $\rho = .6$ correlation of repeated measures

$$N = \frac{2(1.96 + .842)2(1 + (2-1) \times .6)}{2\times (.5)2}$$

$$= \frac{(15.7)(1.6)}{(2)\ (.25)}$$

$$= 50.3$$

⇒ Need approximately 50 subjects in each group in total 100 with attrition about 20% were added. To obtain this sample size at baseline 262 pregnant women were screened, 134 pregnant women from Kangemi and 128 from Kawangware.

Sampling Method

Purposive sampling was used to choose Nairobi-Kenya, Kangemi health center and Kawangware- Riruta health center. A convenience sample is a type of non-probability sampling method where the sample is taken from a group of people easy to contact or to reach.

At baseline the consecutive sampling method was used, consecutive sampling is the process of conducting research including all the people who meet the inclusion criteria and are conveniently available, as part of the sample. In this study all pregnant women who come for the antenatal clinic and met the inclusion criteria's, were asked to be screened. Inclusion into the study was done until the required sample size above was achieved for both study sites.

Sampling method for the intervention study, simple random sample or Equal Probability of Selection Method was used to randomize the study sites in order to allocate intervention group and comparison group. Coin toss was used, Kangemi was head and Kawangware was tail. It was agreed that upon flipping a coin, the head would be the intervention and tail comparison. The result of the toss revealed head which was Kangemi. Therefore, Kangemi was intervention group and Kawangware comparison group.

2.8.4 Variables

Independent variables: Include Demographic profile: the Age, Marital status, Education level, family income level, nutrition status, nutritional status, Nutrition knowledge, attitude and practice

Dependent variables: Maternal depression; maternal malnutrition

Study Input: The intervention

2.8.5 Training Procedures and Quality Assurance

The study, started with the Training of the community health workers, they were trained on how to identify depression and offer the thinking health psychosocial management and dietary intervention for perinatal depression to depressed women. The training was delivered by a dietitian and a clinical Psychologist. The dietary intervention followed the Dietary Guidelines based on national healthy living pyramid of Kenya, My Plate for Mom and applied basic nutrition resource toolkit for trainers from the Ministry of Public Health and sanitation- Kenya.

Psychosocial intervention adapted the Thinking Healthy a manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015.The trained community health volunteers were on the ground to mobilize women to come for the intervention sessions and help in the intervention sessions.

Piloting: For quality assurance, the tools were piloted in a hospital at the antenatal clinic away from the study site. The piloting was done in Kibera South at the antenatal Clinic. Research assistants were familiarized with the tools and were trained on how conduct interviews and data collection, the piloting report was shared with the supervisors and there after data collection process started.

Data Collection Procedures

At baseline questionnaires and anthropometric measurements were used; the Socio-demographics questionnaire; 24-hour recall, brain food essential checklist and Nutrition knowledge attitude questionnaire were used. All questionnaires were translated to Kiswahili. The interviews took about 60 to 90 minutes. Moreover, two FGD was conducted one in each site with ten depressed pregnant women to get the understanding and experiences of depression in women's real life. Anthropometrical measurements were used to assess nutritional status of women; Body Mass Index **(**BMI) and Mid Upper Arm Circumference (MUAC) were used as indicators for nutrition status. MUAC is the circumference of the left upper arm and is measured at the mid-point between the tips of the shoulder and elbow. The measurements is taken on the left arm, bent, mid-point

identified, and marked with a pen then a non-stretch measuring tape was applied around on the left arm and recorded to the nearest 0.1 mm measurements were taken twice for accuracy.

MUAC was used as an indicator for nutrition status for pregnant women; BMI was used to determine weight gain among pregnant women. Body Mass Index Is a person's weight in kilograms divided by the square of height in meters; Body Mass Index is known to be a better indicator of maternal nutritional status than is weight alone. Weight and height are useful if women know their pre-pregnant weight, if the woman show-up after 10 weeks gestation, the BMI can still be calculated from measured height and weight and weight gain can still be advised based on best estimate of pre-pregnancy BMI. A Body Mass Index (BMI) lowers than 18.5 kg/m^2 and an arm circumference lower than 23cm were used to define malnutrition. MUAC is a reliable indicator of risk of malnutrition low birth weight (LBW) and <23 cm cut-off have been recommended to enroll pregnant women in nutritional programs (Ververs et al, 2013).

Instruments for Data collections

Constructs	**Domains**	**Measures/Instrument**
Family Socio-demographics	**Demographic profile:** Age, Marital status, Education level, Occupation, Family income,	Structured questionnaire (Researcher design)
Maternal anthropometric measurements (Nutritional status)	Height, weight (BMI) And (MUAC)	**Anthropometric measurements** Weighing scale (electronic) and Wall Mounted Stadiometer Height was measured using standard stadiometer to nearest 0.1 cm wearing light clothing without shoes. Weight was measured on a calibrated weighing scale and documented to nearest 100g.and The Mid Upper Arm Circumference (MUAC)-, was measure around the arm to the nearest 1mm

Dietary assessment and Nutrient intake	Dietary quality and intake Brain food essentials	Maternal dietary intake was measured A 24-hour dietary recall questionnaire, the antenatal women were asked about categories and amount of food and beverage Eaten during the previous 24h, Women were asked for serving, method of preparation and snacks. Food checklist which contains 13 food items in groups. Pregnant women were asked if the consumed the food for the last three days.
Maternal depression	Perinatal depression	Edinburgh Postnatal Depression Scale (EPDS) was used as a screening tool, a score of 10 and above indicated moderate depression and a score more than 13, indicated clinical depression. EPDS is a validated scale with Cronbach alpha 0.87 to screen antenatal and postnatal depression and has been previously used in Kenya. The EPDS is a 10-item questionnaire. Women are asked to answer each question of how they have been feeling in the past fourteen days.
Assessment of neonatal outcomes	**Neonatal outcomes**	After delivery, data on neonatal outcomes was obtained from the mother's and clinic card. Information obtained was birth weight , and child weights was followed at 6weeks g to 14weeks postpartum.
INTRVENTIONS	INTRVENTIONS	
Dietary intervention and psychosocial management	Thinking Healthy. Cognitive behavior therapy and Dietary intervention – diet education and dietary counselling The Thinking health approach was used for this intervention	For psychosocial intervention, The Thinking Healthy A manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015 The dietary intervention follow the Dietary Guidelines based on national healthy living pyramid of Kenya and My Plate for Mom using applied basic nutrition resource toolkit for trainers from the Ministry of Public Health and sanitation- Kenya, and the Thinking Healthy A manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015

Recruitment Procedures

Recruitment at baseline happened at the antenatal clinic at health centers, every antenatal clinic day the principal researcher and three research assistants (two nutritionist), and Psychologist were at the clinic in the health center. Every pregnant woman who comes for antenatal clinic was asked to be screened. The study purposes were explained and the general principles that apply to all participants in the study that; Participation is voluntary. Refusal to participate did not involve any penalty of benefits to which one was entitled in the clinic. After reading / listening to the explanation, the participants were allowed to ask questions to clearly understand the nature of the study. A written informed consent was signed by the respondent, based on willingness to participate before commencing the interviews. Thereafter, screening was done for maternal depression, nutrition status, dietary intake, brain food essentials, and knowledge attitude practice. Contacts of every woman were taken, all pregnant who had EPDS score of 10 an above were asked to participate in the intervention study. For the interventions the intervention sessions were offered at Kangemi PCEA community hall in Kangemi and Dagoreth community hall at Kawangware.

Intervention

The intervention was the psychosocial management (Cognitive Behavior therapy), and the dietary intervention to depressed pregnant women, and examined its efficacy in reducing depression as well as improving the nutrition health. Pregnant women were captured at baseline at (approximately at 12 week - 25 weeks pregnancy) (See chapter six).

Enrollment to the study happened at baseline, between March and April 2019. In this study the start date was the actual date when the first participant was enrolled at baseline. Rolling out of the intervention started in May 2019, when the pregnant women were in second/third trimester pregnancy almost 20 weeks to 33 weeks pregnancy. The study was completed at the end of November 2019.

The intervention was offered by a trained Clinical Psychologist and a dietitian. Trained Community Health Volunteers (CHV's) helped with mobilizing the women to come for

the intervention, and follow-up with intervention in their group of women assigned to them. The intervention followed up the Thinking healthy structure (Reference Thinking Healthy A manual for psychosocial management of perinatal depression WHO generic field-trial version 1.0, 2015). (WHO, 2015)

Psychosocial Management and Dietary Intervention.

The intervention was offered in a group. Depressed pregnant women received 12 sessions organized in 4 modules: which incorporated five nutrition modules: these modules were offered simultaneously with Nutrition modules. Each module incorporated nutrition topics, and sessions were extended. The comparison group received enhanced usual care without psychosocial intervention, and received the same session provided in the same manner (see chapter six).

Table 2.2: Intervention training sessions propose by WHO

MODULES	SESSIONS	IDEAL FREQUENCIES	APPROXIMATE PERIOD
Introductory session	Opening Session	Delivered in 1 or 2 visits	14 – 40 weeks prenatal
Module 1 Preparing for the baby	Sessions 1.1-1.3	Weekly	14 – 40 weeks prenatal
Module 2 The baby‘s arrival	Sessions 2.1-2.2-7	Fortnightly	14 – 40 weeks prenatal
Module 3 Early infancy	Sessions 3.1- 3.3	Monthly	3rd to 6th week postnatal
Module 4 Middle infancy	Sessions 4.1- 4.3	Monthly	2nd to 4th month postnatal

Dietary Intervention

For dietary intervention pregnant women received basic nutrition education and diet counselling offered by a trained dietitian. Diet education was based on the Kenya National Guidelines for Healthy Diets (Ministry of Health, 2017) with focus on brain food essentials(Gómez-pinilla, 2010) (see chapter six).

Data Management and Data Quality Control

Data was collected by questionnaires designed data collection forms by paper and pen. All the questionnaires were stored under lock and key. The filled questionnaires and forms were double-entered into the Statistical Package for Social Sciences (SPSS) version 22, compared for errors and discrepancies and cleaned before analyses are conducted. The final cleaned dataset was kept in SPSS format in preparation for analyses. All entered data was stored in google drive. An exploratory data analysis technique was used to uncover the distribution structure of the study variables as well as identify outliers using descriptive statistics**.** The data was tested for normality and there were no outliers.

Statistical Analyses plan - Demographic data including, Age, Marital status, Education level, Occupation, Family income, were reported for each subject. A comparison between depressed pregnant women, and the non-depressed pregnant women was conducted to assess the degree to of comparability at baseline. Comparison was also conducted between intervention group and comparison group to assess the degree to of comparability. Between-group comparisons were done by intention-to-treat. Intention-to-treat analysis is a method for analyzing results in a prospective randomized study where all participants who are randomized are included in the statistical analysis and analyzed according to the group they were originally assigned, regardless of what treatment if any they received. Descriptive statistics for the primary outcome measure (EPDS score) as a continuous variable and as a categorical (proportion of patients in the clinical range of depression (defined by score ranges) and normal (defined by score ranges) variable was obtained as well for secondary outcomes. Distribution of different variables (i.e. both the primary and secondary outcomes) were compared between and within groups. Between groups comparisons was done at every time point whereas within groups comparisons was performed between baseline and specific follow-ups, separate for every study group using one-way ANOVA.

Ethical Considerations

Ethical approval was obtained from The Kenyatta National Hospital / University of Nairobi Ethical and Research Committee (KNH/UoN-ERC), License No: NACOSTI/P/19/1489. Permission to conduct the study was obtained from Nairobi City County and facility in-charge of the health centers. Women were explained about the study purpose and the general principles that apply to all participants in the study. A written informed consent was be signed by the respondent, based on willingness to participate in the study, before the interviews. The information collected was kept confidentially and privacy was upheld, serial numbers were used instead of names. All information obtained from participants was kept under lock and key. Information in computers was stored in password protected locations to assure confidentiality. In the facility, the investigators did not interfere with routine patient management.

Risks to subjects: - The study involved discussion of sensitive talks about how the women felt in the past two weeks, which could be uncomfortable. We used friendly language and avoided use of language that discriminate the participant, we avoided racist language or an ethnic or other minority groups. We were careful and sensitive to what participants prefer. The time length of the interviews was about 1 hour and intervention and follow up interviews was bit consuming a lot of time. Therefore, we tried to make intervention comfortable as possible by making it interactive so that mothers enjoy it. Patients found to have severe mental health diagnosis and severe nutrition need will be referred to advance services.

Appendix 3: Demographic Questionnaire for Pregnant Women

1. Name of the Health centre: _____	2. Questionnaire number: _____
3. Interviewer number	
4. Month/Day/ Year of Interview: _____/_____/_____; 4a. Interview Language: _____	
H5. Your gender: ☐1) Female	6: Your Age: _____
7. What is your Marital status 0= Single (Single/ Widow/or Divorced) 1= Married; 2= Not married but live with a partner 3 =Other (Specify: _____)	
8: Are you employed? ☐0) No ☐1) Yes	
9. What is your highest level of education: 0= None 1= Primary 2= Secondary 3= Higher 4= Non-Standard Curriculum	
10. Total number of household members: _____	
11. Total number of children under 18 years old in household: _____	
12. What is your religion?	0= No Religion 1=Muslim 2= Christian 3= Catholic 4= Other religion (Specify) _____
13. What language can you speak well?	1=Kiswahili 2=English 3= Other Language (Specify)_____
14: Study child due date: _____/_____/_____ (day/month/Year) Or Estimated months of pregnant..... _____ months Child birth weight----------	15. Monthly Family income <Ksh 5000 ☐ Ksh 5000-10,000 ☐ Ksh 10,0001-15,000 ☐ .>Ksh 15,000 ☐

Appendix 3b: Dodoso kwa Wanawake Wajawazito

Namba ya dodoso……...

1,Jina la Kituo cha Afya: _____ 2. Nambari ya Swali: _____

3. Mhojiwaji namba : _____

4. Mwezi / Siku / Mwaka wa Mahojiano: _____ / _____ / _____;

4b.Lugha ya Mahojiano: _____

5. Jinsia yako: ☐1) Kike 6: Umri wako: _____

7. Hali yako ya ndoa ni nini?

0 = Single (Single / Widow / au Divorced); 1 = Ndoa;

2 = Sio ndoa lakini huishi na mpenzi; 3 = Nyingine (Taja: _____)

8: Je, umeajiriwa? ☐0) Hapana; ☐1) Ndiyo

9. Ni kiwango gani cha juu cha elimu:0 = Hakuna 1 = Msingi 2 = Sekondari3 4 = Chuo kikuu

10. Jumla ya idadi ya wanajamii: _____

11. Jumla ya idadi ya watoto chini ya umri wa miaka 18 nyumbani: _____

12. Dini yako ni nini? 0 = Hakuna dini 1 = Muslim 2 = Mkristo

3 = Katoliki 4 = Dini nyingine (Taja) _____

13. Ni lugha gani unaweza kuzungumza vizuri? 1 = Kiswahili 2 = Kiingereza 3 = Lugha nyingine (Taja) _____

14: Tarehe ya kuzaliwa watoto: _____ / _____ / _____ (siku / mwezi / Mwaka)

Miezi ya ujauzito .....

15. Mapato ya kila mwezi ya familia

<Ksh 5000 ☐

Ksh 5000-10,000 ☐

Ksh 10,0001-15,000 ☐

.>Ksh 15,000 ☐

Appendix 4: Edinburgh Postnatal Depression Scale[1] (EPDS)

Name:_____ Address:

_____

You're Date of Birth: _____

_____

Baby's Date of Birth:_____ Phone:

_____

As you have recently had a baby, we would like to know how you are feeling. Please CIRCLE the number next to the answer which comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

Kwa vile umejifugua hivi karibuni, tungependa kujua namna unavyohisi.Tafadhali WEKA ALAMA YA MVIRINGO nambari ambayo iko umbavuni wa jibu ambalo linalokaribiana na vile ulivyokuwa ukijihisi SIKU SABA ZILZOPITA, na si vile tu unavyohisi leo.

	ENGLISH	SWAHILI
	Here is an example, already completed. I have felt happy: a. Yes, all the time. ◯ Yes, most of the time. c. No, not very often. d. No, not at all. This would mean that "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.	Huu ni mfano,tayari umeshajazwa. Nimehisi furaha: a. Ndio, wakati wote. ◯ Ndio, wakati mwingi. c. La, sio kila mara. d. La ,hata . Hii ingemaanisha "nimehisi furaha kwa wakati mwingi" katika juma iliyopita. Tafadhali kamilisha maswali haya mengine kwa utaratibu huohuo.
	IN THE PAST 7 DAYS:	**KATIKA SIKU SABA ZILIZOPITA:**
1.	I have been able to laugh and see the funny side of things. a. As much as I always could.	Nimekuwa na uwezo wa kucheka na kuona upande wa furaha wa vitu. a. Kama vile nilivyokuwa

b. Not quite so much now.
c. Definitely not so much now.
d. Not at all.

b. Sio vile sana kwa sasa.
c. Kwa hakika sivyo vile kwa sasa.
d. Hata kamwe.

2. I have looked forward with enjoyment to things.
   a. As much as I ever did.
   b. Rather less than I used to do.
   c. Definitely less than I used to do.
   d. Hardly at all.

Nimetarajia kufurahia vitu.
   a. kama vile nilifanya daima.
   b. Afadhali kidogo kuliko nilivyokuwa.
   c. Kwa hakika kidogo kuliko nilivyokuwa.
   d. Hata kabisa.

3 I have blamed myself unnecessary when things went wrong.
   a. Yes, most of the time.
   b. Yes, some of the time.
   c. Not very often.
   d. No, never.

Nimejilaumu mwenyewe pasipo sababu vitu vikivurugika.
   a. Ndio, wakati mwingi.
   b. Ndio, wakati mwingine.
   c. Sio mara nyingi.
   d. La, kamwe.

4. I have been anxious or worried for no good reason.
   a. No, not at all.
   b. Hardly ever.
   c. Yes, sometimes.
   d. Yes, very often.

Nimekuwa na wasiwasi au sumbuko pasipo sababu nzuri.
   a. La, hata kamwe.
   b. Hata kabisa.
   c. Ndio,wakati mwingine,
   d. Ndio, mara nyingi.

---

5. I have felt scared or panicky for no good reason.
   a. Yes, quite a lot.
   b. Yes, sometimes.
   c. No, not much.
   d. No, not at all.

Nimeshikwa na hofu au kuangaika pasipo sababu nzuri.
   a. Ndio, hakika mara nyingi.
   b. Ndio,wakati mwingine.
   c. La, sio sana.
   d. La, kamwe.

6. Things have been getting on top of me.
    a. Yes, most of the time I haven't been able to cope at all.
    b. Yes, sometimes haven't been coping as well as usual.
    c. No, most of the time I have quite coped well.
    d. No, I have been coping as well as ever.

Vitu vimekuwa vikinilemea.
    a. Ndio ,wakati mwingi sijaweza kuvumilia kabisa.
    b. Ndio, wakati mwingine sijaweza kuvumilia kama kawaida.
    c. La, wakati mwingi nimevumilia hakika vizuri.
    d. La,Nimevumilia vizuri kama kila wakati.

7. I have been so unhappy that I have had difficulty sleeping.
    a. Yes, most of the time.
    b. Yes, sometimes
    c. Not very often.
    d. No, not at all.

Nimekuwa sina furaha hadi nimepata tatizo la kulala.
    a. Ndio,wakati mwingi.
    b. Ndio,wakati mwingine.
    c. Sio kla mara..
    d. La, kamwe.

8. I have felt sad or miserable
    a. Yes, most of the time
    b. Yes, quite often
    c. Not very often

8. Nimesikia kuhuzunika sana
    a. Ndio,wakati mwingi.
    b. Ndio,wakati mwingine
    c. Sio kla mara..
    d. La, kamwe.

9 I have been unhappy that I have been **crying**.
.
    a. Yes, most of the time.
    b. Yes, quite often.
    c. Only occasionally.
    d. No, never.

Nimekuwa sina furaha hadi nimekuwa nikilia.
    a. Ndio,wakati mwingi.
    b. Ndio,mara kwa mara.
    c. Mara chache tu.
    d. La, hasha.

10. The thought of harming myself has Occurred to me.
    a. Yes, quite often.
    b. Sometimes.

Wazo la kujidhuru mwenyewe limenijia.
    a. Ndio, mara kwa mara.
    b. Wakati mwingine.

c. Hardly ever.	c. Kwa nadra daima.
d. Never.	d. Hata.

Users may reproduce the scale without further permission providing they respect copyright by quoting the names of theauthors, the title and the source of the paper in all reproduced copies.

Edinburgh Postnatal Depression Scale[1] (EPDS)

Postpartum depression is the most common complication of childbearing.[2] The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a valuable and efficient way of identifying patients at risk for "perinatal"depression. The EPDS is easy to administer and has proven to be an effective screening tool.

Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDSscore should not override clinical judgment. A careful clinical assessment should be carried out to confirm the diagnosis. The scale indicates how the mother has felt during the previous week. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias orpersonality disorders.

Women with postpartum depression need not feel alone. They may find useful information on the web sites ofthe National Women's Health Information Center <www.4women.gov> and from groups such as Postpartum Support International <www.chss.iup.edu/postpartum> and Depression after Delivery

SCORING

QUESTIONS 1, 2, & 4 (without an *)

Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

QUESTIONS 3, 5-10 (marked with an *)

Maximum 30
Possible Depression: 10 or greater
Always look at item 10 (suicidal

Instructions for using the Edinburgh Postnatal Depression Scale:

1. The mother is asked to check the response that comes closest to how she has been feelingin the previous 7 days.
2. All the items must be completed.
3. Care should be taken to avoid the possibility of the mother discussing her answers withothers. (Answers come from the mother or pregnant woman.)
4. The mother should complete the scale herself, unless she has limited English or has difficultywith reading

.

[1]Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786.

[2]Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002,194-199

Appendix 5: 24-Hour Dietary Recall Protocols for Depressed Pregnant Women

A. Purpose

The purpose of the individual administered 24-hour recall is to gain information regarding the participant's diet. This information will be used to determine the nutritional and educational needs of the participant. Food recalls are also used to evaluate the effectiveness of the nutrition program.

B. Materials Needed

1. 24-hour recall form and a pencil
2. Food Recall Kit containing each of the following:
   - ✓ **Measuring cups and spoons (Liquid and Dry)**
   - ✓ **4 oz. cup =** ½ cup of fresh fruit
   - ✓ **8 oz. cup =** 1 cup of fresh fruit
   - ✓ **16 oz. cup =** 2 cups of lettuce which is 1 portion of vegetables
   - ✓ **CD –** 1 slice of bread
   - ✓ **Deck of cards or the palm of your hand =** 3 ounces of meat
   - ✓ **Food Models**
   - ✓ **Red Dinner Plate** to use as a visual to measure out portions or determine how large a pizza slice or a portion of dessert might be. Ask questions such as, "Did it take up the whole plate? Was it half a plate a fourth of the plate?"
   - ✓ **Plastic container of 2 to 3 cups of rice**

     Rice will be used as an example of measuring more dense foods such as mashed potatoes and oatmeal.
   - ✓ **Plastic container of 2 to 3 cups dried beans or dry cereal**

     Beans or cereal may be used as an example of measuring foods that are more loosely packed, such as dry cereal or vegetables

C. Procedure

1. Explain to the participant that you need to know only what she (he) actually ate. She (he) should not feel embarrassed about any food, as there are no "good" or "bad" foods. No one eats just the right foods all the time.
2. Do not express in words or facial expressions either approval or disapproval of foods mentioned by the participant.
3. Do not ask questions that would lead the participant to feel she (he) "should" have had a certain item and, thus say that they did.
4. Use your Food Recall Kit to determine the amounts of foods consumed.
5. Start with the most recent meal or snack that the participant consumed.

Work backwards to cover all foods and beverage consumed in the last 24 hours or in a "typical day". Weekends and holidays are not typical days and recalls from these days may provide an inaccurate view of the participant's diet.

6. **Quick List**:

Record the list of foods as the homemaker remembers them; portion sizes and preparation methods will be recorded in the next step. This list of foods is termed the quick list. To obtain this list of foods from the participant use the following types of probes to find what foods were eaten:

A. The first type of probing is related to time.

Examples:

"At what time was this? Did you eat or drink anything before or after that?"

"What did you have at that time?"

"At what time did you go to bed?"

B. The second type of probe is related to the participant's activities.

Examples:

"What did you do this morning?"

"While you were working around the house, did you take a break to have something to eat or drink?"

"Did you watch TV last night? When you watched TV, did you eat anything?"

"Did you have anything to drink with this?"

C. The third type of probe tries to get more complete information about foods already reported.

Examples:

"Do you remember anything else that you ate or drank with this food?"

"What else did you have at this meal?"

"Was the (bread, vegetable) eaten plain or did you put something on it?

"Did you have anything in your coffee?"

"Did you have a second helping?"

7. **Detailed Description**:

After you have recorded the participant's quick list, you can then complete the detailed description of foods consumed. This will include recording preparation method, brand name, portion size, and the time the food or beverage was consumed. To get more information on the amounts and the type of foods eaten use the following techniques:

A. Determine if all of the food was eaten or if some food was left on the plate.

B. Encourage the participant to describe foods as clearly as possible. The interviewer may have to restate questions to get more information.

C. Describe combination dishes carefully. Mixtures such as sandwiches, soups, stew, pizza, casseroles, etc. can be prepared in many ways.

D. Ask to see packages, if available, on prepackaged foods, and record brand name and other pertinent information.

8. **Review:**

Once the 24-hour food recall is complete read the list back to the participant.

Ask the participant if the recall is correct or if they forgot to mention any food that was consumed.

9. Thank the participant for their cooperation. Do not comment on the recall at this time, unless the participant asks a specific question.

10. Tell the participant that they will be getting a printout of their food recall and a summary of how their food intake meets Kenya MyPyramid recommendations.

11. Wait and address deficiencies, excesses, etc. when the diet summary is reviewed and when lessons are taught that deal with that area of the diet.

12. Give each participant a copy of "What Should I Eat."

Quick List of Food Items	**Column 1**		Column 2		**Column 3**	**Column 4**	**Coder use only**	
	A. Time	**B. Occa-sion**	**A. Food/Drink and Additions**	**B. Description of Food/Drink and ingredient**	**How much of this (FOOD) did you actually (eat/drink)?**	**Where did you obtain the (FOOD)?**	**Food code**	**Amount**

Appendix 5b: Itifaki za Kukumbuka Lishe ya Saa 24 kwa Wanawake Wajawazito wenye Unyongofu

Maswali ya ulaji wa saa 24

Utangulizi:

Sehemu hii ya mahojiano ni kutuwezesha kupata kile ulichokula siku ya awali. Yote ambayo umekula ikiwa ni pamoja na vinywaji, vitafunio, sahani, viungo na mavazi ya saladi itahitaji kukumbushwa. Hakuna jibu sahihi au sahihi katika mahojiano haya, unahitaji tu kuniambia ni nini ulichokula. Je! Una maswali yoyote? Ikiwa sio, hebu tuanze.

Hatua ya mahojiano:

1. Nakili vyakula vyote na vinywaji vilivyotumiwa siku ya awali katika "Orodha ya Chakula"] Tafadhali uniambie kila kitu ulichokula au kunywa siku zote jana, kutoka saa 6 asubuhi asubuhi hadi saa 6 asubuhi. Jumuisha unachokula na kunywa nyumbani na mbali-hata vitafunio. [Usisumbue bila lazima.]

   [Wakati mhojiwa ataachwa, aulize:] Kitu chochote kingine?

   Sasa, nitakuuliza maelezo zaidi juu ya vyakula na vinywaji ulioorodheshwa. Nataka uniambie "wakati", "tukio", "nini", "kiasi gani" na "wapi" ulikula vyakula vyako vyote jana. Ninapouliza juu ya kiasi, unaweza kutumia miongozo hii ya kupima na picha za chakula kwa ukubwa au uzito wa vyakula. (Ikiwa nyumbani mwa mwjibuji) Tafadhali tumia vikombe vyenye, mugs, au bakuli ili upangilie kiasi cha chakula ulichokula au kunywa nyumbani jana, au angalia lebo yoyote ya mfuko ambayo inaweza kuwa na manufaa. Unapokumbuka chochote kingine ulichokula au kunywa tunapoendelea, tafadhali niseme.
2. a. Ulikuwa wakati gani wa (kula / kunywa) chakula? b. Je, ungeitaje tukio hili?
3. Maswali juu ya chakula kilicholiwa: [Nenda swali la.2]

   a. Tumia Orodha ya Chakula kwa Hifadhi ya fomu 2A, futa chakula katika orodha ya haraka. Tathmini ya kuongeza kwa chakula / kinywaji. b. Uliza kuhusu viungo na maelezo. Je! (Chakula) ulikuwa (kilichokula / kunywa) kilichofanywa? Je! Viungo gani vya chakula vilikuwa katika (chakula au sahani)? Ilikuwa na viungo

vinginevyo? [Kama ndiyo) Walikuwa wapi? [Omba maandiko ya chakula ikiwa inawezekana wakati mhojiwa hawezi kujibu viungo]

4. Uliza kuhusu kiasi: Ulikula kiasi gani (kila mmoja)? [Nenda wswali la.3]
5. Uliza kuhusu chanzo cha chakula: Ulipata wapi (chakula)?
6. Nenda kwenye kipengee cha chakula cha pili kwenye Orodha ya Haraka. [Ruka hatua hii na kwenda hatua ya 7 wakati vyakula vyote katika Orodha. Fuata maelekezo ya fomu.

Appendix 6: - Brain Food Essentials Checklist for Pregnant Women

S/N	**BRAIN FOOD ESSENTIALS CHECKLIST**	**YES=1 NO = 0**	HOW MUCH PER/ DAY, OR/ WEEK OPEN ENDED (tick the consumed)
1.	Did you consume fish, lean meats, organ meats, eggs, Sardines, and cod Liver oil?		
2.	Did you consume, groundnuts, pumpkin seeds, Sunflower seeds, or Flaxseeds		
3.	Did you consume seed oils, olive oils, margarine and butter		
4.	Did you consume grain whole e.g. whole ugali meal, rice whole grain, githeri/ corn/maize, wheat, sorghum, millet or any other grains or foods made from these etc.		
5.	Did you consume legumes e.g. Red kidney beans, chickpeas, lentils, and black beans? lima beans, Include any other local.		
6.	Did you consume dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, kale, spinach, nightshade; mushrooms, spinach, broccoli.		
7.	Did you consume other vegetables (e.g. tomato, onion, eggplant) pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)		
8.	Did you consume eggs from chicken, duck, or any other egg		
9.	Did you consume dairy (milk, yoghurt, cheese)		
10.	Did you consume red meat including organ meet (beef, veal, pork, goat meat), or meat products (ham, sausages, cured meat, etc.)		
11.	Did you consume white meat (chicken, turkey, rabbit, etc.) commercial sweets or pastries (not homemade) such as cakes, cookies, biscuits		
12.	Did you consume commercial sweets or pastries (not homemade) such as cakes, cookies, biscuits		
13.	Did you consume spices (black pepper, turmeric, ginger etc		

Appendix 7: Nutrition Knowledge, Attitude and Practice for Pregnant Women

Knowledge Questions	True	I don't know	False
Maize is energy giving food			
Egg are rich in energy			
Carbohydrates and fats are energy giving foods			
Fish is a good source of proteins			
Fruits and vegetables are rich in vitamins and minerals			
Nutrition cannot be provided by just one kind of food			
Proteins-rich food are needed to build and repair body tissues			
High-fiber diet is dangerous for people during pregnant.			
Eating vegetables helps baby to develop well			
poor nutrition is a result of poor diet			
Antioxidant are important for disease prevention			
Water is a nutrient			
Omega-3 food are important for brain health			
Nut and seed are good source of Omega -3			
Fruits like avocado's are good source of Omega -3			
Fat fish, olive oil, cord liver can give us Omega -3			
There is relationship between what we eat and diseases			

Nutritional attitude among pregnant women in urban low income

Attitudes questions	Strongly disagree	Disagree	Agree	Strongly agree
Preparing a balanced meal is time - consuming.				
It is important for mothers to know about preparing a balanced meal				
It is not vital to eat a balanced meal if already you are pregnant				

A nutritious meal can come on one's own small garden.				
I should eat fruits only when I feel like				
Vegetables must be over-cooked to kill microbes				
Self-view of nutritional status is important				
Hygiene is more important than food nutrition				
Taking supplements is better than eating food.				
Processed food is generally better than raw foods.				
It is not easy to maintain good nutrition for a poor family				
Eating a variety of food in moderation is a key to balanced nutrition				

Nutritional practices among pregnant women in urban low-income Nairobi Kenya

S/N	**Questions**	**Responses**
1.	Avid any food or diet in the current pregnancy	3. Yes 4. No
2.	Reasons for avoiding Religion, Culture,	5. Big baby, 6. Labor difficult, 7. Others (Discomfort, Dislike etc), 8. 4. N/A
3.	Dietary regimen during pregnancy	3. Yes 4. No

4.	Skipping meals during pregnancy	3. Yes 4. No
5.	Types of meal skipped	6. Breakfast, 7. Lunch, 8. Snack, 9. Dinner, 10. N/A
6.	Taking additional meal	3. Yes 4. No
7.	Number of additional meals	5. One, 6. Two. 7. Three or More, 8. N/A
8.	Took iron supplement	3. Yes 4. No
9.	Habits of eating snacks between meals	3. Yes 4. No

Appendix 8: Nutritional Knowledge Attitude and Practice Evaluation among Pregnant Women

I am going to ask you some questions about nutrition of pregnant and lactating women. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have.

Practices

Question P.1: Food-intake practices

Based on the objectives of the survey, food-intake practices can be assessed in terms of:

i. Intake of foods from a list of locally available nutrient-rich foods through a short food-intake checklist. To assess the intake of nutrient-rich foods, refer to the practice section of modules 6, 7 and 8 for iron, vitamin A and iodine, respectively. Before measuring food-intake practices, lists of locally available nutrient-rich foods of interest should be created; or

ii. Frequency of intake of foods from a list of locally available nutrient-rich foods with a short food-frequency questionnaire; or

iii. Dietary diversity through the dietary-diversity questionnaire to assess the quality of the diet. The guidelines for measuring dietary diversity are available online (FAO, 2011): http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/FAO-guidelines-dietary-diversity2011.pdf

Nutrition knowledge of pregnant mothers

Knowledge

Question K.1: Women's nutrition during pregnancy

How should a pregnant woman eat in comparison with a non-pregnant woman to provide good nutrition to her baby and help him grow?

Please list four practices she should do.

_____

_____

- Eat more food (more energy)
- Eat more at each meal (eat more food each day)

Or

- Eat more frequently (eat more times each day)
- Eat more protein-rich foods
- Eat more iron-rich foods
- Use iodized salt when preparing meals
- Other
- Don't know

Question K.2: Micronutrient supplements for pregnant women

Most women would benefit from two types of supplements, or tablets, during pregnancy. Which are they?

_____

_____

- ☐ *Iron supplements*
- ☐ *Folic acid supplements*
- ☐ *Other*
- ☐ *Don't know*

Question K.3: Recommendation of folic acid supplements

Can you tell me why it is so important to take folic acid supplements during pregnancy?

a) Probe if necessary:

_____

_____

b) What is the health benefit for taking folic acid supplements/tablets?

- For normal development of the nervous system of the unborn baby (brain, spine and skull)
- To prevent birth defects/abnormalities the nervous system of the unborn baby (brain, spine and skull)
- Other
- Don't know

Question K.4: Health risks for low-birth-weight babies

When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby, meaning that the baby is small or has a low birth weight. What are the health risks for these babies?

_____

- ☐ Slower growth and development
- ☐ Risks of infections/being sick
- ☐ Risks of dying
- ☐ Risks of being undernourished/having micronutrient deficiencies
- ☐ Risks of being sick once adult/developing chronic diseases in adulthood (heart disease, high blood pressure, obesity, diabetes)
- ☐ Other
- ☐ Don't know

Attitudes about health problems

Giving birth/having a low-birth-weight baby

Perceived susceptibility

A.1: How likely do you think you are to have a low-birth-weight baby?

- ☐ 1. Not likely
- ☐ 2. You're not sure
- ☐ 3. Likely

If Not likely:

Can you tell me the reason why it is not likely?

_____

Perceived severity

A.2: How serious do you think it is for your baby to have a low-birth-weight?

- ☐ 1. Not serious
- ☐ 2. You're not sure
- ☐ 3. Serious

If Not Serious:

Can you tell me the reason why it is not serious?

_____

Attitudes towards an ideal or desired nutrition-related practice

A.3: Eating more food during pregnancy: eating more at each meal or eating more frequently or having more snacks during the day

Perceived benefits

How good do you think it is to eat more food during pregnancy?

- ☐ 1. Not good
- ☐ 2. You're not sure
- ☐ 3. Good

If Not good:

Can you tell me the reasons why it is not good?

_____

Perceived barriers

A.4: - How difficult is it for you to eat more food during pregnancy?

- ☐ 1. Not difficult
- ☐ 2. So-so
- ☐ 3. Difficult

If Difficult:

Can you tell me the reasons why it is difficult?

_____

Undernutrition

Knowledge

Question K.1: Signs of undernutrition

U.1: How can you recognize that someone is not having enough food?

Probe if necessary:

What are the signs of undernutrition?

_____

_____

- ☐ *Lack of energy/weakness: cannot work, study or play as normal (disability)*

- ☐ *Weakness of the immune system (becomes ill easily or becomes seriously ill)*
- ☐ *Loss of weight/thinness*
- ☐ *Children do not grow as they should (growth faltering)*
- ☐ *Other*
- ☐ *Don't know*

Question K.2: Causes of undernutrition

a) What are the reasons why people are undernourished?

_____

_____

- ☐ *Not getting enough food*
- ☐ *Food is watery, does not contain enough nutrients*
- ☐ *Disease/ill and not eating food*
- ☐ *Other*
- ☐ *Don't know*

b) What are the reasons why people do not get enough food?

_____

_____

- ☐ *Not having enough money to buy food*
- ☐ *Food is not available*
- ☐ *Other*
- ☐ *Don't know*

Question K.3: Seeking growth monitoring for infants and young children

a). Who can help the mother to find out if the baby is growing well? Where can she go?

_____

_____

- ☐ *Go to the health centre/ask a doctor or nurse (health professional) (seeking health-care services for growth monitoring)*

☐ *Other*

☐ *Don't know*

Question K.4: Meaning of lack of weight gain among infants and young children

a) . If the baby is not gaining weight, what does that mean?

If no answer, probe:

What could be the causes?

_____

_____

☐ *The baby is not eating well/the baby does not want to eat*

☐ *The baby may be sick often*

☐ *Other*

☐ *Don't know*

Question K.5: Prevention of undernutrition

a).What should we do to prevent undernutrition among **[population of interest]**?

_____

_____

Infants (0–6 months)

☐ *Breastfeed exclusively/give only breastmilk*

☐ *Go to the health centre/hospital and check that the child is growing (growth monitoring services)*

Attitudes

Undernutrition

Perceived susceptibility

A.1: How likely do you think your child is to be undernourished, that is they stop growing or lose weight?

☐ 1. Not likely

☐ 2. You're not sure

☐ 3. Likely

If Not likely:

b) Can you tell me the reason why it is not likely?

_____

Perceived severity

A.2: How serious do you think undernutrition is for a baby's health?

- ☐ 1. Not serious
- ☐ 2. You're not sure
- ☐ 3. Serious

If Not Serious:

Can you tell me the reason why it is not serious?

_____

_____

Iron-deficiency anaemia

Knowledge

Question K.1: General signs of iron-deficiency anaemia

a) Have you heard about iron-deficiency anaemia?

- ☐ Yes
- ☐ No
- ☐ Don't know/no answer

If Yes:

b) Can you tell me how you can recognize someone who has anaemia?

_____

_____

- ☐ *Less energy/weakness*
- ☐ *Paleness/pallor*
- ☐ *Spoon nails/bent nails (koilonychia)*
- ☐ *More likely to become sick (less immunity to infections)*
- ☐ *Other*
- ☐ *Don't know*

Question K.2: Consequences of iron-deficiency anaemia for infants and young children

a) What are the health risks for infants and young children of a lack of iron in the diet?

_____

_____

- ☐ *Delay of mental and physical development*
- ☐ *Other*
- ☐ *Don't know*

Question K.3: Consequences of iron-deficiency anaemia for pregnant women

a) What are the health risks for pregnant women of a lack of iron in the diet?

_____

_____

- ☐ *Risk of dying during or after pregnancy*
- ☐ *Difficult delivery*
- ☐ *Other*
- ☐ *Don't know*

Question K.4: Causes of iron-deficiency anaemia

a) What causes anaemia?

_____

- ☐ *Lack of iron in the diet/eat too little, not much*
- ☐ *Sickness/infection (malaria, hookworm infection, other infection such as HIV/AIDS)*
- ☐ *Heavy bleeding during menstruation*
- ☐ *Other*
- ☐ *Don't know*

Question K.5: Prevention of anaemia

a) How can anaemia be prevented?

- ☐ *Eat/feed iron-rich foods/having a diet rich in iron*
- ☐ *Eat/give vitamin-C-rich foods during or right after meals*
- ☐ *Take/give iron supplements if prescribed*
- ☐ *Treat other causes of anaemia (diseases and infections) – seek health-care assistance*
- ☐ *Continue breastfeeding (for infants 6–23 months old)*
- ☐ *Other*
- ☐ *Don't know*

Question K.6: Iron rich foods – easily absorbed

a) Can you list examples of foods rich in iron?

Organ meat

- ☐ *Liver*
- ☐ *Kidney*
- ☐ *Heart*

[Add any other locally available organ meat.]

Question K.7: Foods that increase iron absorption

a) When taken during meals, certain foods help the body absorb and use iron. What are those foods?

- ☐ *Vitamin-C-rich foods, such as fresh citrus fruits (orange, lemons, etc.)*
- ☐ *Other*
- ☐ *Don't know*

Question K.8: Foods that decrease iron absorption

a) Some beverages decrease iron absorption when taken with meals. Which ones?

_____

- ☐ *Coffee*
- ☐ *Tea*
- ☐ *Other*
- ☐ *Don't know*

Practices

Question P.1: Food-intake practices Error! Bookmark not defined.

a) Yesterday, during the day and night, did you eat any of the following?

*(*Read the list of iron-rich foods and tick either yes or no for each food item*)*

- ☐ Organ meat □ Yes□ No
- ☐ Liver □ Yes □ No
- ☐ Kidney □ Yes □ No
- ☐ Heart □ Yes□ No ***[Add other locally available}***

Question P.2: Consumption of vitamin-C-rich fruits

a) Do you usually eat fresh citrus fruits, such as **[provide examples of locally available fresh citrus fruits]**, or drink juice made from them?

- ☐ Yes □No
- ☐ Don't know/no answer

If Yes:

Everyday?

- ☐ Yes, No Don't know/no answer

b) When do you usually eat fresh citrus fruits? (*Read the following options to the respondent*)

- ☐ Before a meal
- ☐ During the meal
- ☐ After a meal
- ☐ Other (*specify*) _____
- ☐ Don't know/no answer

Question P.3: Consumption of coffee/tea

a) Do you usually drink coffee or tea?

- ☐ Yes
- ☐ No
- ☐ Don't know

If Yes:

Everyday?

- ☐ Yes
- ☐ No
- ☐ Don't know

b) When do you usually drink coffee or tea? (*Read the following options to the respondent*)

- ☐ Two hours or more before a meal
- ☐ Right before a meal
- ☐ During the meal
- ☐ Right after a meal
- ☐ Two hours or more after a meal
- ☐ Other (*specify*) _____
- ☐ Don't know/no answer

Attitudes

Attitudes towards a health or nutrition-related problem

Iron-deficiency anaemia

Perceived susceptibility

a) How likely do you think your child is to be iron-deficient/anaemic?

OR

b) How likely do you think you are to be iron-deficient/anaemic?

- ☐ 1. Not likely
- ☐ 2. You're not sure
- ☐ 3. Likely

If Not likely:

c) Can you tell me the reason why it is not likely?

_____

Perceived severity

a) How serious do you think iron-deficiency/anaemia is?

- ☐ 1. Not serious
- ☐ 2. You're not sure
- ☐ 3. Serious

If Not Serious:

b) Can you tell me the reason why it is not serious?

_____

_____

Attitudes towards an ideal or desired nutrition-related practice

Preparing meals with iron-rich foods

Perceived benefits

a) How good do you think it is to prepare meals with iron-rich foods such as beef, chicken or liver?

- ☐ 1. Not good
- ☐ 2. You're not sure
- ☐ 3. Good

If Not good:

b) Can you tell me the reasons why it is not good?

_____

Perceived barriers

a) How difficult is it for you to prepare meals with iron-rich foods?

- ☐ 1. Not difficult
- ☐ 2. So-so
- ☐ 3. Difficult

If Difficult:

b) Can you tell me the reasons why it is difficult?

_____

Self-confidence

a) How confident do you feel in preparing meals with iron-rich foods?

- ☐ 1. Not confident
- ☐ 2. Ok/so-so
- ☐ 3. Confident

If Not confident:

b) Can you tell me the reasons why you do not feel confident?

_____

Attitudes towards food preference

3 Food preferences

How much do you like the taste of [**iron-rich food item or meal**]?

- ☐ 1. Dislike
- ☐ 2. You're not sure
- ☐ 3. Like

Vitamin A deficiency

Knowledge

Question K.1: Signs of vitamin A deficiency

a) Have you heard about vitamin A deficiency or lack of vitamin A?

- ☐ Yes
- ☐ No
- ☐ Don't know/no answer

If Yes:

b) Can you tell me how you can recognize someone who lacks vitamin A in his or her body?

_____

_____

- ☐ *Weakness/feels less energetic*
- ☐ *Be more likely to become sick (less immunity to infections)*
- ☐ *Eye problems: night blindness (inability to see at dusk and in dim light), dry eyes, corneal damage, blindness*
- ☐ *Other*

☐ *Don't know*

Question K.2: Causes of vitamin A deficiency

a) What causes a lack of vitamin A in the body?

_____

_____

☐ *Poor variety of foods*

☐ *Eat too little food/not eat much (poor intake)*

☐ *Other*

☐ *Don't know*

Question K.3: Prevention of vitamin A deficiency

a) How can one prevent a lack of vitamin A in the body?

_____

_____

☐ *Eat/feed vitamin-A-rich foods – having/giving a diet rich in vitamin A*

☐ *Eat/feed foods fortified with vitamin A*

☐ *Give vitamin A supplements/sprinkles*

☐ *Other*

☐ *Don't know*

Question K.4: Food sources of vitamin A Error! Bookmark not defined.

a) Can you list examples of foods rich in vitamin A?

Probe if necessary:

Do you know of any animal-source foods, vegetables or fruits that are rich in vitamin A?

_____

Animal-source foods

☐ *Liver*

☐ *Kidney*

☐ *Heart*

☐ *Egg yolks/egg from chicken, duck, guinea fowl or other bird*

☐ *Milk, cheese, yogurt or other dairy product*

- ☐ *Orange-coloured vegetables*
- ☐ *Orange sweet potato*
- ☐ *Carrot*
- ☐ *Pumpkin*
- ☐ *Squash*

[Add other locally available vitamin-A-rich vegetables (e.

Practices

Question P.1: Food-intake practices Error! Bookmark not defined.

a) Yesterday, during the day and night, did you eat any of the following foods? *(Read the list of vitamin-A-rich foods and tick yes or no for each food item)?*

Animal-source foods

Liver	□ Yes	□ No
Kidney	□ Yes	□ No
Heart	□ Yes	□ No

Egg yolks/egg from chicken, duck, guinea fowl or other bird

□ Yes □ No

Milk, yogurt or other dairy products

□ Yes □ No

Orange-coloured vegetables

Orange sweet potato	□ Yes	□ No
Carrot	□ Yes	□ No
Pumpkin	□ Yes	□ No
Squash	□ Yes	□ No

[Add other locally available vitamin-A-rich vegetables (e.g. red sweet pepper).]

Green vegetables □ Yes □ No

Amaranths, spinach and other green leafy vegetables: □ Yes □ No

[Add locally available vitamin-A-rich leaves.]

Attitudes

Attitudes towards a health or nutrition-related problem

Vitamin A deficiency

Perceived susceptibility

a) How likely do you think your child is to lack vitamin A in his/her body?

OR

b) How likely do you think you are to lack of vitamin A in your body?

- ☐ 1. Not likely
- ☐ 2. You're not sure
- ☐ 3. Likely

If Not likely:

c) Can you tell me the reason why it is not likely?

_____

Perceived severity

a) How serious do you think a lack of vitamin A is?

- ☐ 1. Not serious
- ☐ 2. You're not sure
- ☐ 3. Serious

If Not Serious:

b) Can you tell me the reason why it is not serious?

_____

Attitudes towards an ideal or desired nutrition-related practice

Preparing meals with vitamin-A-rich foods

Perceived benefits

a) How good do you think it is to prepare meals with vitamin-A-rich foods such as carrots, green leafy vegetables, sweet-potatoes or liver?

- ☐ 1. Not good
- ☐ 2. You're not sure

☐ 3. Good

If Not good:

Can you tell me the reasons why it is not good?

_____

_____

Perceived barriers

How difficult is it for you to prepare meals with vitamin-A-rich foods?

☐ 1. Not difficult

☐ 2. So-so

☐ 3. Difficult

If Difficult:

Can you tell me the reasons why it is difficult?

_____

_____

Self-confidence

How confident do you feel in preparing meals with vitamin-A-rich foods?

☐ 1. Not confident

☐ 2. Ok/so-so

☐ 3. Confident

If Not confident:

Can you tell me the reasons why you do not feel confident?

_____

Attitudes towards food preference

Food preferences

How much do you like the taste of [**insert a vitamin-A-rich food item or meal**]?

Do you dislike it, you neither like it nor dislike it (neutral) or do you like it?

☐ 1. Dislike

☐ 2. Neutral

☐ 3. Like

Practices

Question P.1: Use of iodized salt

a) Did you use salt to cook the main meal eaten by members of your family last night?

- ☐ Yes
- ☐ No
- ☐ Don't know/no answer

If Yes:

b) What kind of salt did you use? (*If possible, ask the respondent to show you the salt.*)

- ☐ Iodized
- ☐ Not iodized
- ☐ No salt at home
- ☐ Don't know/no answer

Knowledge

Question K.1: Signs of iodine deficiency:

a) Have you heard about iodine deficiency?

- ☐ Yes
- ☐ No
- ☐ Don't know/no answer

If Yes:

b) Can you tell me what it is?

Probe if necessary:

Can you describe the signs of a lack of iodine in the body?

_____

_____

- ☐ *Apathy (lack of motivation and excitement)*
- ☐ *Having difficulty working or studying*
- ☐ *Goitre*
- ☐ *Other*
- ☐ *Don't know*

Question K.2: Consequences for the unborn baby

What could be the consequences or health risks for the unborn baby of a lack of iodine in the diet of a pregnant woman?

_____

- ☐ *Risk of being mentally impaired*
- ☐ *Risk of being physically damaged*
- ☐ *Other*
- ☐ *Don't know*

Question K.3: Cause of iodine deficiency

What causes iodine deficiency?

_____

- ☐ *Poor or no intake of iodized salt*
- ☐ *Other*
- ☐ *Don't know*

Attitudes

Attitudes towards a health or nutrition-related problem

Iodine deficiency

Perceived susceptibility

a) How likely do you think you are to lack iodine?

- ☐ 1. Not likely
- ☐ 2. You're not sure
- ☐ 3. Likely

If Not likely:

If Not likely:

b) Can you tell me the reason why it is not likely?

_____

Perceived severity

How serious do you think a lack of iodine in the body is?

- ☐ 1. Not serious
- ☐ 2. You're not sure
- ☐ 3. Serious

If Not Serious:

Can you tell me the reason why it is not serious?

_____

Preparing meals with iodized salt

Perceived benefits

a) How good do you think it is to prepare meals with iodized salt?

- ☐ 1. Not good
- ☐ 2. You're not sure
- ☐ 3. Good

If Not good:

c) Can you tell me the reasons why it is not good?

_____

Perceived barriers

a) How difficult is it for you to buy and use iodized salt?

- ☐ 1. Not difficult
- ☐ 2. So-so
- ☐ 3. Difficult

If Difficult:

b) Can you tell me the reasons why it is difficult?

_____

Appendix 9: Final evaluation on Knowledge Attitude Change Among Women in Urban Low Income Nairobi Kenya

Women's nutrition knowledge during pregnancy and breastfeeding					
	Intervention		**Control**		**p-value**
	Knows	Don't	Knows	Don't	
How should a pregnant woman eat in comparison with non-pregnant women to provide good nutrition to herself and baby?	97.6	2.4	90.2	9.8	0.202
Most women would benefit from two types of supplements, or tablets during pregnancy, do you know them	83.3	16.7	78.0	22.0	0.588
Why it is so important to take folic acid sup. during pregnancy	83.3	16.7	78.0	22.0	0.588
Health risks for low birth weights	88.1	11.9	90.2	9.8	0.753
Attitudes towards a health or nutrition related problem					
How do you think you are to have a low birth weight baby Perceived susceptibility					
	Interv.	Comp.			
Not likely	59.5	85.4	p-value		
Not sure	19.0	12.2	0.009		
Likely	21.4	2.4			
How Serious do you think it is your baby to have low birth weight- Perceived severity					
Not Serious	26.2	4.9			
Not Sure	33.3	17.1	0.001		
Serious	40.5	78.0			
How good do you think it is to eat more food during pregnancy – Perceived benefits					
Not good	4.8	4.9			
Not Sure	14.3	19.5	0.834		
Good	81.0	75.6			
How difficult is it for you to eat more food during pregnancy- Perceived barriers					
Not difficult	71.4	82.9			
So-so	2.4	12.2	0.008		
Difficult	26.2	4.9			
Under Nutrition Knowledge					
	Intervention		Control		p-value
	Knows	Don't	Knows	Don't	
How can you recognize that someone is not having enough food?	92.7	7.3	91.5	8.5	0.500
Reasons Why people are undernourished	92.7	7.3	92.7	7.3	1.00
Reasons why people do not get enough food	95.1	4.9	97.6	2.4	1.00
How can (caregiver) find out if the baby is growing well or not?	95.1	4.9	95.1	4.9	1.00

If the baby is not gaining weight, what does that mean	97.6	2.4	97.6	2.4	1.00
What should we do to prevent undernutrition among population	85.4	14.6	90.2	9.8	0.737
Attitudes toward a health or nutrition –related problem –					
How likely do you think your child is to be undernourished, that is they stop growing or lose weight? perceived susceptibility					
Not likely	63.4	78.0			
Not sure	19.5	17.1	0.177		
Likely	17.1	4.9			
How serious do you think undernutrition is for baby's heath?- Perceived severity					
Not Serious	12.2	2.4			
Not sure	36.6	9.8	0.002		
Serious	51.2	87.8			

Iron Deficiency – anaemia

	Intervention		Control		p-value
	Knows	Don't	Knows	Don't	
How to recognize someone who has anaemia	58.5	41.5	68.3	31.7	0.492
What are the health risk for infants and young children of a lack of iron in the diet	51.2	48.8	53.7	46.3	0.500
What are risks for pregnant women of a lack of iron in the diet	62.5	37.5	47.5	52.5	0.261
What causes anaemia	67.5	32.5	68.3	31.7	1.000
How can anaemia be prevented	63.4	36.6	70.7	29.3	0.639
Can you list examples of foods rich in iron	36.6	63.4	48.8	51.2	0.372
When taken during meals, certain foods help the body absorb and use iron. What are those foods	68.3	31.7	51.2	48.8	0.176
Some beverages decrease iron absorption when taken with meals. Which ones?	52.5	47.5	41.5	58.5	0.377

Iron deficiency anaemia

How likely do you think your child is to be iron –deficient/ anaemic?- Perceived susceptibility					
Not likely	46.3	63.4			
Not sure	39.0	26.8	0.299		
Likely	14.6	9.8			
How serious do you think iron deficiency / anemic is?- Perceived severity					
Not Serious	2.4	7.3			
Not sure	31.7	26.8	0.558		
Serious	65.9	65.9			
How good do you think it is to prepare meals with iron foods?- Perceived benefit					
Not good	9.8	0			
Not sure	19.5	14.6	0.089		
Good	70.7	85.4			

How difficult is it for you to prepare meals with iron-rich foods- Perceived barriers					
Not difficult	78.6	82.9			
So-so	9.5	17.1	0.054		
Difficult	11.6	0			
How confident do you feel in preparing meals with iron-rich foods					
Not confident	7.1	4.9			
Ok/so-so	21.4	12.2	0.454		
Confident	71.4	82.9			
How much do you like taste of iron rich food item or meal					
Dislike	14.3	12.2			
Not sure	9.5	14.6	0.761		
Like	76.2	73.2			

Iodine Analysis

	Intervention	Control	p-value		
Did you use salt to cook the main meal eaten by members of your family last night					
Yes	97.6	90.0	0.196		
No	2.4	10.0			
What kind of salt did you use-Practices					
Iodized	95.2	97.6	1.00		
Not Iodized	4.8	2.4			

Have you heard about iodine deficiency –Knowledge					
	Intervention	Control			
Yes	61.9	53.7	0.156		
No	31.0	24.4			
Don't know	7.1	22.0			
	Intervention		Control		p-value
	Knows	Don't	Knows	Don't	
Signs of a lack of iodine in the body (K1)	59.5	40.5	53.7	46.3	0.661
Consequences for unborn baby (K2)	42.9	57.1	46.3	53.7	0.827
Cause of iodine deficiency	73.8	26.2	61.0	39.0	0.247
Perceived susceptibility					
	Intervention	Control	p-value		
Not likely	54.8	68.3			
Not sure	28.6	26.8	0.198		
Likely	16.7	4.9			
Perceived severity					
Not serious	4.9	9.8			
Not sure	36.6	31.7	0.744		
Serious	58.5	58.5			
Perceived benefits					

Not good	0	0			
Not sure	31.0	22.0	0.249		
Good	69.0	78.0			
Perceived barriers					
Not difficult	81.0	73.2			
So-so	14.3	17.1	0.612		
Difficult	4.8	9.8			

Vitamin A Deficiency – Analysis

Have you heard about Vitamin A deficiency or lack of vitamin A –Knowledge

	Intervention	Comparison	p-value		
Yes	63.4	77.5			
No	22.0	15.0	0.363		
Don't know	14.6	7.5			

	Intervention		Control		p-value
	Knows	Don't	Knows	Don't	
Signs of Vitamin A deficiency	52.4	47.6	56.1	43.9	0.827
Causes of Vitamin A deficiency	64.3	35.7	48.8	51.2	0.187
Prevention of Vitamin A deficiency	66.7	33.3	56.1	43.9	0.372
Food sources of Vitamin A	69.0	31.0	46.3	53.7	0.047

Perceived susceptibility					
	Intervention	Control	p-value		
Not likely	45.2	55.0			
Not sure	45.2	37.5	0.675		
Likely	9.5	7.5			
Perceived severity					
Not serious	7.1	12.2			
Not sure	35.7	24.4	0.457		
Serious	57.1	63.4			
Perceived benefits					
Not good	0	0			
Not sure	31.0	7.3	0.011		
Good	69.0	92.7			
Perceived barriers					
Not difficult	68.3	78.0			
So-so	22.0	14.6	0.602		
Difficult	9.8	7.3			

Appendix 10:- Training Materials Nutrition

What Should I Eat?

For Moms

MyPyramid

MyPyramid.gov

When you are pregnant, you have special nutritional needs. Follow the MyPyramid Plan below to help you and your baby stay healthy. The Plan shows different amounts of food for different trimesters, to meet your changing nutritional needs.

Food Group	1st Trimester	2nd and 3rd Trimesters	What counts as 1 cup or 1 ounce?	Remember to...
	Eat this amount from each group daily.*			
Fruits 	2 cups	2 cups	1 cup fruit or juice ½ cup dried fruit	*Focus on fruits*—Eat a variety of fruits.
Vegetables 	2½ cups	3 cups	1 cup raw or cooked vegetables or juice 2 cups raw leafy vegetables	*Vary your veggies*—Eat more dark-green and orange vegetables and cooked dry beans.
Grains 	6 ounces	8 ounces	1 slice bread 1 ounce ready-to-eat cereal ½ cup cooked pasta, rice, or cereal	*Make half your grains whole*—Choose whole instead of refined grains.
Meat & Beans 	5½ ounces	6½ ounces	1 ounce lean meat, poultry, or fish ¼ cup cooked dry beans ½ ounce nuts or 1 egg 1 tablespoon peanut butter	*Go lean with protein*—Choose low-fat or lean meats and poultry.
Milk 	3 cups	3 cups	1 cup milk 8 ounces yogurt 1½ ounces cheese 2 ounces processed cheese	*Get your calcium-rich foods*—Go low-fat or fat-free when you choose milk, yogurt, and cheese.

*These amounts are for an average pregnant woman. You may need more or less than the average. Check with your doctor to make sure you are gaining weight as you should.

In each food group, choose foods that are low in "extras"—solid fats and added sugars.

Pregnant women and women who may become pregnant should not drink alcohol. Any amount of alcohol during pregnancy could cause problems for your baby.

Most doctors recommend that pregnant women take a prenatal vitamin and mineral supplement every day **in addition to** eating a healthy diet. This is so you and your baby get enough folic acid, iron, and other nutrients. But don't overdo it. Taking too much can be harmful.

MyPlate for Moms

Make half your plate vegetables and fruits, about one quarter grains and one quarter protein. Choose foods that are high in fiber and low in sugar, solid fats and salt (sodium). For most women, these are the average food amounts for one day.

Vegetables

Eat more vegetables. Use fresh, frozen or low-sodium canned vegetables. Avoid French fries.

Daily Amount
3 or more of these choices:
- 2 cups raw leafy vegetables
- 1 cup raw vegetables or juice
- 1 cup cooked vegetables

Protein

Choose healthy protein. Eat vegetable protein daily. Avoid bacon, hot dogs and bologna.

Daily Amount
6-7 of these choices:
- 1 ounce fish, poultry or lean meat
- 1 egg
- ½ ounce nuts
- ¼ cup cooked dry beans, lentils or peas
- ¼ cup tofu
- 1 tablespoon nut butter

Grains

Eat mostly whole grains like brown rice. Limit bread, noodles and rice that are white.

Daily Amount
6 of these choices in the 1st trimester,
8 in the 2nd/3rd trimester and while breastfeeding:
- 1 slice whole wheat bread or ½ bagel
- 1 small (6-inch), whole wheat tortilla
- 1 cup cereal
- ½ cup cooked pasta, rice or cereal

Fruits

Add color with fruit. Make most choices fruit, not juice.

Daily Amount
2 of these choices:
- 1 cup fresh fruit
- 1 cup unsweetened frozen or canned fruit
- ½ - ¾ cup juice
- ½ cup dried fruit

Dairy

Enjoy calcium-rich foods. Choose pasteurized nonfat or lowfat milk, yogurt and cheese.

Daily Amount
3 of these choices for women

or

4 of these choices for teens:
- 1 cup milk
- 1 cup soy milk with calcium
- 1 cup of plain yogurt
- 1½ ounces cheese

Choose Healthy Fats & Oils

- Use plant oils like canola, safflower and olive oil for cooking.
- Read food labels to avoid saturated and trans fats (hydrogenated fats).
- Avoid solid fats such as lard and butter.
- Eat cooked fish at two meals each week.
- Limit oils to 6 teaspoons each day.

Choose Healthy Beverages

- Drink water, nonfat or lowfat milk instead of soda, fruit drinks and juice.
- Limit caffeine drinks like coffee and tea. Avoid energy drinks.
- Do not drink alcohol when you are pregnant or may become pregnant.
- Alcohol passes through breast milk. If breastfeeding, talk with your healthcare provider about alcohol use.

April 16, 2013

REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE
MINISTRY OF PUBLIC HEALTH AND SANITATION

APPLIED BASIC AGRI-NUTRITION RESOURCE TOOLKIT FOR TRAINERS

May 2013

This was produced under the USAID-funded Kenya Horticulture Competitiveness Project (KHCP). It is made possible by the support of the American people through USAID. The contents are the sole responsibility of Fintrac Inc. and do not necessarily reflect the views of USAID or the United States government.

WHAT IS APPLIED NUTRITION?

SELECT

PREPARE

COOK

HEALTH

WHAT IS APPLIED NUTRITION?

Trainers note: Ask the participants, "What do you think is applied nutrition?"

*It is what you '**select**' to eat, how you '**prepare**' the food, and how you '**cook**' the food.*

SELECT:

Select a variety of foods from each of the following groups: starches (carbohydrates), fruits and vegetables, proteins, fats and oils, salt and sugar, and water.

- **Starches (Carbohydrates)**: Select a variety of carbohydrates throughout the day including roots, tubers, grains, legumes, and pulses. Make starchy foods the basis of most meals.
- **Fruits and Vegetables**: Select a variety of fruit and vegetables. Include at least five different colors. You will be eating necessary vitamins and minerals to maintain a healthy body.
- **Proteins**: Select a variety of protein from both animal and plant sources. Each week select proteins from sources such as beans, lentils, fish, chicken, beef, goat, rabbit, and eggs.
- **Fats and Oils**: These are necessary for the body to function, but should be used in small quantities.
- **Salt and Sugar**: Reduce your intake of salt and sugar.
- **Water**: Consume at least eight glasses of water daily.

PREPARE:

- Wash your hands. Attend to personal hygiene before preparing food.
- Use only well washed utensils and cooking vessels.
- Wash fruit and vegetables in clean, safe water very well to remove all dirt that maycause diarrhea or gastric upset (vomiting).
- Only remove skin off fruit and vegetables if necessary or inedible.
- Wash and chop leafy greens just before cooking, as this will retain the most nutrients.
- If you need to chop leafy green vegetables, make sure you do not chop the vegetabletoo finely, as this will also reduce the nutrient retention when cooking.
- Pre-soak legumes and pulses to release nutrients and save on fuel since soakedlegumes and pulses take a shorter time to cook.

COOK:

- Ensure animal products are well-cooked to avoid food-borne infections (i.e. diarrhea).
- Avoid over-cooking vegetables, as this will increase the nutrient loss.
- Only cook vegetables just before meal times to retain as many nutrients as possible. The longer cooked vegetables sit in water, the more nutrients are lost.
- Use alternative food cooking methods to make meals interesting and ensure diets contains sufficient nutrients. Cover food that requires long periods of cooking to retain nutrients and save energy.

CHART NUMBER 2

BENEFITS OF HEALTHY EATING

CHART NUMBER 2

BENEFITS OF HEALTHY EATING

Eating the right quantities and variety of foods will improve the health of your body and mind.

Improved Studies:

- Children grow and develop in a healthy way.
- Health of your children will result in better performance in their studies.

Improved Productivity:

- Eating healthy will enable you to physically work harder and make positive decisions, which will lead to making more money.

Healthy Family:

- The possibility of family members becoming ill is reduced when eating a balanced diet; thus, less money is spent on medical costs.
- Spending less on medical costs means you have more money to buy healthy food for the family.


ENERGY SUPPLEMENTS
DAIRY PRODUCTS
FATS & OILS
SPICES
PROTEINS (Animal)
PROTEINS (Plant)
VEGETABLES
FRUITS
STARCHES
DAILY EXERCISES
WEIGHT CONTROL
WATER
Eat a variety from each food group
REPUBLIC OF KENYA
MINISTRY OF HEALTH
infonet-biovision
biovision
Foundation for ecological development
ENIHEALTH

CHART NUMBER 9

SERVING SIZE RECOMMENDATIONS: CEREALS, GRAINS, TUBER, & ROOTS

Each day eat 3 – 5 cups (6-11 servings) of cooked cereals, grains, tubers, or roots.

250 grams = 2 servings

CHART NUMBER 10

SERVING SIZE RECOMMENDATIONS: VEGETABLES & FRUIT

Each day eat 1.5 – 2.5 cups (3-5 servings) of cooked or 3-5 cups of raw chopped vegetables.

250 grams = 2 servings

CHART NUMBER 11

FRUITS

Each day eat 1-2 cups (2-4 servings) of chopped or whole fruit.

250 grams = 2 servings

CHART NUMBER 12

RAW FOODS

Eat raw foods often.

One serving or portion is equivalent to ½ cup fruit or cooked vegetables and1 cup raw vegetables.







CHART NUMBER 13

ANIMAL AND PLANT PROTIEN

Each day eat 80g-120g (1/3-1/2) cup servings of animal protein or 1-2 cups of plant protein (2-4 servings).

250 grams = 2 servings

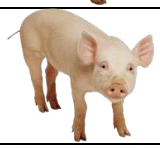
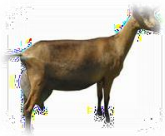
Animal Protein	Plant Protein
	
	
	
	
	
	
	
	

CHART NUMBER 14

SERVING SIZE RECOMMENDATIONS: DAIRY PRODUCTS

Each day take 2 cups of dairy

YOGURT

CHART NUMBER 15

FATS AND OILS

Reduce your intake of saturated fats and oils to one spoonful each day

Choose fats and oils that have this fortification logo:

Appendix 11: Details of How the Intervention Sessions Offered to Women

Module	Sessions	Tasks and activities
Introduction Module	Opening Session: Introducing Thinking Healthy and Diet intervention	**Task 1.** Introduce the importance of maternal nutritional wellbeing and psychosocial wellbeing by emphasizing that the mother is the key to the infant's health and development during pregnancy period, her physical and mental health determine how the baby will progress. Perinatal depression explained Why is it important to manage perinatal depression?
	Conducting thinking healthy-Cognitive behavior therapy	**Task 2.** **Introducing the 3 areas of Thinking healthy (Cognitive Behavioral Therapy)** Three steps: **Step 1.** Learning to identify unhealthy thoughts **(**See Manual) **Step 2**. Learning to replace unhealthy thinking with positive or healthy thinking. **Step.3** practice healthy thinking and acting: refer the manual **Task 3.** Finding solutions to life problems **Task 4.** Introducing the basic principles of Cognitive Behavior Therapy and health belief model that will be used in each session.
	Thinking health about nutrition**:**	**Task 5.** Ground rules for taking part in program. Go through each rule making sure the mother understands and agrees. Refer to the manual **Task 6:** Importance of nutrition during pregnancy ensuring the mother and infant's well-being. Nutrition for mom, how should a pregnant woman eat, My healthy plate. Health food pyramid for Kenya **Task 7.** Explain practice work between sessions
Module 1: Preparing for the baby – pregnancy	Session 1.1: Mother's personal health	The purpose of this session is to review the principles of Thinking healthy and to apply the approach to the mother's personal health **Task 1**. Review the previous session **Task 2**. Review the Mood Chart; Step 1. Learning to identify unhealthy thoughts about the mother's personal health; Step 2. Learning to replace unhealthy thinking with healthy thinking **Task 3**. Thinking Healthy about the mother's personal health. practicing thinking and acting healthy

	Nutrition Module 1 Nutrition Module 2**:**	**Task 4.** Thinking health about nutrition, How should I eat when I'm pregnant woman, My Health plate, applied nutrition, selects, prepare cook and eat health. Benefits of healthy eating, the healthy eating pyramid, the effects of poor nutrition (Tool kit Chart 1,2 and 3 Essential nutrients for brain (Gomez,2010) **Task 5**. Explain practice work between sessions, Meal planning and how to budge
	Session 1.2: Mother 's relationship with the baby Nutrition Module 3:	**Session 1.2 - Mother 's relationship with the baby** To review the progress from the first session and to apply the Thinking Healthy approach to the mother 's relationship with her unborn baby **Review task1&2:** Mood Chart and Summaries the key messages from the previous session **Review Task 3**. Thinking healthy about the mother's relationship with her baby. **Step 1**: Learning to identify unhealthy thoughts about the mother's relationship with her baby **Step2:** Learning to replace unhealthy thinking with healthy thinking **Step 3**: Practicing Thinking and Acting Healthy Nutrition during pregnancy- effect of poor nutrition, basic hygiene (chart 4, 5, 6 and 7) Best methods for cooking food to retain nutrients, tools to use when measuring serving amount; serving size recommendations:cereals, grains, tuber, & roots; serving size recommendations: vegetables & fruit; Importance of eating raw foods (Tool kit chart 8 to 17)
	Session 1.3: Mother 's relationship with people around her Nutrition Module4.	The purpose of this session is to review the progress from the last session and to apply the THINKING HEALTHY approach to the mother 's relationship with people around her, i.e., her immediate family, relatives, friends and the community. **Task 1** Review of previous session and Summarizing the key messages from the previous session. **Task 2** Review Mood Chart **Step 1:** Learning to identify unhealthy thoughts about the mother's relationship with people around her **Task 3** THINKING HEALTHY about the mother's relationship with people around her **Step 2** Learning to replace unhealthy thinking with helpful thinking

		Step 3 Practicing thinking and acting healthy **Activity 1** Assess and monitor social support Animal and plant protein; serving size recommendations: dairy products; Fats and oils, sugar and salt, Water Activity: Check the diet chart and Check rest and relaxation
Module 2 The baby‘s arrival-– the first month	Session 1.1: Mother ‘s personal health Session 1.2: Mother ‘s relationship with the baby	This module followed the same structure as module on breastfeeding and emphasized on the nutrition topics covered in module one. **Sessions 2.1-2.2-7** **Session 2.1 –** Mother‘s personal health **Session 2.2 -** Mother ‘s relationship with the baby **Session 2.3 –** Mother ‘s relationship with people around her
	Session 1.3: Mother ‘s relationship with people around her Nutrition topics; -	Tasks 1&2: Review sessions as module one. (Reference Manual) Tasks3: Thinking healthy about the mother’s personal health **Stages 1,2&**3 of thinking health **Activity 1**: Teach the mother to do the following post-delivery exercises **Activity 2** Check the diet chart: **Activity 3**; Nutrition: Exclusive breastfeeding for the first 6 months Thinking health about nutrition after baby arrives; what should I eat when I’m breastfeeding, Importance exclusive breast-feeding the healthy eating pyramid, brain food; the Benefits of healthy eating when breastfeeding, the effects of poor nutrition for the mother and baby
Module 3: Early infancy and Module 4: Middle infancy	Session 1.1: Mother ‘s personal health Session 1.2: Mother ‘s relationship with the baby Session 1.3: Mother ‘s relationship with people around her	**Module 3: Early infancy and Module** 4: Middle infancy were offered monthly, This module follows the same structure as module one and two. Emphasized on nutrition topics covered in module one and two and follow up The purpose of these session is to assess the mother and baby ‘s health during early infancy (second to fourth month) by listen to her problems, and help her apply the thinking healthy approach and health belief to her personal health in the first few month after birth. The same principle was applied.

MODULE 1

PREPARING FOR THE BABY

Session 1.1 – Mother's personal health

Learning objectives of this session

The purpose of this session is to review the principles of Thinking healthy and to apply the approach to the mother 's personal health. This session is important

because for the first time, you will be helping the mother in practical appli-cation of the concepts learned in the first session.

Job aid required: Health Calendar

TASK 1

Review the previous session

Briefly summarize the key messages from the first session.

Do this sequentially, using the pictures on the Health Calendar as the focus of discussion. When this is done repetitively, the family will start to associate the pictures with the concepts and these will serve as visual cues between sessions, helping the mother form her own mental images which can be discussed.

TASK 2

Review the Mood Chart

Go through the Mood Chart with the mother. Ask if she had had noticed any particular unhealthy thoughts in the lastweek. If yes, praise her for successfully completing the first step. Ask her how these thoughts made her feel and act.Listen attentively and sympathetically.

Now ask if she had tried to replace these with alternative thoughts. If not, discuss, and encourage her and other familymembers to come up with suggestions.

Again, briefly explain the importance of the mother ‘s personal physical and psychological health for the baby thereforethis is the area you would like to address first of all.

TASK 3

Thinking Healthy about the mother's personal health

STEP 1

Learning to identify unhealthy thoughts about the mother'spersonal health

Picture a

to my circumstances there is nothing I can do to improve my health

Using the relevant section of Health Calendar, ask the mother to focus on the woman in picture A and describe the caption that reads out her thoughts. Discuss what these circumstances might be, e.g., poverty, illiteracy, domes- tic problems.

Picture B

There is no point in making an effort

Now ask the mother to focus on Picture B. Discuss how these problems have induced a state of hopelessness and helplessness in the woman.

Picture C

Greater probability of poormother & infant health

Now focus on Picture C. Discuss the consequences of giving up. Do not blame the woman in the picture. Say that this is a very natural hu- man response to stresses and problems. However, it is important to identifythe thinking styles and related feelings early, so that the actions and conse-quences can be changed.

Now ask the mother if she has had such thoughts.

This would be a good time to discuss with the mother the process of childbirth and how and which services would beprovided.

The CHW can also use the Safe Child Birth Checklist published by the WHO.

To access this check list please follow this

link:

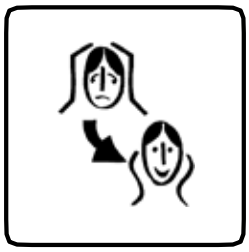
http://www.who.int/patientsafety/implementa

tion/checklists/childbirth/en/

If necessary, prompt the mother with the examples of unhealthy thoughts, actions, and consequences given below.You may add to these examples from your own experience of working with women in your area.

THOUGHT	**FEELING/ACTION**	**CONSEQUENCE**
Being ill is in my fate	Helplessness, sadnessI will not get vaccinated,as there is no point.	Greater risk of illness (tetanus) for both motherand baby
What does an illiterate person like me know about health matters	Poor confidence, self-esteem. No effort made to learn about health matters	Greater risk of poor health for both mother and family

Poor folk like us areborn to be unhelpful	Hopelessness. No attempt made to make maximum use of whateverresources are available	Greater risk of poor health
I am not in control of my general health or pregnancy	Not paying attention to one's symptoms or signsof poor health	Greater risk of seriushealth problems developing



STEP 2

Learning to replace unhealthy thinking with healthy thinki

Picture D

My health matters – Even if I have limitedoptions, I can try to improve my diet with what is available

Focusing on picture D, read out the caption. Discuss if Picture D is abetter alternative to Picture A.

Picture E

My health worker can help me with this

Focusing on Picture E, tell the mother you are there to help her.

Picture F

Small changes can lead to ahealthier you and baby

Discuss that it‘s important not to think in terms of ‘all or none‘. Even small changes (such as those to be discussed in this programme) canmake big differences to the health of the whole family

Now discuss the unhealthy thoughts about personal health that mother may have described in step 1. Ask the motherto think of alternative thoughts.

Ask the mother to think of alternative thoughts for examples described in step 1.

If mother is unable to think of any,prompt her with the following alternative thoughts, feelings/actions, and consequences.

THOUGHT	**FEELING/ACTION**	**CONSEQUENCE**
Looking after my health, to a large extent, is in my control	Making an effort to do positive things for one‘s health, e.g. vaccination	Protection against a potentially fatal illness
It is not necessary to be educated to learn about health matters	Active effort to learn about and follow health principles, e.g. balanced diet.	Better health for motherand baby
Even a poor person can make an effort to stay healthy	Making an effort to make the best use of available resources	Better health for mother and baby
Looking out for problems in pregnancy and getting help early is my responsibility andwill help the doctor/health worker/nurse help me	Looking out for early problem signs and actively seeking help	Decreased risk of pregnancy related problems

STEP 3

Practicing thinking and acting healthy

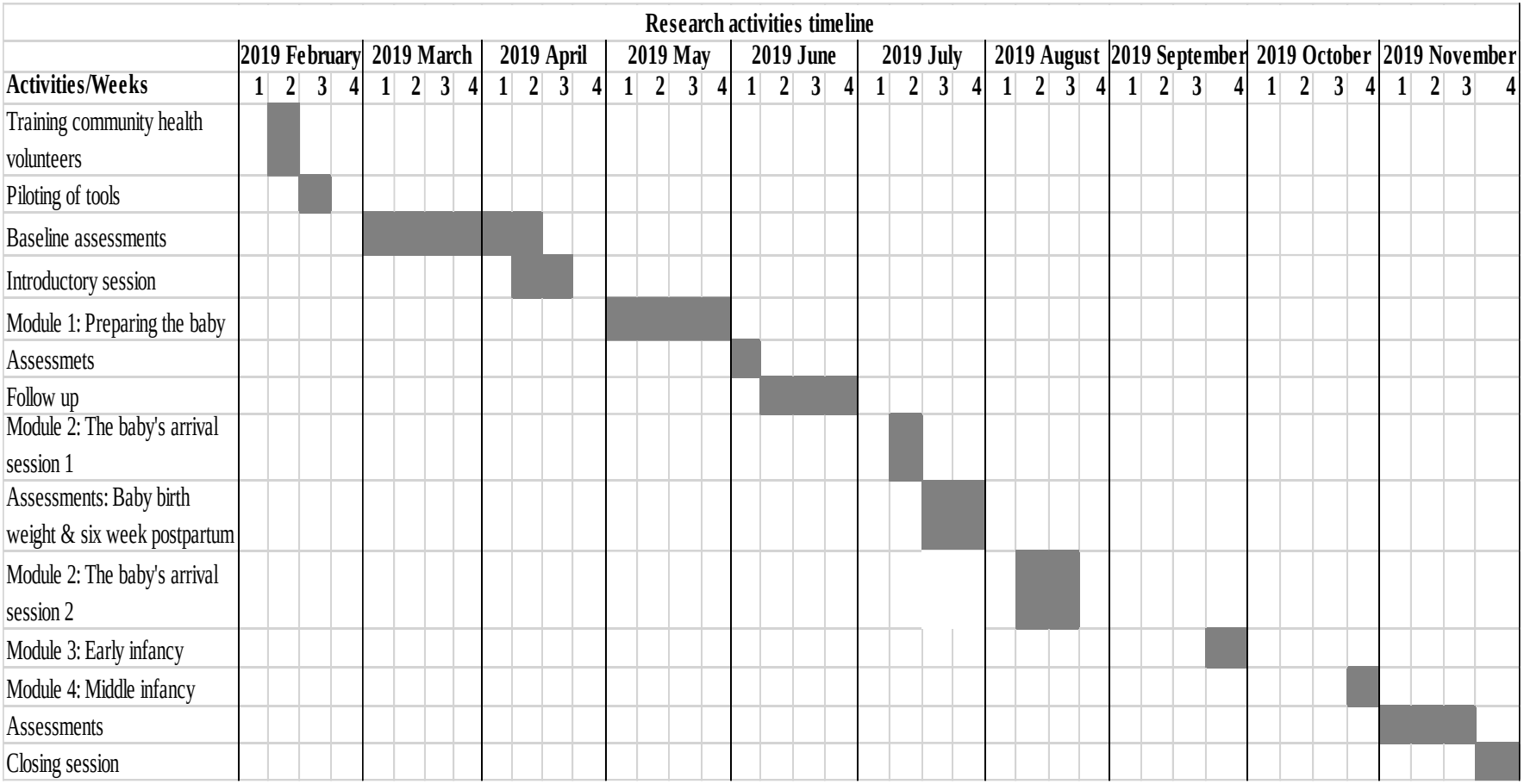
Activity 1

As a CHW you likely will have been taught about maternal nutrition. Tell the mother that you would like to prepare abalanced diet chart from foodstuff easily available in the household. Engage the whole family in this exercise. Use thediet chart provided in the Health Calendar. An example of a diet chart is given below. Include only those items that areavailable in the household..

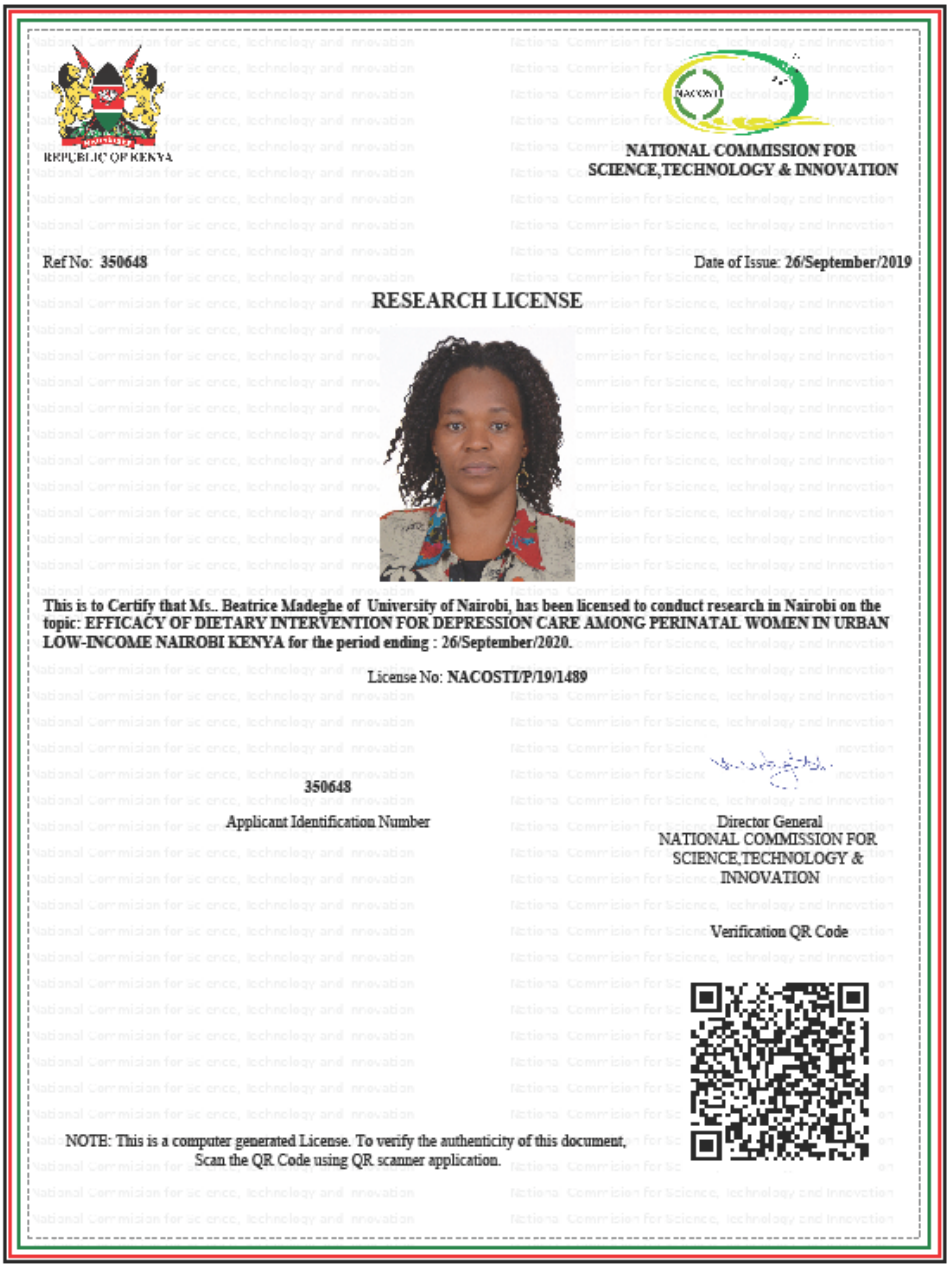
Explain that a balanced diet does not mean expensive or excessive di

TIME	CHOICE OF FOOD ITEMS	DAIY MONITORING						
		1	2	3	4	5	6	7
Breakfast 								
Before Lunch 								
Lunch 								
Tea time 								
Dinner 								
Bedtime 								

Appendix 12: Research timelines



Appendix 13: NACOSTI Permit



REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 350648

Date of Issue: 26/September/2019

RESEARCH LICENSE

This is to Certify that Ms.. Beatrice Madeghe of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: EFFICACY OF DIETARY INTERVENTION FOR DEPRESSION CARE AMONG PERINATAL WOMEN IN URBAN LOW-INCOME NAIROBI KENYA for the period ending : 26/September/2020.

License No: NACOSTI/P/19/1489

350648

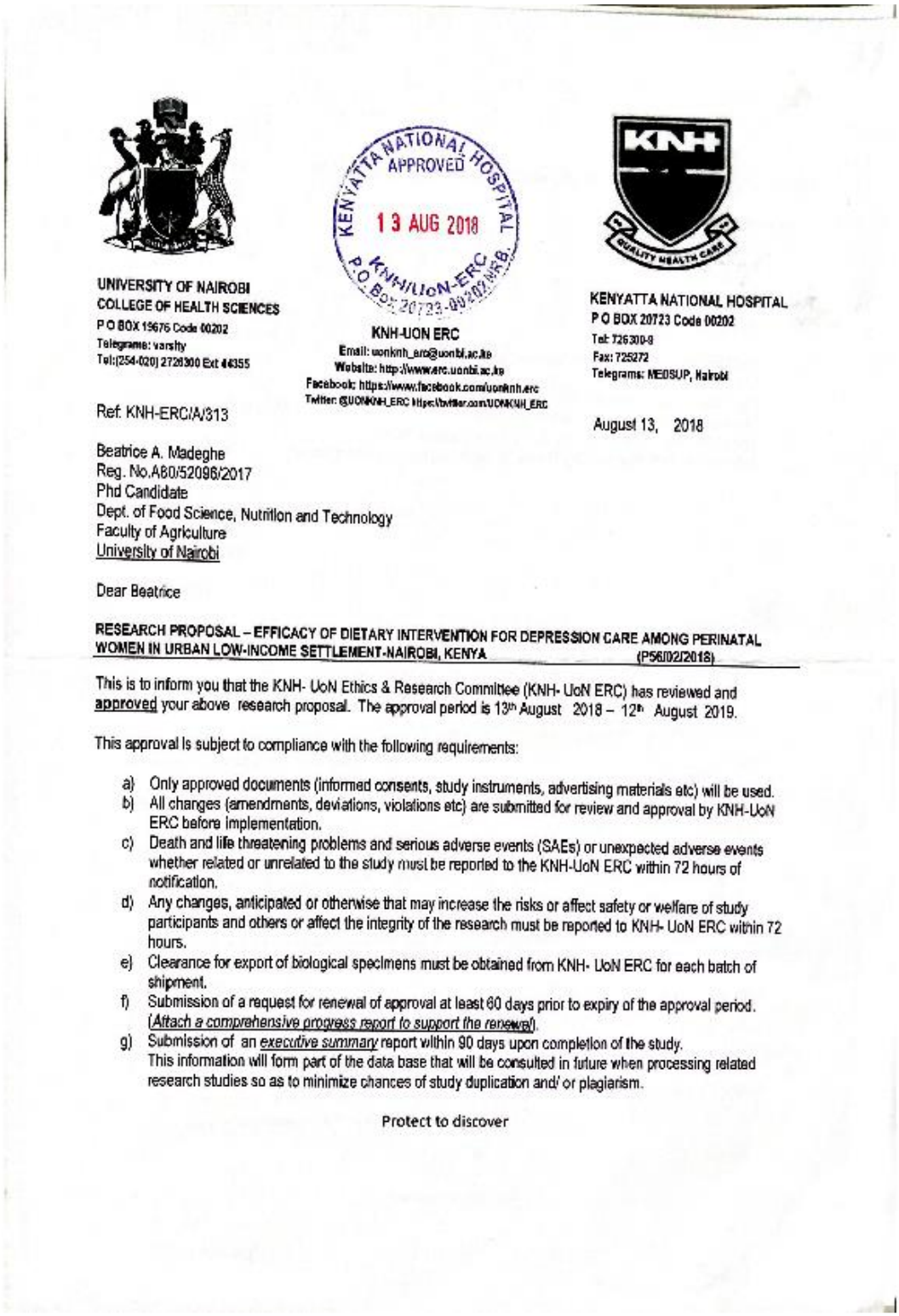
Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix 14: KNH/UON-ERC Clearance



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KENYATTA NATIONAL HOSPITAL
APPROVED
13 AUG 2018
KNH/UoN-ERC
P.O. Box 20723-00202 NAIROBI

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/313

August 13, 2018

Beatrice A. Madeghe
Reg. No.A60/52096/2017
Phd Candidate
Dept. of Food Science, Nutrition and Technology
Faculty of Agriculture
University of Nairobi

Dear Beatrice

RESEARCH PROPOSAL – EFFICACY OF DIETARY INTERVENTION FOR DEPRESSION CARE AMONG PERINATAL WOMEN IN URBAN LOW-INCOME SETTLEMENT-NAIROBI, KENYA (P56/02/2018)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above research proposal. The approval period is 13th August 2018 – 12th August 2019.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover