

**1RISK FACTORS FOR ANEMIA AMONG WOMEN ENROLLING FOR ANTENATAL
CARE FOR THE FIRST TIME AT JUBA TEACHING HOSPITAL, SOUTH SUDAN**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
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DEDICATION

I dedicate this work to the Almighty God for His unending grace and guidance, to my beloved husband Mr. Christo Thon Magor for his understanding, love, support and encouragement and also to my family and my friends for their support, encouragement and for giving me a reason to smile.

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ABBREVIATIONS AND ACRONYMS

ANC	-	Antenatal Care
MCH	-	Mean Corpuscular Hemoglobin
MCHC-		Mean Corpuscular Hemoglobin Concentration
HB	-	Hemoglobin
HIV	-	Human Immunodeficiency Virus
JTH	-	Juba Teaching Hospital
PCV	-	Packed Cell Volume
RSS	-	Republic of South Sudan
WHO	-	World Health Organisation

RISK FACTORS FOR ANEMIA AMONG WOMEN ENROLLING FOR ANTENATAL CARE AT JUBA TEACHING HOSPITAL, SOUTH SUDAN

ABSTRACT

Anemia during pregnancy is a global public health problem affecting developing and developed countries. It is one of the major causes of prenatal and maternal morbidity and mortality globally, contributing to 20% of all maternal deaths. It also contributes to preterm deliveries, low birth weights, fetal growth restriction and infant mortality. In South Sudan, the burden of anemia is presumed to be high, but there is no documentation of its magnitude. Knowledge from an epidemiologic study of anemia in this setting is important to assist in formulating policies for prevention and management of anemia, and thus contribute to a reduction of the disease burden.

OBJECTIVE: To determine the associated risk factors for anemia among pregnant women attending antenatal clinic for the first visit at Juba Teaching Hospital in South Sudan.

Study design and sitting: This was an unmatched case control study which compared 120 antenatal mothers whose hemoglobin levels were less than 11g/dl (cases) against 120 with hemoglobin levels equal or more than 11g/dl (controls). Carried out at antenatal clinic at Juba Teaching hospital; South Sudan

Study population: 240 eligible women attending antenatal clinic for the first time at Juba Teaching Hospital in South Sudan and who had consented for the study.

Data collection and management: A structured questionnaire was administered to all eligible antenatal mothers to determine their sociodemographic, socioeconomic and obstetrics characteristics. Blood sampling for hemoglobin level was done and women found to have hemoglobin level of equal to or more than 11g/dl were classified as non-anemic (controls), while women found to have hemoglobin levels of less than 11g/dl were classed anemic (cases). Blood for malaria parasite, HIV testing and stool analysis

for ova and cyst of parasitic worms such as hookworms was done. Data was analyzed using SPSS software version 21

RESULTS:

A total of two hundred and forty (240) antenatal mothers were enrolled for this study, in which 120 were cases and 120 were controls. Majority was primigravidae (56%), aged between 25-29 years (80%) and married (95.8%). 182 were housewives. 130 started antenatal care late at second trimester. Anemia in pregnancy was significantly associated with certain sociodemographic, obstetric and socioeconomic characteristics. Young age and lack of education significantly increased risk of anemia in pregnancy. The risk of anemia was reduced in those aged above 24 years (OR 0.28, 95% CI 0.1-0.75, P value 0.005). Higher level of education decreased anemia risk during pregnancy (OR 0.28, 95% CI 0.10-0.78, P value 0.015 for college education). Gestational age more than 13 weeks (OR 2.42, 95% CI 1.10-5.32, P value 0.028) as well as higher parity (OR 6.84, 95% CI, 2.35-19.89, P value < 0.001 for grand multiparity) were significantly associated with increased risk of anemia. With regards to diet, 3 or more meals per day (OR 0.17, 95% CI 0.06-0.47, P value 0.001), diet containing liver (OR 0.15, 95% CI 0.08-0.28, P value <0.001) and diet rich in fruits (OR 0.24, 95%CI 0.13-0.43, P value<0.001) significantly reduced risk of anemia. Infections such as malaria and hookworms in index pregnancy significantly increased risk of anemia in the subsequent pregnancy (OR 7.17, 95% CI 2.66-19.33, P value<0.001) and (OR 10.9, 95% CI 2.49-47.7, P value 0.002) respectively.

Conclusion:

The study found that age below 24 years, lack of education, grand multiparty and higher gestation more than 13 weeks, maternal infections such as malaria and hookworms and low socioeconomic status were significantly associated with increased risk of anemia in pregnancy. While diet containing iron such as liver, fruits and eating 3 or more meals per day were significantly associated with decreased risk of anemia in pregnancy

INTRODUCTION AND LITERATURE REVIEW

INTRODUCTION

Anemia is defined by the World Health Organization as hemoglobin level below 11g/dl in first and third trimester and 10.5g/dl in the second trimester. Anemia can further be classified into mild (10-10.9g/dl), moderate (7-9.9g/dl) and severe anemia (<7g/dl)(1). Anemia reduces the oxygen-carrying capacity of the blood due to a reduction in the concentration of hemoglobin or fewer than normal circulating erythrocytes. This deficiency either occurs through increased destruction or reduced production of red blood cells.

Anemia is a worldwide public health issue experienced in both developing and developed countries with major consequences for human health not leaving behind economic and social development. It is experienced in all stages of life cycle, although more common in young children and pregnant women and is considered to be among the major factors contributing to global burden of disease(2). It is estimated anemia affect between 33-75% of pregnant women in Africa (1, 3).

Causes of anemia include: Iron and folic acid deficiencies, malaria and hookworm infections and hemoglobinopathies being the principle causes of anemia in pregnancy (4). Some of these causes have been studied extensively, with malaria causing many as 10,000 maternal deaths through causation of severe anemia (5-7). The predisposing factors are grand -multiparity, young age, low socioeconomic status, and illiteracy (1, 8).

In the developing countries, due to the scarce resources and by extension poor nutrition, the most prevalent form of anemia in pregnancy is iron deficiency anemia accounting for more than 75% of the cases, followed by folic acid deficiency anemia. It is also not unusual to find anemia due to a combination of iron and folic acid deficiency(2). HIV also has a key role in the causation of anemia in pregnancy.

Iron deficiency anemia (IDA) is the most common cause of nutritional anemia due to the fact that as the pregnancy progresses there is more demand for iron for the maternal and fetal tissue growth. Anemia has been attributed with several unfavorable

experiences during pregnancy and in the postpartum period, both for the infant and the mother including an increased risk of hemorrhage, sepsis, maternal mortality, perinatal mortality and low birth weight (9).

Most sub-Saharan Africa countries such as South Africa, have currently adopted national policies to prevent and treat anemia and malaria prophylaxis for all pregnant women, despite this, a high rates of anemia still persist (10).

In South Sudan, the burden is very high yet no study on the prevalence of anemia has been undertaken and thus there is a need to provide data to aid in reduction of the disease burden.

LITERATURE REVIEW

Anemia is defined by hemoglobin levels lower than the defined normal reference ranges. Hemoglobin is the main pigment in red blood cells. Anemia may be due to reduced production of hemoglobin, premature destruction of red cells or through chronic blood loss or an acute voluminous hemorrhage. Anemia leads to a decreased circulation of red blood cells and hence less oxygen in circulation. Levels usually vary with age, sex and physiological status like pregnancy, smoking status and geographical region (due to altitude effects) (11).

World Health Organization(WHO) classifies anemic groups of people as follows: Non-pregnant women (≥ 15 years) 12g/dl, Pregnant women 11g/dl and for Men (≥ 15 years) 13g/dl (1, 6). In the cohort of pregnant women the anemia can further be sub classified into mild anemia (10-10.9g/dl), moderate anemia (7-9.9 g/dl), and severe anemia (< 7 g/dl).

Among the broad classification of anemia using the causative agent (nutritional, marrow disease and hemolytic), nutritional anemia is the most prevalent in both high and low income countries with higher prevalence in the low resource setting(12).

According to WHO statistics of 2008, the prevalence of anemia was estimated at 24.8% of the world's population (1.6 billion people). The highest prevalence is in preschool-age

children (41.8%), the pregnant women (41,4%) and the lowest prevalence in men 12.7%) (3,5,13). In Africa and South East Asia, the prevalence is estimated at 48.2%. The African region has the highest proportion of individuals affected by anemia.

Data from the African region, for the pregnant women cohort are generally sparse as some countries don't aggregate this data, the data from WHO was based on 46 African countries which have the data (3, 5).

Anemia in pregnancy

Generally, prevalence of anemia in pregnancy is lower in developed countries of Europe and USA being about 20% or lower (1). In developing countries of Africa, Latin America and Asia, the prevalence is higher ranging between 40 and 60%, and is even much higher in the sub-Saharan African countries (except South Africa) where it has been estimated to be as high as 70% (1, 2, 14).

A study done in Malawi between July 1997 and June 1998 on the etiology of anemia in pregnant among women attending ANC at St. Elizabeth Hospital in Blantyre found prevalence of anemia 57.1% (12). Another one conducted in Kilifi District on women attending ANC for the first visit shows prevalence of anemia 76% (15).

Study done in Sudan (Eastern Sudan) on prevalence and risk factors of anemia among women attending ANC at Halfa Teaching Hospital found prevalence of 62.6% (16). This exceeds the WHO threshold of prevalence ($\geq 10\%$) for it to be termed as a matter of public health significance.

Nutrition and anemia

The etiology of anemia in pregnancy is multifactorial and varies with different world regions. Specific to sub-Saharan Africa are, malaria, iron deficiency (often exacerbated by hookworm infestation), folate deficiency, hemoglobinopathies and human immunodeficiency virus (HIV) infection. The iron and folate deficiency are also referred to as nutritional anemia (17).

Despite the multifactorial nature of anemia in pregnancy in sub-Saharan Africa, it is believed to be mostly due to nutritional deficiencies, particularly iron deficiency. It is estimated that about 2 billion people suffer from iron deficiency worldwide (13). Hemoglobin is formed from among other things, iron, folate and vitamin B. Studies in West Africa have suggested folate deficiency as a main causative agent for anemia in those populations and vitamins A and B have also been suggested as probable causes of anemia (12). Dietary deficiency of these elements can lead to anemia. This imbalance can be due to low nutrient uptake (poor dietary habits or lack of food), poor absorption of the nutrients from the gut or utilization in the body and lastly due to increased nutrient losses or demands (12).

Despite the reduction of iron requirements during the first trimester due to absence of menstruation, it steadily rises from about 0.8 mg per day during the first month of pregnancy to about 10 mg per day to the last 6 weeks to delivery pregnancy over and above the non-pregnant state. The expansion of maternal red blood cell capacity for increased transport of oxygen, including iron transfer has led to increased iron requirement to both the placental structures and growing fetus. The implication is that these cohorts of women are very likely to develop anemia (18, 19).

Socioeconomic status is more often than not a useful proxy measure for the nutritional status, the key assumption here being that if one is poor then they are unlikely to get their daily nutritional requirements. Some food stuffs have a higher source of iron than others e.g. animal proteins are a good source of iron and this may not be affordable to many people. Also during the dry season, it is not unusual for someone to go for a day without food.

Parasitic infections and anemia

Infections by parasites especially intestinal (hook worms, tapeworms etc.) and shistosomes are very common in developing countries. This is often a mirror of the socioeconomic status of the inhabitants. The foods in these places may not be hygienically prepared and as such contribute to spread of helminthes. These helminthes

cause anemia by sucking blood from the gut or leading to ulceration and perforations in the gut which lead to blood loss (8, 20-22).

Most sub-Saharan countries by virtue of being in the tropics have high malaria endemicity. Malaria during pregnancy is a serious public health problem in Sub-Saharan Africa. It is estimated that each year, approximately 25 million pregnant women in Sub-Saharan Africa are at risk of *Plasmodium falciparum* malaria infection (5). Malaria has been shown to be a major cause of anemia in pregnant women as the parasites attack the red blood cells leading to their destruction and some of the medications used to treat the malaria also lead to red blood cells destruction thus complicating the anemia. It's no wonder then that malaria during pregnancy will frequently lead to severe forms of anemia (2, 17).

The contributing factors for anemia, just like the main causative agents will vary by region and even by season; in the rainy season, there will be more malaria and therefore there may be more anemic. Similarly during the dry season, nutritionally caused anemia may be more prevalent (4, 13, 14).

Chronic infections such as HIV are becoming increasingly culpable in the causation of anemia (12). And with the greatest burden of HIV being in the sub-Saharan countries then it is imperative that if proved to be a risk factor in a given population, then measures should be taken to manage it.

Predisposing factors to anemia

Besides the above factors, higher parity and shorter birth interval (less than two years) contribute to the development of anemia. Also, presence of chronic illnesses, hyperemesis gravidarum, low education level, lack of uptake of supplements, ignorance or other cultural beliefs may predispose the mothers to anemia (16).

Effects of anemia in pregnancy

Anemia in pregnancy is a preventable condition, which is associated with a high risk of cardiac failure and shock, rendering women less able to withstand even moderate blood loss at delivery (17). Anemia has been shown to contribute to maternal mortality,

productivity losses (considerable incapacity to women from tiredness, lassitude, breathlessness, and decreased ability to work) and diminished health and mental capacity in next generation, premature births, low birth weight, fetal impairment and infant deaths (23, 24).

STUDY JUSTIFICATION

An estimated 58.27 million women worldwide are anemic during pregnancy, of which 95.7% live in developing countries. In Sub Saharan Africa, where the burden of anemia is high, it causes maternal and fetal complications such as preterm deliveries, premature rupture of membranes, infections, and low birth weight. There are various risk factors that predispose women to anemia in pregnancy and most studies on these have been conducted in developed countries and other developing countries however none had been undertaken in South Sudan yet.

In South Sudan, despite the policy on iron supplementation and malaria prophylaxis to all antenatal mothers, the burden of anemia still high. The aim of this study was to look at factors associated with anemia in pregnancy among antenatal mothers. This would provide data to assist in good policy formulation, which will in-turn, inform guidelines, improve the quality of antenatal care and reduce the fetal, neonatal and maternal morbidity and mortality.

CONCEPTUAL FRAMEWORK

NARRATIVE

In Sub-Saharan Africa, Low socio -economic status is an important contributing factor for anemia. Mothers of low socio-economic (Poverty) are likely to be infected by parasites such as malaria and hookworms which leads to iron deficiency anemia, also they are likely to have micronutrient deficiency due poor feeding. Increasing parity and lack of education predispose to anemia in pregnancy. Without interventions and knowledge of factors associated of anemia in pregnancy, anemia will continue to lead to maternal complications, such as hemorrhage, puerperal sepsis, preterm labor, prematurity and low birth weight. Therefore, knowledge of sociodemographic, economic

and obstetrics factors predisposing the pregnant women to anemia are important. This would provide data to assist in good policy formulation, which will in-turn, inform guidelines, improve the quality of antenatal care and reduce the fetal, neonatal and maternal morbidity and mortality.

The schematic representation of this conceptual framework is shown below:

CONCEPTUAL FRAMEWORK SCHEMATIC

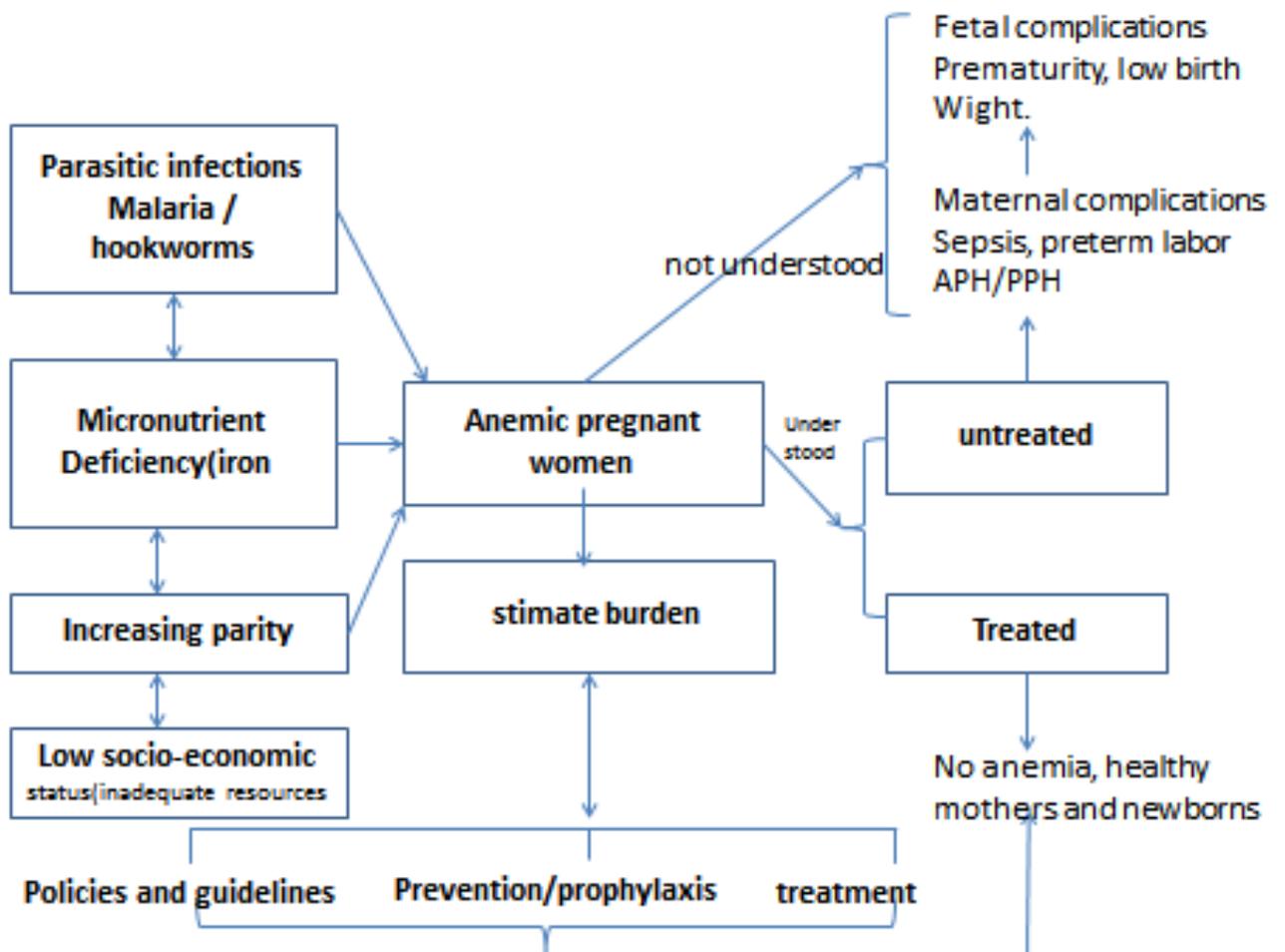


Figure 1: Conceptual framework

RESEARCH QUESTION

Is there a difference in socio-demographic, economic and obstetrics characteristics among pregnant women attending antenatal clinic for the first visit with anemia and without anemia at Juba Teaching Hospital, South Sudan?

HYPOTHESIS

Null hypothesis: There is no difference in socio-demographic, economic and obstetrics characteristics among pregnant women attending antenatal clinic for the first visit with anemia and without anemia at Juba Teaching Hospital, South Sudan.

OBJECTIVES

Broad objective:

To determine the associated risk factors for anemia among pregnant women attending antenatal clinic for the first visit at Juba Teaching Hospital, South Sudan.

Specific objectives:

1. To determine socio-demographic and socioeconomic characteristics of pregnant women attending ANC for the first visit.
2. To determine the obstetrics characteristics of pregnant women attending ANC for the first visit.
3. To explore the association between hookworm and malaria infections and anemia in pregnant women attending ANC for the first visit.
4. To determine the role of dietary factors in relation to anemia in pregnancy among women attending ANC for the first visit.

METHODOLOGY

STUDY DESIGN

This was an unmatched case control study which compared 120 antenatal mothers who were anemic their HB level being $<11\text{g/dl}$ (cases) and 120 antenatal mothers were non-anemic their HB level being $\geq 11\text{g/dl}$ (controls). Multiple exposures were evaluated. These exposures were classified into four broad groups namely: sociodemographic factors, socioeconomic status, obstetric factors and parasitic infections. The aim was to determine the factors associated with anemia among pregnant women attending ANC at Juba Teaching Hospital. The choice of the design was suitable because it was a case control study and thus allowed for a comparison of multiple risk factors of anemia and at the same time allowed for determination of the strength of the association of anemia in pregnancy.

STUDY SITE AND SETTING

Study was carried out in the antenatal clinic at Juba teaching Hospital. It is a government referral hospital located in Juba town which is the capital city of South Sudan. The hospital serves an estimated population of 546,496 and has a total number of 506 beds. It offers a wide range of comprehensive health services i.e. Medical, Surgical, Pediatric, Obstetrics and gynecology and basic emergency services. The hospital has Obstetrics and Gynecology department, which consists of the maternity unit and gynecology ward. The maternity unit, is made up of antenatal and postnatal wards, labor ward, new born unit, antenatal clinic and operating theatre. The maternity unit is managed by four consultant obstetrician gynecologists, 6 medical officers, 8 medical officer interns, clinical officers and nursing staff. Majority of South Sudanese women seek antenatal care and health service there. Attendance for ANC is 7,403 patients per year, and an average of 617 patients every month. Being a referral hospital with high work load made it a suitable site for the study because of the large number of women seen in this facility.

The choice of this setting was suitable because it is a referral hospital which served huge number of the patients and also no similar study has been done in the setting.

STUDY POPULATION

The study population consisted of 240 eligible pregnant women attending antenatal clinic for the first time at Juba Teaching Hospital, South Sudan and who had consented for inclusion into the study. 120 mothers were anemic with HB level <11g/dl (cases), and a similar number were non anemic with HB level of ≥11g/dl (controls).

The choice of this population was suitable because the pregnant women coming to the clinic for the first time were not likely to be on any medication or to have received any supplementation.

SAMPLE SIZE CALCULATION AND SAMPLING PROCEDURES

The sample size calculations were based on calculations to detect a difference in proportions. No available data on anemia in pregnancy, neither study done on anemia burden in South Sudan. We used the findings of a study in Ethiopia (Getachew et al)

Sample size calculation was based on the Fleiss formula for calculating sample size in unmatched case control studies (Fleiss JL. Statistical Methods for Rates and Proportions, 2nd Ed. New York: Wiley; 1981)

$$n = \frac{[Z_{\alpha/2}\sqrt{(r+1)pq} + Z_{1-\beta}\sqrt{rp_1q_1 + p_2q_2}]^2}{r(p_1 - p_2)^2}$$

Where;

$Z_{\alpha/2}$ - Standard normal deviate for 95% level of confidence = 1.96

$Z_{1-\beta}$ - Standard normal deviate for 80% power = 0.84

r - Ratio of cases to control = 1:1 in this study

p_1 - The proportion of pregnant women with at least one known risk factor for anemia in pregnancy. [Based on a study on risk factors of anemia in pregnancy

in Ethiopia, the median prevalence of the five factors that were significantly associated with anemia was 44%. by (Getachew et al)

p_2 - Proportion of non-anemic women estimated to have the risk factors for anemia in pregnancy.

$p_1 - p_2$ - Difference in risk factor prevalence to be detected (set at 18%)

\bar{p} - The average of p_1 and p_2

$P_1=44\%$

$P_2=62\%$

Therefore;

$$n = \frac{[1.96\sqrt{(1+1) \times 0.35 \times 0.65} + 0.84\sqrt{1 \times 0.44 \times 0.56} + 0.26 \times 0.74]^2}{1 \times (0.44 - 0.26)^2}$$

$n = 109$

Therefore, the total sample size was 218 (109 cases and 109 controls)

We inflated the sample size by 10% to cater for any loss to follow-up and non-response.

A sample size of 240 antenatal women was recruited. (120 cases and 120 controls)

STUDY INSTRUMENT

The study instrument was a structured questionnaire administered to the study participants who fulfilled the eligibility criteria. The questionnaire had the following sections:

1. Sociodemographic, socioeconomic and obstetrics characteristics data
2. Dietary data and infections in pregnancy data
3. Clinical examination finding data
4. Laboratory investigation result data

DATA COLLECTION

Data was collected between January 2016 and March 2016. 240 pregnant women were recruited in this study.in which 120 were cases and other 120 were controls. The principle investigator was responsible for conducting all interviews assisted by research assistants. The research assistants were qualified clinical officers, they had one day training on how to fill in the questionnaire and how to carry out clinical examination before data collection started. The questionnaires were examined for clarity and completeness. Appropriate adjustments were made.

The study was carried out as follows: ANC mothers were informed about the study, its objectives, benefits and risks. After informed consent was obtained, patients were interviewed and examined in a private study room. Blood sample was taken for hemoglobin level and clients found to have levels of less than 11g/dl was categorized as cases and they went for further laboratory Investigations and were treated accordingly. Those with hemoglobin levels of ≥ 11 g/dl were assigned to the controls. Blood sample was also taken for malaria parasite and HIV test and stool analysis for ova and cyst of worms. A structured questionnaire was used to collect information from all eligible women to determine their sociodemographic, economic, obstetrics characteristics.

The client flow:

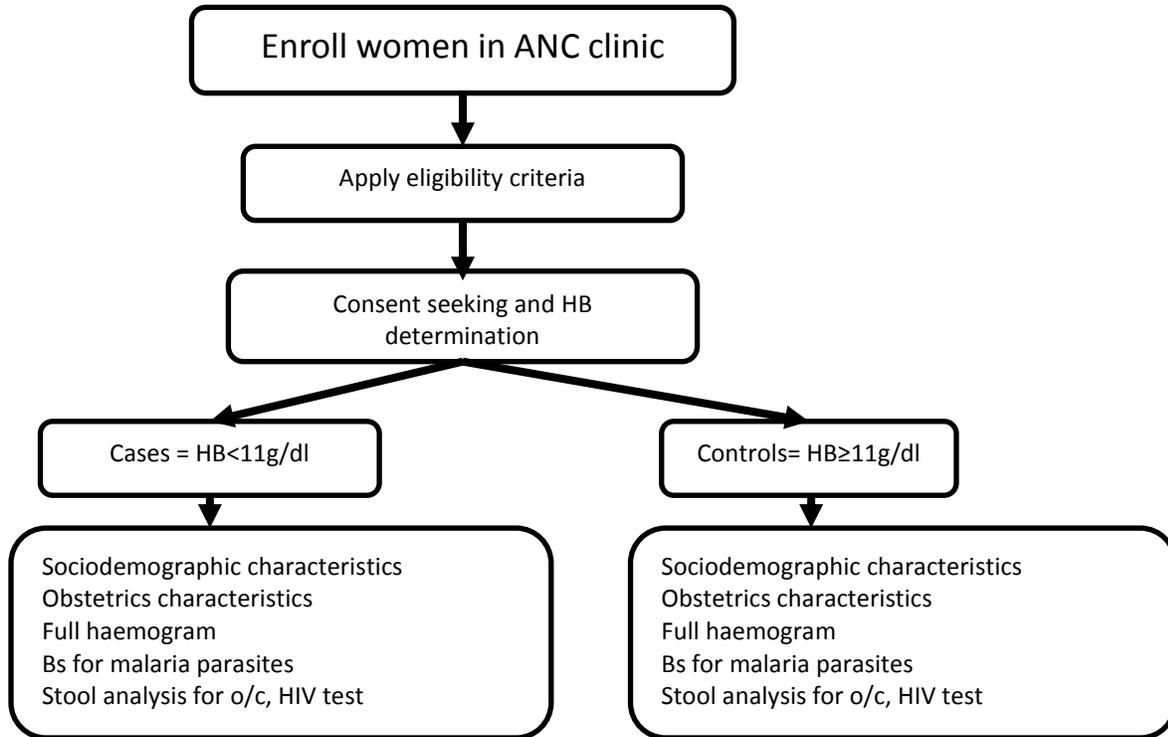


Figure 2: Flow chart

All samples were safely stored and transferred to the laboratory at Juba Teaching Hospital. Questionnaires were filled out (appendix I). Physical examination was carried out by principle investigator and clinical officer (appendix III). After hemoglobin level was determined, those found to have hemoglobin less than 11g/dl were done further investigation and treated. Blood was drawn for full haemogram from antecubital vein about two milliliters put in sequestered bottle, also stool sample was put in plastic containers and examined under microscope for presence of worms such as hookworms, *s. mansoni*, *ascaris* and *E.histolytica*, as well as thick blood slide examined under microscope for presence of malaria parasites. Once the results were ready, they were discussed with the patients and recorded in the lab form

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria

1. All pregnant women attending antenatal care for the first visit at Juba Teaching Hospital during the study period.
2. Pregnant women willing to participate in the study and giving their consent.

Exclusion criteria

1. Very sick pregnant women and thus unable to give consent and those not willing to participate in the study.
2. Pregnant women already on iron supplementation.
3. Pregnant women with chronic renal disease.

DEPENDENT AND INDEPENDENT VARIABLES

Dependent variable

Presence or absence of anemia based on hemoglobin level

Independent/exposure variables

Sociodemographic, socioeconomic and obstetrics characteristics obtained by using the questionnaire. Other data obtained through laboratory studies (Malaria, Hookworm and HIV).

QUALITY ASSURANCE PROCEDURES

Pretesting of the questionnaire was carried out at Juba Teaching Hospital antenatal clinic before actual data collection. The pretested questionnaires were analyzed and the feedback obtained informed changes and adjustments before a final draft. The participants' file numbers were entered in a register upon recruitment for serialization in order to avoid double recruitment. The register was counter checked on a regular basis for double entries, there was no double recruitment encountered during the study. Blood and stool samples collected were stored safely and investigated in laboratory where quality assurance was maintained. Unused blood samples were disposed as per protocol in the Juba hospital laboratory.

DATA MANAGEMENT AND ANALYSIS

The data collected was transferred into a Microsoft Access database and analyzed using SPSS software version 20 (IBM). A quality check was instituted prior to data collection, during data entry and after data entry and was the responsibility of the principle investigator. Prior to data collection, a standard operating procedure for data management was developed based on study questionnaire and planned fieldwork procedures. The research assistants were trained using the manual and they used it during data collection. Codes were defined for the data and used to design a database for data entry. The units of measurement for all physiological measures and laboratory investigation were specified. A metadata or data dictionary was developed to help in archiving and documenting all study data. The gathered data was confirmed for completeness, coded and then entered into computer software, MS Excel and thereafter transferred to SPSS software version 20.0 and analyzed. Data cleaning was conducted using SPSS and was involved looking for missing or irregular entries, The data was protected using passwords and backed up using external hard drives such as flash disks. At the end of the study, raw data were destroyed through shredding.

Data were analyzed using SPSS, while presentation was in the form of tables, charts and graphs. Descriptive statistics (mean, mode, frequencies) were reported to describe the case and control groups while inferential statistics were used to establish the association between anemia in pregnancy and various risk factors using a chi-square. A bivariate logistic regression was used to analyze the probable risk factors as predictors of anemia in pregnancy. During the bivariate analysis unadjusted or crude Odds ratios were estimated along with accompanying 95% confidence intervals for potential risk factors of anemia including sociodemographic factors, economic, obstetric factors, malaria, hookworm infestation and HIV. All risk factors with p values < 0.05 were reported as significant risk factors for anemia in pregnancy. All significant risk factors were then entered into a multivariable logistic regression model with anemia in pregnancy as the dependent variable (1=yes; 0=no) to adjust for confounding. The adjusted odds ratio (95% CI) was reported from the multivariable model.

ETHICAL CONSIDERATIONS

The study was carried out at antenatal care and those found to be anemic were investigated further and treatment offered. Approval was sought from the KNH/UON Ethics and Research committee, as well as from Ethical and Research committee of MOH/ROSS. Informed consent was sought and obtained from the antenatal mothers, participation was voluntary and no incentives were given. Records were coded and patient's names were not used thus confidentiality was maintained. The participants were free to withdraw from the study at any stage and not to answer some questions without penalty.

STUDY LIMITATIONS :

Some of the clients were not able to remember some of the exposure variables (recall bias) and to overcome this; questions were stated in a clear and direct form. Time was a problem, due to shorter study period, and to overcome that counseling and information given about the study to the clients was done in groups and the questionnaire was filled individually after informed consent. Selection of the controls was a challenge most of ANC mothers were anemic

RESULTS

A total of two hundred and forty (240) antenatal mothers were enrolled in this study. Of the total number, one hundred and twenty (120) antenatal mothers were anemic with HB level of less than 11g/dl (cases) and one hundred and twenty (120) antenatal mothers were non-anemic with HB level equal or more than 11 g/dl (controls). Majority were primigravida about 56% (68), majority were at age between 25-29 years (80), 95.8% were married and one hundred and eighty two (182) antenatal mothers were housewives. Majority (130) antenatal mothers started antenatal care late at second trimester .as shown in the tables below

Table 1: Association between sociodemographic characteristics of pregnant women and anemia

Sociodemographic characteristics	Anemic (cases = 120) N (%)	Non-anemic (controls = 120) N (%)	OR (95% CI)	P value
Age				
< 20 years	22(18.3)	8(6.7)	1.0	
20-24 years	40(33.3)	29(24.2)	0.5(0.17-1.39)	0.147
25-29 years	35(29.2)	46(38.3)	0.28(0.1-0.75)	0.005
30-34 years	17(14.2)	27(22.5)	0.23(0.1-0.7)	0.003
35 years and above	6(5)	10(8.3)	0.22(0.05-0.95)	0.018
Marital status				
Married	115(95.8)	117(97.5)	1.0	
Single/ widowed	5(4.2)	3(2.5)	1.70(0.40-7.26)	0.477
Highest level of education				
None	34(28.3)	23(19.2)	1.0	
Primary	50(41.7)	41(34.2)	0.82(0.42-1.61)	0.574
Secondary	29(24.2)	39(32.5)	0.50(0.25-1.03)	0.060
College	7(5.8)	17(14.2)	0.28(0.10-0.78)	0.015
Place of residence				
Rural	21(17.5)	10(8.3)	1.0	
Urban	99(82.5)	110(91.7)	0.43(0.19-0.95)	0.038

Table 1: Shows that the sociodemographic characteristics of pregnant women. Age 24 years and below, low level of education and rural residence, were significantly associated with increased risk of anemia. The odds of anemia in pregnancy was significantly reduced in aged 25 years and above, (OR 0.28, 95%CI 0.1-0.75, P value=0.005) college education (OR0.28, 95%CI 0.10-0.78, P value= 0.015) and residing in urban areas (OR0.43, 95%CI0.19-0.95, P value=0.038).The other socio-demographic factors were not associated with risk of anemia.

Table 2: Association between obstetric characteristics of antenatal mothers and anemia

Obstetric characteristics	Anemic (cases = 120) N (%)	Non-anemic (controls = 120) N (%)	OR (95% CI)	P value
Parity				
Primigravida	30(25.0)	38(31.7)	1.0	
Para 1	24(20.0)	30(25.0)	1.01(0.49-2.08)	0.971
Para 2	14(11.7)	28(23.3)	0.63(0.28-1.41)	0.263
Para 3-4	25(20.8)	19(15.8)	1.67(0.78-3.58)	0.191
Grand Multiparous	27(22.5)	5(4.2)	6.84(2.35-19.89)	<0.001
Gestation at enrolment				
1-13 weeks	16(13.3)	36(30.0)	1.0	
14-27 weeks	75(62.5)	57(47.5)	2.96(1.50-5.86)	0.002
>28 weeks	29(24.2)	27(22.5)	2.42(1.10-5.32)	0.028
Previous pregnancies				
Yes	97(80.8)	87(72.5)	1.0	
No	23(19.2)	33(27.5)	0.63(0.34-1.15)	0.129
Duration since last pregnancy				
<1 year	20(16.7)	14(11.7)	1.0	
1-2years	31(25.8)	33(27.5)	0.66(0.28-1.52)	0.328
>2years	46(38.3)	40(33.3)	0.80(0.36-1.80)	0.597

As shown in table 2, the obstetric characteristics that were significantly associated with increased risk of anemia in pregnancy were grand multiparity (OR= 6.84, 95%CI 2.35-19.89, P value<0.001), gestation at enrollment (OR= 2.96, 95%CI 1.50-5.86, P value 0.002) and higher gestation more than 13 weeks (OR= 2.43, 95%CI 1.10-5.32, P value 0.028). The other obstetric factors were not significantly associated with risk of anemia.

Table 3: Association between socioeconomic characteristics, diet of antenatal mothers and anemia

Socioeconomic characteristics	Anemic (cases = 120) N (%)	Non-anemic (controls = 120) N (%)	OR (95% CI)	P value
Current occupation				
Housewife	98(81.7)	84(70.0)	1.0	
Employed	17(14.2)	30(25.0)	0.49(0.25-0.94)	0.033
Not employed	5(4.2)	6(5.0)	0.71(0.21-2.42)	0.589
Husband's occupation				
Employed	90(75.0)	103(85.8)	1.0	
Not employed	24(20.0)	17(14.2)	1.62(0.82-3.20)	0.168
Number of meals per day				
Once/day	18(15.0)	6(5.0)	1.0	
1-2/day	77(64.2)	64(53.3)	0.40(0.15-1.07)	0.068
=> 3/day	25(20.8)	50(41.7)	0.17(0.06-0.47)	0.001
Diet in the last one week before ANC visit				
Liver	21(17.5)	71(59.2)	0.15(0.08-0.28)	<0.001
Vegetable	117(97.5)	118(98.3)	0.66(0.11-4.03)	0.653
Fruits	58(48.3)	97(80.8)	0.24(0.13-0.43)	<0.001
Milk	41(34.2)	43(35.8)	0.98(0.57-1.67)	0.939

As shown in table 3, risk of anemia was significantly decreased among employed women (OR=0.49, 95%CI 0.25-0.94, P value= 0.033). It was also decreased significantly in those consuming 3 or more meals per day and having a diet containing

liver and those rich in fruits (OR=0.17,95%CI 0.06-0.47,P value=0.001), (OR=0.15,95%CI 0.08-0.28,Pvalue<0.001) and (OR=0.24,95%CI 0.13-0.43,P value<0.001) respectively. The other factors were not associated with risk of anemia.

Table 4: Association between medication taken in index pregnancy and anemia

Medications taking in index pregnancy	Anemic (cases = 120) N (%)	Non-anemic (controls = 120) N (%)	OR (95% CI)	P value
Any medications taken during current pregnancy				
No	78(65.0)	89(74.2)	1.0	
Yes	41(34.2)	30(25.0)	1.56(0.89-2.73)	0.12
Medication taken				
Deworming medications	4(3.3)	5(4.2)	0.79(0.21-3.03)	0.735
HIV medications	1(0.8)	0(0.0)	NA	NA
Antimalarial prophylaxis	17(14.2)	9(7.5)	2.04(0.87-4.77)	0.102

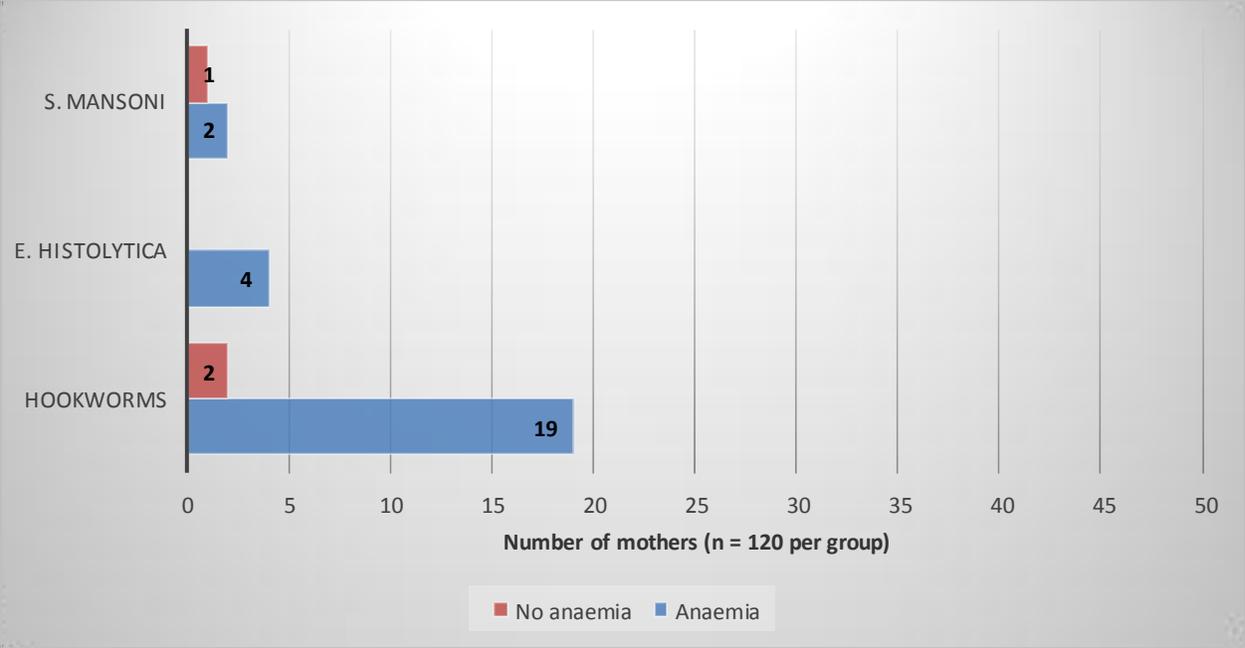
Table 4 shows that medications taken in index pregnancy were not associated with risk of anemia. .

Table 5: Association between Infections (Malaria and HIV infection) in index pregnancy and anemia

Infections in index pregnancy	Anemic 120 N (%)	Non-anemic 120 N (%)	OR (95% CI)	P value
Clinical malaria episode in index pregnancy				
No	62(51.7)	87(72.5)	1.0	
Yes	48(40.0)	33(27.5)	2.04(1.18-3.54)	0.011
Malaria parasites on peripheral blood film				
Absent	89(74.2)	114(95.0)	1.0	
Present	28(23.3)	5(4.2)	7.17(2.66-19.33)	<0.001
HIV test				
Negative	112(93.3)	117(97.5)	1.0	
Positive	4(3.3)	1(0.8)	4.18(0.46-37.96)	0.204
Not tested	0(0.0)	1(0.8)	NA	

Table 5 shows that malaria infection in index pregnancy was significantly associated with increased risk of anemia. OR=7.17, 95% CI 2.66-19.33, P value<0.001), the odds of anemia was about 7 fold in malaria infected antenatal mothers and that HIV infection was not significant risk of anemia in this study.

Figure 3: Association between Parasitic infection in index pregnancy and anemia



As shown in figure 1, parasitic infection was significantly associated with increased risk of anemia, the odds of anemia was tenfold higher in hookworm infected women (OR= 10.9,95% CI 2.49-47.7, P value = 0.002). The others were not associated with risk of anemia.

DISCUSSION, CONCLUSION AND RECOMMENDATION

DISCUSSION

Anemia in pregnancy is a major public health problem especially in developing countries with a global prevalence of 41.8% (Pena Rosas, De-Regil 2012). Apart from increasing the risk of death by up to five times, anemia in pregnancy predisposes both the mother and fetus to complications including, but not limited to, preterm labor, premature rupture of membranes, susceptibility to infections, prematurity, low birth weight, low APGAR scores and infant death.

The study found that age less than 24 years, low level of education, grand multiparity, higher gestational age, low socioeconomic status and infections in index pregnancy such as malaria and hookworm were significantly associated with increased risk of anemia in pregnancy. However, other known causes of anemia such HIV were not significantly associated with increased anemia risk in pregnancy.

In keeping with a WHO report that the commonest cause of anemia in pregnancy is nutritional, this study found similarly whereby iron-rich diets such as those with liver and fruits were significantly associated with reduced risk of anemia in pregnancy. Also, consuming 3 or more meals per/day was significantly associated with reduced risk of anemia in pregnancy. Similar findings were report in study done in South west Ethiopia (24).

World health organization reported^[1] the peak of anemia in pregnancy to be in the third trimester and in this study similar findings were reported. The odds of anemia in pregnancy was increased about 2fold at higher gestation more than 13 weeks. Similar finding were reported in study done in Eastern Sudan on prevalence of anemia and risk factors (16). This study also found that women aged 24 years and below, those with low level of education and rural residence were significantly associated with increased risk of anemia in pregnancy. The odds of anemia in pregnancy were significantly reduced in aged 25 years and above and in those residing in urban areas. This is consistent with a study conducted in Ethiopia and Kakamega County, Kenya, on risk

factors of anemia in pregnancy (12, 24). Pregnant women in rural areas are generally from lower socioeconomic class and are more likely to lack of knowledge on adequate nutrition during pregnancy and have inequitable access to health care. It is however, important to note that the link between urbanization and anemia has not been extensively studied. This study also found that low socioeconomic status and lack of employment were significantly associated with increased risk of anemia in pregnancy which is consistent with study done in South west Ethiopia (24).

According to the KDHS 2009, only 15% obtain antenatal care in first trimester in Kenya and only 47% received care before second trimester (24 weeks). This study found that majority of antenatal mothers started at second trimester. Similar finding were reported in study done in Kakamega County, Kenya on anemia prevalence and possible risk factors (12). From a study done in an antenatal clinic in Eastern Sudan on prevalence and risk factors of anemia (16), it was concluded that grand multiparity is associated with increased risk of anemia in pregnancy, similar to our finding of a 6fold increased odds of anemia among grand multiparous women.

Malaria, also known to be a major cause of anemia in pregnancy (16, 25), was found to be significantly associated with increased risk of anemia in pregnancy, the odds of anemia being 7fold in malaria infected antenatal mothers. This may be explained by the study being based in malaria endemic area. The findings of this study reinforce what others have stated that malaria control is important in pregnant women. Similar finding were reported in study done in Gabon on prevalence of plasmodium falciparum infection in pregnancy (25). Our study also found that parasitic infections such as hookworms were significantly associated with increased risk of anemia in pregnancy, the odds being tenfold higher in hookworm infected women. This is similar to the findings of study done by Shulman that reported iron deficiency and hookworm infestation as the main causes of anemia in women attending ANC in their district hospital (18, 15, and 21).

Other causes of anemia in pregnancy like HIV and use of antiretroviral medications were not associated with risk of anemia in pregnancy in this study,

This study had some limitations and as such the findings have to be interpreted and applied cautiously. Firstly, we did not measure the ferritin levels in the women who participated in this study and hence we were unable to estimate the prevalence of the deficiency. We however used surrogate indicators of this (dietary intake and pica) and it's therefore not unusual that liver and fruits were protective against the anemia. Secondly, the study sample size calculation was based on malaria parasitemia; this may have limited the detection of other important associations like HIV. This was chosen due to the fact that the prevalence of malaria is high in this region and HIV is presumed low or uncharacterized hence would have necessitated a large number of women to be recruited. The resources and time could not permit this.

CONCLUSION

Factors significantly associated with increased risk of anemia in pregnancy were: age below 24 years, lack of education, grand multiparity, late antenatal start, higher gestation more than 13 weeks, infections in index such as malaria and hookworm infections and low socioeconomic status. Dietary factors, such as eating 3 or more meals per day and consuming a diet containing liver and fruits were significantly associated with decreased risk of anemia in pregnancy. HIV infection was not significantly associated with anemia risk and that lack of association could be due to the few cases in the study that resulted in lack of adequate power to detect a difference. The other characteristics of pregnant women that were studied were not found to be significantly associated with risk of anemia in pregnancy.

RECOMMENDATIONS

1. Health education talks on good nutrition, early initiation of antenatal care, routine iron supplementation, antimalarial prophylaxis and deworming measures should be encouraged.
2. There should be stringent guidelines on screening, investigation and treatment of anemia, parasitic infections and HIV in all pregnant women.
3. There is need for more research on nutrition and infections in the context of anemia in pregnancy.

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APPENDICES

APPENDIX I: WORK PLAN

PROJECT MONTHS	May	June	July	August	September	October	November
Proposal development							
Proposal presentation							
Ethical approval							
Training of study team							
Data collection							
Analysis of data manuscript writing/Presentation							

APPENDIX II: QUESTIONNAIRE

Data collection sheet of risk factors for anemia among pregnant women attending antenatal clinic for the first visit at Juba Teaching Hospital/ South Sudan

ANC NO.....

SERIAL NO.....

A- General information

1. What is your current age in completed years?

.....

2. How many times have you delivered?

- a. Primigravida ()
- b. Para 1 ()
- c. Para 2 ()
- d. Para 3 -4 ()
- e. Grand multiparous ()

3. What is the gestation of the index pregnancy at the time of ANC visit (in weeks)?

- a. 1-13 weeks ()
- b. 14-27 weeks ()
- c. \geq 28 weeks ()

4. Have you had any previous pregnancies?

- a. Yes ()
- b. No ()

5. If yes, what is the duration since the last pregnancy?

- a. < 1 year ()
- b. 1-2 years ()
- c. > 2 years ()

6. What is your marital status?

- a) Married ()
- b) Single ()
- c) Separated/divorced ()
- d) Widowed ()

7. What is the highest level of education attained?

- a. Primary ()
- b. Secondary ()
- c. College ()
- d. None ()

8. What is your current occupation?

- a. House wife ()
- b. Employed ()
- c. Not employed ()

9. What is your husband's occupation?

- a. Employed ()
- b. Not employed ()

10. Place of residence

- a)Rural ()
- b)Urban ()

11. History of any illness or infection in index pregnancy

- a. No ()
- b. Malaria ()
- c. Vaginal bleeding ()
- d. Parasitic infection ()
- e. Others ()

12. Have you ever had blood transfusion in index pregnancy?

- a. Yes ()/why/when.....
- b. No ()

13. Any medications taken during in index pregnancy

- a. Yes()/what.....,why.....,when.....
.....
- b. No ()

14. on average how many meals do you eat /day?

- a. Once /day ()
- b. 1-2/day ()
- c .>3/day ()

15. Have you consumed (eaten or drunk) any of the following in the last one week?

- a. Liver ()
- b. vegetable ()
- c. Fruits ()
- d. Milk ()
- e. other

16. Have you been eating any non-food (Pica, Tobacco) items in idex pregnancy?

- a. Yes ()
- b. No ()

B- Physical examination

a. Pallor () b. Edema... () c. Jaundice... ()

d. Temperature.... () e. Splenomegaly ()

f. weight in kgs.....()

g. height in cm.....()

LABORATORY FORM

ANC NO.....

SERIAL NO.....

1- FULL HEMOGRAM

a) Hemoglobin concentration

a) ≥ 11 g/dl ()

b) 10-10.9 g/dl ()

c) 7-9.9g/dl ()

d) < 7 g/dl ()

b) Red cell count.....

c) Leucocytes

Total

Differential.....

Neutrophils.....,Basophils.....,

Eosinophil.....Monocytes.....

Lymphocytes.....

d) Platelet count.....

e) PCV.....

f) MCV.....

g) MCH.....

h) MCHC.....

i) **2-Stool analysis for ova and cyst, yes () or No ()**

a) Hookworms () b) Ascaris () c) Trichuris ()

d) E.histolytica () e) S. mansoni ()

3-Peripheral Blood Film Picture for Malaria

1) Present..... ()

2) Absent..... ()

4-HIV test

a) Yes +ve () -ve ()

b) No ()

APPENDIX III: INFORMED CONSENT

Introduction:

I am Dr. Doris Paul Mayom Akech, a postgraduate student registered for master of medicine, in obstetrics and gynecology at University of Nairobi, Kenya.

Purpose of the study:

I am carrying out a study as a part of the requirement for Master of Medicine qualification.

The objectives of the study are to determine the risk factors of anemia among pregnant women attending antenatal clinic at Juba Teaching Hospital.

I am requesting you to participate in this study as a client of ANC at JTH. I would also like to inform you about the ethical considerations which will guide your participation:

1. Participation is voluntary
2. You are free to withdraw from the study at any time and there are no consequences for your decision.
3. You are free to ask any question in order to understand the study.
4. We will maintain confidentiality at all times.
5. This study has been reviewed by an ethics committee. You can access it if you wish.

I will be available to answer any questions that will help you to understand the nature of the study. Understanding the nature of the study is very important. If you wish to seek any clarification, kindly contact me on 0955120109.

BENEFITS

There are no personal benefits for the participant but there will indirect benefits is that the study will help a better understanding of factors associated with anemia among pregnant women attending ANC at Juba Teaching Hospital.

RISKS

There are minimal risks involved in participation. The participant might experience pain and discomfort during drawing of blood samples and these procedures are conducted as part of routine care in ANC.

CONSENT FORM

University of Nairobi

Study participation consent form

Risk factors for anemia among pregnant women attending antenatal clinic for the first visit at Juba Teaching Hospital/South Sudan

Principle investigator:

Dr: Doris Paul Mayom Akech, MBChB. Postgraduate student in Department of Obstetrics and Gynecology,
School of Medicine, College of Health Sciences
University of Nairobi, +211955120109, +254721381040

Investigators' statement

We are asking you to be in a research study. The purpose of this consent form is to give you the

Information you will need to help you decide whether to be in the study. Please read this form carefully. You may ask questions about what we will ask you to do, the risks, the benefits and

Your rights as a volunteer, or anything about the research or in this form that is not clear. When

Your questions have been answered, you can decide if you want to be in this study or not.

This process is called "informed consent".

Purpose and benefits

The aim of this study is to determine the risk factors for anemia in pregnancy among pregnant women attending antenatal clinic at Juba Teaching Hospital, South Sudan. And to know their prevalence among pregnant women, this study will benefit society by providing information that can be used to improve services, and quality of antenatal care. This will ultimately lead to healthier births and improved rates of maternal and neonatal mortality.

Procedures

This is what will happen if you decide to participate in this study. I will ask you questions about your age, parity, marital status, economical status, previous deliveries and the current pregnancy. If your hemoglobin level is less than 11g/dl, I will do further investigations i.e. I will draw 2ml of blood for a full haemogram and blood slide for malaria parasites. Also I will require a stool sample to investigate further causes of the anemia.

Risks, stress, or discomfort

You may become embarrassed, worried, or anxious when answering some of the questions as they are of a personal nature e.g. the socio-economic history. Participation in the study will require you to commit your time. Completing the questions will take 20-30 minutes. However, we will try to serve you as quickly as possible.

Other information

We will keep your identity as a research subject confidential. Only the investigator, institutional review board of University of Nairobi Ethics and Research Committee will have access to the information about you. The information about you will be identified by the study number and will not be linked to your name in any records. Your name will not be used in any published reports about this study. Although we will make every effort to keep your information confidential, no system for protecting your confidentiality can be completely secure. It is still possible that someone could find out you were in this

study and could find out information about you. You may withdraw from the study; refuse to answer any of the questions asked or to have any of the tests described above at any time without loss of benefit or penalty. If you have any questions regarding the study you can contact the investigator listed above. You are free to refuse to participate in the study, if you decide not to participate in the study you will receive similar care to that provided to ANC mothers participating in the study.

Signature of investigator _____ Date _____

Name of Investigator _____

Subject's statement:

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. If I have questions later on about the research I can ask the investigator listed above. If I have questions about my rights as a research subject, I can call the ministry of health ethic and research committee /Juba South Sudan +211912401827. I will receive a copy of this consent form.

Signature of subject _____ Date _____

Or, Left thumbprint of subject
_____ Date _____

Name of Subject _____

Signature of witness (If thumbprint used) _____

Name of Witness _____

University of Nairobi Ethics and Research Committee

Hospital Road along Ngong Road

P.O. Box 20723 Code 00202, Nairobi

Telephone 2726300 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

Website: www.uonbi.ac.ke/activities/KNHUoN

Secretary, KNH/UON-ERC: PROF, A.N. GUANTAI

Copies to:

1. Subject
2. Investigator's file

SUPERVISORS:

Prof. Koigi Kamau, MBCHB, M.Med (Obs & Gynae).

School of Medicine, College of Health Sciences, University of Nairobi.

Associate professor Department of Obstetrics and Gynaecology, University of Nairobi.

Prof. Eunice Cheserem, MBCHB, M.Med (Obs&Gynae), Dip-IMHC.

Associate Professor, Department of Obstetrics and Gynaecology

School of Medicine, CHS UON.

Questionnaire Translations

التذييل 1: الاستبيان عن

استمارة جمع البيانات من دور عوامل الخطر من فقر الدم أثناء الحمل بين النساء الحوامل ممن يترددن على عيادة في مستشفى جوبا جنوب السودان

عدد الزيارات الرعاية قبل الولادة:-----
الرقم :-----

التسلسلي

أ- معلومات عامة

١ ما هو العمر في سنة؟:-----

٢ كم مرات ولدتى؟:-----

- أ امرأة حامل للمرة الاولى
ب امرأة حامل للمرة الثانية
ج امرأة حامل للمرة الثالثة
د امرأة حامل للمرة الاولى

٣ ما هي فترة الحمل على مؤشر الزيارة الرعاية قبل الولادة (في أسابيع)؟

- أ ١ - ١٣ أسابيع
ب ١٤ - ٢٧ أسابيع
ج ٢٨ أسابيع

٤ هل لديك أي حالات الحمل السابقة؟

- أ نعم
ب لا

٥ إذا كانت الإجابة بنعم ، ما هي المدة منذ الحمل ؟

- أ > ١ سنة
ب ١- ٢ سنوات
ج < ٢ سنوات

٦ الحالة الشخصية المتعلقة بالزواج

- أ متزوج
ب أعزب
ج فصل/ مطلق
د أرمل

- ٧ ما هي أعلى مستوى من التعليم؟
 أ الابتدائية
 ب الثانوية
 ج الكلية/الجامعة
 د لا شيء من الوارد أعلاه
- ٨ ما هي وظيفتك الحالية؟
 أ زوجة/ربة منزل
 ب موظف عام, موظف دولة/مشغل
 ج لا اعمل
- ٩ ما هو عمل زوجك؟
 أ موظف عام, موظف دولة
 ب لا يعمل
- ١٠ مكان الإقامة
 أ الريف
 ب مدينة, بلدة, حاضرة
- ١١ تاريخ من أي مرض في الحمل
 أ لا شيء
 ب الملاريا
 ج نزيف مهبل
 د عدوى الأمراض الطفيلية-----
 ه آخرين
- ١٢ قبل هل تم نقل الدم لك في هذه الحمل؟
 نعم () /لماذا- - - - متى -----
 أ لا
 ب
- ١٣ أي من الأدوية خلال الحمل الحالي؟
 نعم//لماذا
 أ لا شيء
 ب
- ١٤ على متوسط ما عدد الوجبات التي تأكل؟
 مرة واحدة يوميا
 أ ١ - ٢/ في اليوم
 ب < ٣ مرات في اليوم
 ج

ماذا أكلتني و شربتني منذ أمس (٢٤ ساعة أذكر)؟

١٥

الكبد

أ

الخضرا

ب

ثمار

ج

الحليب

د

أخرى

هـ

هل تم تناول أي غير الغذائية التبغ و البنود خلال هذا الحمل؟

نعم

أ

لا

ب

ب. الفحص البدني

Pallor/الشحوب كلما بكرت

أ

الاستقساء

ب

مرضع يرقان

ج

درجة حرارة الجسم،

د

تضخم غير طبيعي للطحال (طب)

هـ

الوزن/ كجم

و

٣. الموافقة المسبقة

أنا الدكتورة دوريس بول ميوم اكيثش طالب دراسات عليا التسجيل في ماجستير طب في التوليد وأمراض النساء في جامعة نيروبي، كينيا

الغرض من هذه الدراسة هو جزء من شرط مؤهلات ماجستير طب في التوليد وأمراض النساء

الأهداف لتحديد عوامل الخطر من الإصابة بفقر الدم بين النساء الحوامل اللاتي يترددن على عيادة الولادة بمستشفى جوبا

أنا أطلب منكم أن تشارك في هذه الدراسة

الاعتبارات الأخلاقية على هذه المشاركة .

١ مشاركة طوعية

٢ العمل مجاناً إلى الانسحاب من الدراسة في أي وقت

٣ العمل على طلب أي من أجل فهم هذه الدراسة

٤ السرية هو الحصول على

أنا سوف تكون مستعدة للرد على أية أسئلة، فهم طبيعة الدراسة الهامة جدا

إجراءات الدراسة

من المحقق أن الموافقة على التوقيع، كما سيتم طرح أسئلة استبيانات منظمة

استفاد

لا توجد منفعة شخصية للمشاركة ولكن هناك فوائد غير مباشرة هو أن مزايا الدراسة سوف يساعد على فهم أفضل من انتشار عوامل الخطر من الإصابة بفقر الدم بين النساء الحوامل الذين حضروا المؤتمر الوطني الافريقي في جوبا مستشفى تعليمي

المخاطر

هو الحرج من بعض الأسئلة عند الرد، مثل الحالة الزوجية، الاجتماعية - الاقتصادية التاريخ

التوقيع----- التاريخ-----

APPENDIX V: LETTER OF ETHICAL APPROVAL



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
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KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/369

28th August 2015.

Dr. Doris Paul Mayom Akech
H58/69863/2013
Dept. of Obs/Gynae
School of Medicine
University of Nairobi

Dear Dr. Mayom

RESEARCH PROPOSAL –RISK FACTORS OF ANEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC FOR THE FIRST VISIT AT JUBA TEACHING HOSPITAL/SOUTH SUDAN: A CASE CONTROL STUDY (P341/05/2015)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 28th August 2015 – 27th August 2016.

This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- 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.
- 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.
- 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).
- Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- 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.

For more details consult the KNH/UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to discover



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 Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC



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For more details consult the KNH/UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to discover

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

- c.c. The Principal, College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chairperson, KNH/UoN-ERC
The Dean, School of Medicine, UoN
The Chairman, Dept. of Obs/Gynae, UoN
Supervisors: Prof. Kolgi Kamau, Prof. Eunice Cheserem