

**LEVELS AND DETERMINANTS OF NUTRITIONAL STATUS,  
KNOWLEDGE AND PRACTICES OF ADULT  
OSTEOARTHRITIS PATIENTS: THE CASE OF KIKUYU  
ORTHOPAEDIC AND REHABILITATION CENTRE, KENYA**

By

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## Declaration

This Dissertation is my original work and has not been presented for a degree in any other University.

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## Acronyms and Abbreviations

AARD	Association of Arthritis and Rheumatic Disease
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Diseases Control and Prevention
CPHR	Center for Public Health Research
CI	Confidence Interval
DDS	Dietary Diversity Score
FGD	Focus Group Discussion
GPPAQ	General Practice Physical Activity Questionnaire
HIV	Human Immunodeficiency Virus
IU	International Units
Kcal	Kilocalories
KII	Key Informant Interview
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
KORC	Kikuyu Orthopedic and Rehabilitation Centre
MOH	Ministry of Health
NASR	Nutrition Assessment Shared Resource
NCC-CC	National Collaborating Centre for Chronic Conditions
NCDs	Non Communicable Diseases

NHS	National Health Service
NSAIDS	Non-steroidal Anti-inflammatory Drugs
OA	Osteoarthritis
RDA	Recommended Dietary Allowance
RR	Relative Risk
SD	Standard Deviation
SPF	Sun Protection Factor
SPSS	Statistical Program for Social Sciences
UK	United Kingdom
U.S.A.	United States of America
WHO	World Health Organization

## Operational Definitions

- Adult:** A person who has reached the age of eighteen years or beyond.
- Arthritis:** Inflammation of a joint, usually accompanied by pain, swelling, and stiffness, and resulting from infection, trauma, degenerative changes, metabolic disturbances, or other causes. It occurs in various forms, such as bacterial arthritis, osteoarthritis, or rheumatoid arthritis.
- BMI:** Body Mass Index, an indicator of wasting and/or overweight in adults computed by dividing an individual's weight in kilograms by the square of his/her height in metres.
- Co-morbidity:** Refers to either the presence of one or more disorders (or diseases, in addition to a primary disease or disorder, or the effect of such additional disorders or diseases.
- Concoction:** A combination of various ingredients, usually herbs, spices, condiments, powdery substances or minerals, mixed up together, minced, dissolved or macerated into a liquid.
- Knowledge:** Knowledge here refers to awareness of nutrition information and skills gained through nutrition education and counseling on appropriate nutrition and dietary management of medical conditions offered by health workers.

**Obesity:** Condition of malnutrition in which there is deposition of excessive body fat around the body particularly in the subcutaneous tissue that arises from intake of food in excess of the body's energy requirement. Can be measured using the weight to height ratio. Usually defined with a BMI equal to or greater than 30.

**Osteoarthritis:** The most common kind of arthritis, it is a progressive, degenerative wear and tear of the joint cartilage. The disease affects large weight bearing joints of the body such as hips, knees, ankles, elbows and shoulders that undergo wear and tear.

**Overweight:** Body weight above some standard acceptable weight that is usually defined in relation to height. Usually defined with a BMI greater than 25 but equal to or less than 29.9.

**Sedentary Behaviour:**

Refers to time spent sitting or reclining (leaning or lying backwards) at work or at home, getting to and from a place, or with friends including time spend (sitting at a desk, sitting with friends, traveling in a car, a bus, train, reading, knitting, playing cards or watching television), within a day (24 hours) but does not include time spend sleeping at night.

## Abstract

Osteoarthritis (OA) is the commonest condition that affects human beings; however, there is paucity of information in its management in Kenya and Africa at large. According to the Association of Arthritis and Rheumatic Disease of Kenya (AARD) there is sufficient evidence that arthritis is a growing burden in this country hence the need to improve quality of life of arthritis sufferers by empowering them to participate in their own care by being part of the treatment plan which involves medication, diet, weight management and physical activity.

The objective of this study was to determine the nutritional status, knowledge and practices of adult OA patients. The study took place at Kikuyu Orthopedic and Rehabilitation Centre (KORC) in Kikuyu County from November 2011 to January 2012. A structured questionnaire was pretested and used to collect information on socio-economic demographics, nutritional knowledge, dietary diversity and level of physical activity. Anthropometric measurements of height and weight were used to calculate BMI and determine nutritional status of the patients. Focus Group Discussion guide and Key Informant interview guide were used to collect qualitative data. SPSS 16.0 and Ms-Excel 2007 software was used for statistical data analysis.

A sample size of 205 OA patients was determined using the Fischer's formula. The study design was cross-sectional, descriptive and analytical in nature. Sampling procedure involved purposive sampling of KORC and exhaustive sampling method was used to select respondents.

The respondents were aged between 18-74 years and 26.8 % were male while 73.2 % were female, 31.2 % of the respondents originated from Nairobi County and 30.7 % from



Kiambu County. The study showed that more than two thirds (80.2 %) of the respondents had low level of knowledge (scored 0 % to 40 %), 8.7 % correctly described a balance diet as diet containing carbohydrates, proteins, fats, vitamins and minerals and 67 % described it as adequate amount of food. Eighty six (86 %) of the respondents had moderate dietary diversity score consuming between 4-8 food groups in a day. Fifty percent (50 %) of the respondents reported that they suffered from other diseases with 45 % suffering from hypertension and 25 % from diabetes mellitus.

In conclusion, OA patients have low nutritional knowledge. Their daily dietary intake of fruits (30.7 %), eggs (7.3 %), milk and milk products (15.6 %) is low while that of fish and sea foods (3.4 %) which are known to be rich in omega 3 and Vitamin D is extremely low. Majority of the patients are overweight or obese (71 %). Physical activity level is moderate while sedentary behavior mean time is 4.8 ( $\pm 2.2$ ) hours.

Education level is related to nutritional status ( $r=0.360$ ,  $p=0.014$ ), knowledge ( $r=0.419$ ,  $p=0.024$ ) and dietary practices ( $r=0.539$ ,  $p=0.002$ ). There is a positive association between nutrition knowledge and dietary diversity ( $r=0.127$ ) ( $p=0.04$ ). Physical activity is related to nutritional status ( $\chi^2=10.129$ ,  $P=0.03$ ). Approximately 42.9 % of the variance of nutritional status is accounted for by age, monthly income and education level.

To improve patient's nutritional status and knowledge therefore there is need to educate the public on healthy habits such having a balanced diet and exercising. Nutritionists should work closely with OA patients in order guide them on appropriate diet, weight management and physical activity.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background to the Study

Arthritis is a condition associated with joint inflammation. It describes more than 100 rheumatic diseases and related conditions that affect joints, tissues that surround the joints and other connective tissues (Cheng, 2010). Arthro is a Greek word for joint referring to inflammation. The pattern, severity and location of symptoms can vary depending on the specific form of the disease (Cheng, 2010).

Osteoarthritis (OA) is a type of arthritis, known as one of the oldest and most common disease in human beings (Adole *et al.*, 2011). Osteoarthritis is also known as degenerative joint disease, arthrosis, osteoarthrosis or hypertrophic arthritis. Osteoarthritis causes the cartilage to lose its elasticity and predisposes it to likely damage should it stiffen. The cartilage which acts as a shock absorber and cushion gradually wears away in some areas and upon damage, then tendons and ligaments are stretched, which causes pain. Eventually the bones may rub against each other causing very severe pain (Dava and Arthur, 2006). The disease affects large weight bearing joints of the body such as hips, knees, ankles, elbows and shoulders that undergo wear and tear. Therefore the problems that occur in osteoarthritis include; progressive cartilage destruction, sub-articular cysts formation, sclerosis of surrounding bone, osteophyte formation and capsular fibrosis (Gluet, 2010).

It has been established that musculo skeletal diseases are common worldwide and are reported to be one of the leading causes of morbidity (Ekwom, 2011). Research findings from Kenya's Ministry of Health indicate that diseases of bones and joints are extremely common and inflict an enormous burden on cost in the health system. Musculoskeletal diseases are the leading cause of pain, disability and absenteeism from work (MOH, 2004).

Low back pain has reached epidemic proportions especially in urban areas, and is reported by 80 % of people at some time in their life's. Forty percent (40 %) of people over the age of 70 years suffer from osteoarthritis of the knee. Eighty percent (80 %) of patient with osteoarthritis have some degree of limitation of movement, and 25 % cannot perform their major daily activities (MOH, 2004).

In Kenya and the world in general, this is the bone and joint decade, dedicated to raising awareness of the growing burden of arthritis, to improve quality of life of arthritis sufferers by empowering patients to participate in their own care and to support research on the causes and treatment of arthritis. Promotion of cost effective prevention and treatment of arthritis and sensitizing of health professionals about arthritis is part of the initiative (Oyoo, 2004).

According to the Ministry of Health, Kenya became the second country in Sub-Saharan Africa to endorse the World Health Organization (WHO) Bone and Joint Decade; for many years in this country, HIV and malaria have attracted much of the public's attention and available resources. It is imperative to appreciate that non-communicable diseases like arthritis that take longer to be visible are just as bad in the long run and they cause substantial influence on the health and quality of life of

individuals (MOH, 2004). The risk of developing osteoarthritis is largely related to lifestyle factors like diet, weight, exercise and previous injury, dietary and lifestyle changes have huge effect on the prevention and management of osteoarthritis (Hand and Nicholas, 2011; MOH, 2004).

Excessive body weight increases the load borne by weight bearing joints. Obesity causes changes in posture and gait and in overall locomotor activity, which must be taken in to account in considering joint biomechanics (Oyoo, 2000). Obesity is associated with OA of the knee and gout. The association between obesity and OA of the knee has been shown to exist prior to as well as concurrent with obesity, indicating that obesity is a risk factor for and not merely a consequence of OA (Oyoo, 2000).

Research has evidently proved that foods rich in Vitamin C, D, Beta-carotene and Omega 3 are appropriate for slowing down the progression of the disease. Diets that are high in refined foods like rice, white bread, white pasta, and laden with saturated and trans fats have been shown to contribute to the development or progression of OA (Hand and Nicholas, 2011).

This study therefore focused on the role of appropriate nutrition in the prevention and management of OA by assessing the nutritional status, knowledge and practices of patients in Kikuyu Orthopedic and Rehabilitation Centre (KORC), Kenya.

In seeking to respond appropriately to the goals of the bone and joint decade, this study focused on the nutritional status and practices of osteoarthritis patients, earmarked to contribute to increased awareness on the role of appropriate nutrition, in the prevention and management of osteoarthritis.

## 1.2. Statement of Research Problem

Global statistics indicate that musculoskeletal conditions continue to affect hundreds of millions of people. This scenario typifies Kenya, where osteoarthritis remains a recurrent problem and a disease with no cure. However there is much more patients could adopt as corrective measure to prevent and minimize the overall effects on their everyday life. A treatment plan for osteoarthritis includes both drug and non-drug treatments (Akala, 2010).

There is increasing vulnerability towards osteoarthritis in Kenya, hence there is need to consider additional investment both in resources and research aimed at minimizing emerging cases of osteoarthritis (Machamba, 2011). This calls for sustained public awareness across various community groups, to dispel the myth that osteoarthritis is an inevitable rite associated with aging (NCC-CC, 2008).

While many campaigns on nutritional education on other diseases have been carried out in the country, the musculoskeletal diseases have not received as much attention, and there are limited guidelines to enhance the knowledge and skills of health providers, patients, and caregivers and the public at large with regard to nutrition and osteoarthritis. The problem within the current decade is that little has been done to establish whether osteoarthritis patients have the right nutritional practices and whether their nutritional status is related to the disease (Machamba, 2011).

### 1.3 Justification of the Study

Diet influences musculoskeletal health and appropriate diet prevents obesity a cause and co-morbidity of osteoarthritis. Obesity is a major risk factor for OA of the knee. Other studies have revealed that adults with obesity are less likely than those without obesity to follow physical activity recommendations, despite the known benefits of physical activity for weight loss and weight maintenance (Cooper *et al.*, 2000).

The drug treatment is mainly medication while the non-drug treatments are appropriate nutrition and exercise each with its own benefits and contribution to the overall success of the treatment plan (Dava and Arthur, 2006). According to research the size of muscles around a joint are not a guarantee to the prevention of OA, which is the reason why evidently most athletes end up suffering from OA later in life. Healthy joint surface resulting from proper diet to enhance the replacement of cartilage is the only guarantee for the prevention of OA not through exercise or medication (Machamba, 2011).

In a study undertaken by Afya Kenya, over 80 % of older adults suffer from OA (Akala, 2010). This condition causes pain and can make it difficult for older people to take care of themselves. However, patients who take charge of the disease through a self-management program can lower pain, improve their function and overall quality of life. Such self-management programs focus on nutrition and physical exercises (Akala, 2010).

Insurance companies in Kenya spend enormous amount of money on OA and its co-morbidities because the disease takes a long time to treat and impact negatively on patients and companies (Machamba, 2011).

## **1.4 Aim of the Study**

The aim of this study was to contribute data that can be used to raise awareness of the public and care providers on the relationship between osteoarthritis, nutritional status and practices of patients.

## **1.5 Purpose of the Study**

The purpose of this study was to generate useful information on the nutritional status, knowledge and dietary practices of adult OA patients for effective dietary and weight management among the patients.

## **1.6 Objectives**

### **1.6.1 General Objective**

To determine the levels and factors associated with nutritional status, knowledge and practices of adult osteoarthritis patients attending orthopedic clinic at KORC.

### **1.6.2 Specific Objectives**

1. To determine the demographic and socio-economic characteristics of OA patients.
2. To determine the level and sources of nutritional knowledge regarding OA among the patients.

3. To determine dietary diversity in relation to Energy, Protein and Micronutrients (Vitamin C, Beta-carotene, Vitamin D and Omega 3) among OA patients.
4. To assess nutritional status and other co-morbidities among OA patients.
5. To determine the level of physical activity among OA patients.
6. To determine the factors associated with knowledge, practices and nutritional status among OA patients.

## **1.7. Research Questions**

1. What is the level and sources of nutritional knowledge regarding OA among patients at KORC?
2. What is the dietary diversity score of OA patients from KORC?
3. What is the nutritional status of OA patients from KORC?
4. Which co-morbidities do OA patients from KORC suffer from?
5. What is the level of physical activity of OA patients from KORC?
6. How much time do OA patients from KORC spend in sedentary behavior?
7. What are the factors associated with knowledge, practices and nutritional status among OA patients from KORC?

## **1.8. Scope and Limitation of the Study**

This study was limited to adult patients suffering from osteoarthritis from Kikuyu Orthopedic and Rehabilitation Centre.



## 1.9 Expected Benefits

The research findings will be useful to OA patients in an effort to foster a self-management approach towards the management of osteoarthritis in addition to the medication obtained from hospitals. Increased awareness will benefit community household members, service providers and the general public on the significance of appropriate diet as a means of preventing and managing osteoarthritis.

This research will contribute to the goal and objectives of the bone and joint decade initiative which is to improve bone and joint health by enhancing collaborative efforts among individuals and organizations in order to raise awareness of the growing burden of musculoskeletal disorders on society, to promote wellness and prevent musculoskeletal disease, and to advance research that will lead to improvements in prevention, diagnosis and treatment (CDC, 2009).

# CHAPTER TWO : LITERATURE REVIEW

## 2.1 Osteoarthritis

Osteoarthritis is a tissue destructive process managed by minimizing tissue damage, the management constitutes of medication and self-management techniques, which include; appropriate nutrition and exercise. The administration of appropriate nutrition in the management of osteoarthritis defines the scope of this study. Self-management implies taking control of living with the condition, and is crucial for emotional and physical well-being. Eating a well-balanced diet is imperative for osteoarthritis patients since the diet provides them with the nutrients they need and helps them maintain a healthy weight (Taylor, 2010).

## 2.2 Global Overview of the Disease

The arthritis care annual report reports that 10 million people in the UK have some form of arthritis, and it is the commonest form of physical disability in the UK (Arthritis Care, 2011). Osteoarthritis, the most common form of arthritis currently affects nearly 27 million people in the United States, and costs an estimated \$5,700 annually per person living with the disease. With the combination of inactivity, obesity, injury and the aging of Americans, the rising prevalence of osteoarthritis is expected to escalate the severe health and economic effects of this disease (CDC, 2010).

The effect of musculoskeletal diseases worldwide has led to the Bone and Joint Decade initiative which is a global, multi-disciplinary initiative targeting the care of people with musculoskeletal conditions--bone and joint disorders. Its focus is on improving the quality of life as well as advancing the understanding and treatment of those conditions through research, prevention and education. The bones and joints that create function and movement are connected by muscle and ligaments, their state of health and how they enable a person to lead an active and healthy life is what the initiative aims to improve (CDC, 2010).

### **2.3 Disease Pattern by Age and Gender**

Research has established that the arthritis burden is greater for women than men. In view of a study done at KNH out of 1167 arthritis patients, a sample size of 204 was studied, 17.24 % of the patients had osteoarthritis, the ratio of male to female was 1:6 and the mean age was 60.6 yrs (Ekwom, 2011).

This pattern is the same worldwide; the CDC epidemiologists established that approximately one million hospitalizations occurred in 2003 for which arthritis was the primary diagnosis. Nearly 60 percent of these were for women. Furthermore, an estimated 43 million visits to physician's offices and outpatient clinics were made in one year with arthritis as the primary diagnosis. Women accounted for 64 % of those visits; the burden and impact are greater among U.S.A. women than men (Helmick, 2007).

## **2.4 Role of Nutrition in Osteoarthritis Management**

Nutrition plays a role in osteoarthritis care and the effect depends on the general approach of patients to food, the amount they eat; whether that makes them overweight or malnourished and the specific food items they may try to avoid or consume in quantity because they either aggravate or ameliorate arthritis pain. Osteoarthritis being a disease of inflammation, the most effective and logical treatment is anything that fights inflammation. Medical management of arthritis usually starts with ibuprofen and other anti-inflammatory medications, and nutritional care starts with anti-inflammatory foods. When it comes to specific foods patients should eat an anti-inflammatory diet that involves avoiding foods that make inflammation worse (saturated fat, trans fat and simple refined carbohydrate) and eating plenty of foods that reduce inflammation (Bauer,2007).

## **2.5 Nutritional Requirements for Osteoarthritis Patients**

### **2.5.1 Macronutrient Requirement**

A healthy body weight is achieved by balancing the energy intake in the diet with the energy used through activity. However, every individual has unique nutritional requirements, depending on age, gender, body size and level of activity. The guideline for daily intake is 2,000 kilocalories (kcal) for an active woman and 2,500 kcal for an active man. Therefore, for people with osteoarthritis who are less able to exercise, the only way to lose weight is to eat fewer calories (Bauer, 2007).

## 2.5.2 Micronutrient Requirement

The risk of developing osteoarthritis is largely related to lifestyle factors like diet, weight, exercise, and previous injury. Dietary and lifestyle changes can have a significant effect on the prevention and management of osteoarthritis. According to nutrition research foods rich in antioxidants and anti-inflammatory substances are beneficial to osteoarthritis patients as they relieve inflammation and pain (adopted from Hand and Nicholas, 2011).

Vitamin C helps to reduce the progression of osteoarthritis. It is involved in the formation of both collagen and proteoglycans (two major components of cartilage, which cushions the joints). Vitamin C is also a powerful antioxidant that helps to counteract the effects of free radicals in the body, which can damage cartilage.

Vitamin C is found in citrus fruits, strawberries, peppers, kiwi, cantaloupe, green-leafy vegetables, cauliflower, tomatoes, potatoes, and pineapple. Adults need between 75 mg (women) and 90 mg (men) of vitamin C each day, osteoarthritis experts recommend consuming 200 milligrams of vitamin C daily (Hand and Nicholas, 2011).

Beta-carotene is an antioxidant that helps reduce the risk of osteoarthritis progression. Beta-carotene is found in red, yellow, and orange fruits and vegetables (pumpkin, cantaloupe, peppers, and carrots) and many dark-green leafy vegetables (spinach, kale, Romaine lettuce). Adults require about 2,330 International Units (IU) of beta-carotene each day, osteoarthritis experts recommend 9,000 IU of beta-carotene daily (Hand and Nicholas, 2011).

Vitamin D is necessary for proper calcium absorption and bone structure, which are crucial in proper joint functioning. A low intake of vitamin D appears to

increase cartilage loss. Vitamin D is known as the sunshine vitamin because the body can make it when the skin is exposed to ultraviolet sunlight, all that is needed is 15 minutes of exposure (face, arms and legs), without wearing SPF (Sun Protection Factor) which blocks the ability to make this conversion, three to four times a week. However, it may be difficult for some people to meet the suggested daily exposure, including people who do not get outdoors much, people who are bundled up during the winter months with little sun exposure, and for older people whose skin is less efficient at this conversion (Hand and Nicholas, 2011).

Fortified milk and cereals, eggs, tuna, and fish-liver oils all help the body obtain vitamin D. Supplements are another option, but it is important to discuss this with the health care provider first. Recommended vitamin D intake ranges from 600 IU (for adults up to age 70) to 800 IU (for adults over age 70), osteoarthritis experts suggest at least 600 IU daily (Hand and Nicholas, 2011).

Omega-3 fatty acids suppress inflammation and are used to form the outer membranes of joint cells. Omega-6 fatty acids, on the other hand, promote inflammation that can contribute to the pain and stiffness of osteoarthritis. Most people consume approximately 10 times more of the inflammation-promoting omega-6's than they do the anti-inflammatory omega-3's (Hand and Nicholas, 2011).

Patients should decrease the intake of omega-6 fatty acids by cutting back on corn, safflower and cottonseed oil. Limit the intake, as much as possible, of saturated fats and trans-fatty acids. Nutrition and health experts recognize that omega-3's are healthy and should be a part of the diet. Osteoarthritis experts recommend three grams

of omega-3 fatty acids daily (with 0.7 grams coming from fish sources). Omega-3 fatty acids are found in cold-water fish (such as salmon, halibut, tuna and sardines), pecans, walnuts, soy foods (tofu, soybean oil), olive and canola oils, flaxseeds, and flaxseed oil (Hand and Nicholas, 2011).

(Refer to appendix 11 for nutrient composition for different types of food).

## **2.6 Effects of Obesity on Osteoarthritis**

Obesity causes osteoarthritis and is not merely the result of inactivity imposed by the disease when it affects weight-bearing joints. Obese subject who do not yet have OA can significantly reduce the risk by losing weight. A weight loss of only 5kg is associated with a 50 % reduction in the risk for symptomatic knee OA. It is important to instruct the obese patient in dietary weight reduction principles but the degree of inactivity imposed by OA and a characteristic low calorie requirement make weight loss difficult (Oyoo, 2000).

Being overweight puts extra stress on the joints, which increases the risk of wear and tear. In fact, every one pound of weight a person loses equates to four pounds less stress and pressure on the knees. The other reason why being overweight is a problem is that body fat is not just an inert substance; it is metabolically active, capable of producing hormones and chemicals that actually increase levels of inflammation. By losing weight and avoiding excess calories that can cause weight gain patients automatically, reduce the level of inflammation in the body (Bauer, 2011).

Body mass index (BMI) indicates whether weight is within a healthy range. This is weight (in kilograms) divided by height (in meters) squared. People are classified as underweight if they have a BMI of below 18.5, normal if their BMI is 18.5-24.9, overweight if their BMI is 25-29.9 and obese if, it is over 30 (Bowman and Russel, 2006).

### 2.6.1 Osteoarthritis and other co morbidities

General practitioners should be alert to the presence of co-morbidities when managing patients with osteoarthritis. In a study undertaken by Medline and Embase a total of 89 relevant studies were identified. The review found evidence for 18 co-morbidities which met the inclusion criteria. The meta-analysis determined statistically significant associations for overweight with the incidence of type II diabetes, all cancers except esophageal (for female), pancreatic and prostate cancer, all cardiovascular diseases (except congestive heart failure), asthma, gallbladder disease, osteoarthritis and chronic back pain (Dunstan *et al.*, 2008).

There is a strong association between overweight defined by body mass index (BMI) and the incidence of type II diabetes in females (RR = 3.92 (95 % CI: 3.10-4.97)). Statistically significant associations with obesity was found with the incidence of type II diabetes, all cancers except esophageal and prostate cancer, all cardiovascular diseases, asthma, gallbladder disease, osteoarthritis and chronic back pain. Obesity defined by BMI was also most strongly associated with the incidence of type II diabetes in females (Dunstan *et al.*, 2008).



## **2.7 Food and Nutrient Interaction**

While it is true that everyone stands to benefit from a well balanced diet, people with arthritis need extra care to eat well because the illness creates its own obstacles to good nutrition. According Dava and Arthur, (2006), pain often interferes with food shopping and cooking. Nausea and other gut reactions to medications may reduce appetite giving way to malnutrition, while the necessity to eat every time a patient is taking medicine may lead to excess calorie intake hence weight gain.

## **2.8 Food Consumption Patterns and Trends**

Diets evolve with time, being influenced by many factors and complex interactions. Income, prices, individual preferences and beliefs, cultural traditions as well as geographical, environmental, social and economic factors all interact in a complex manner to shape dietary consumption patterns. National availability of the main food commodities provides a valuable insight into diet and their evolution over time. Actual food availability may vary by region, socio-economic level and season (Drewnowski and Popkin, 1997).

Nutritional practices play a major role in shaping consumption patterns of healthy people and those suffering from arthritis. The practices influence the choice of food; the cooking method for each type of food; the combination of foods to increase bioavailability and provision of essential nutrients; frequency of food consumption and the quantities to consume to meet the required daily allowances.

## **2.9. Dietary Diversity**

Dietary diversity refers to the different food groups consumed over a given reference period. Dietary diversity score is thus often used as a proxy measure of the nutritional quality of an individual's diet. This is a more meaningful indicator than knowing that households consume four different foods, which might all be cereals. The following set of 12 food groups is used to calculate the Dietary Diversity Score; cereals, fish and seafood, roots and tubers, pulses/legumes/nuts, vegetables, milk and milk products, eggs, fruits, oil/fats, meat/poultry/offal, sugar/honey and miscellaneous (FANTA, 2006).

Daily dietary diversification is relevant to OA patients especially fruits and vegetables that contain Vitamins C, and beta- carotene which are anti-oxidants, fish and sea foods which are anti-inflammatory food contain omega-3 as well as Vitamin D (Hand and Nicholas, 2011).

## **2.10. Intra- household Food Allocation and Behavior**

There are many arthritis diets (Holford, 2008) and attention must be given to individual therapy depending on the type of arthritis an individual is suffering from. Support at the household level is important for the patients. The way food is allocated and distributed within the household can limit the capacity of osteoarthritis patients to access the quantity and diversity of foods needed for effective nutritional care and support.

## 2.11. Role of Physical Activity in Osteoarthritis Management

Physical inactivity is now identified as the fourth leading risk factor for global mortality. Physical inactivity levels are rising in many countries with major implications for the prevalence of non communicable diseases (NCDs) and the general health of the population worldwide (WHO, 2005).

According to physical activity policy, health improvement directorate physical activity is important for helping people to maintain weight loss over several months or years. Those who include physical activity as part of their weight loss plan have a better chance of long-term success. Physical activity brings important reductions in risk of mortality and morbidity for those who are already overweight or obese by protecting against osteoporosis and have beneficial effects in those with osteoarthritis and low back pain. For general health benefits, adults should achieve a total of at least 30 minutes a day of at least moderate intensity physical activity on 5 or more days of the week (WHO, 2005).

The recommendations for adults are also appropriate for older adults. Older people should take particular care to keep moving and retain their mobility through daily activity. Additionally, specific activities that promote improved strength, coordination and balance are particularly beneficial for older people. The recommended levels of activity can be achieved either by doing all the daily activity in one session, or through several shorter bouts of continuous activity of 10 minutes or more causing increased breathing or heart rate (WHO, 2009).

## **2.12. Nutrition and Osteoarthritis Information Communication.**

The role of nutrition in the prevention and management of arthritis should be integrated in the treatment plan in this country. This will go a long way in giving the patients the holistic treatment they deserve as well as making the treatment more effective (Machamba, 2011). The government, donors, health providers, nutritionists and other stakeholders should embark on general and specific OA management guidelines (Sitati, 2012).

## **2.13. Gaps in Knowledge**

Though it is evident that OA is becoming an increasing global problem and a growing burden in Kenya, there is little documentation on the extent of the problem in this country. In assessing the nutritional status, knowledge and practices of osteoarthritis patients, this research study aimed at filling the existing gap on appropriate nutrition practices towards the prevention and self-management of osteoarthritis in Kenya.

# CHAPTER THREE: STUDY METHODOLOGY

## 3.1 The Study Area

This study was conducted at KORC one of the oldest in Kenya and was founded in 1908 by Scottish Missionaries. KORC progressed over the foundational years as a small first-aid centre but in 1975 it received a major boost from the late President Jomo Kenyatta who seconded medical staff to the KORC from the Government.

In 1993 an orthopaedic unit was established at KORC to specifically deal with orthopaedic problems not related to trauma. This programme has evolved into a comprehensive Rehabilitation Centre and new facilities for this work were built and dedicated in 1998. KORC was a fully equipped to 37-bed hospital providing orthopaedic, reconstructive surgery and rehabilitation for its clients. KORC opened its doors in 1998 with annual tally of 5000 patients seeking treatment and over 800 surgical procedures performed. Services offered include inpatient and outpatient orthopaedic care, physiotherapy and occupational therapy, limb shop services (makes prosthesis and orthosis) rehabilitation and a guest hostel with a 36 bed capacity and conference/ Seminar facilities.

## **3.2 Demographic Characteristics**

### **3.2.1 Location**

KORC is within the jurisdiction of Kiambu County which covers an area of 1,323.9 sq Km<sup>2</sup>. The County lies between latitudes 0° 75' and 1° 20' south of Equator and longitudes 36° 54' and 36° 85' east.

### **3.2.1 Population**

According to the Kenya Population and Housing Census 2009, the population of the County was 1,623,282. Out of this 802,609 (49.4%) were males and 820,673 (50.6%) were females (KNBS, 2009).

## **3.3 Research Methodology**

### **3.3.1 Study Population**

The study population consisted of adult osteoarthritis patients aged 18 to 74 years, attending orthopedic clinic at KORC from November 2011 to January 2012.

### **3.3.2 Study Design**

The study design was cross-sectional, descriptive and analytical in nature. Kikuyu Orthopedic and Rehabilitation Centre was selected for this study as a strategic convergent centre with inherent capacity for the management of OA patients.

### **3.3.3 Sample Size Determination**

#### **a. Sample size determination of osteoarthritis patients**

The study population for the cross sectional study component was derived from the records of adult OA patients who attended clinic at KORC between 2010 and 2011. To determine the desired sample size (**nf**) when population is less than 10,000, the required sample size (**n**) when population is greater than 10,000 must be computed first and then **nf** derived from **n**.

Fischer's formula (Fischer's et al., 1991)  $n = z^2 pq / d^2$  was used to determine **n**.

$$n = z^2 pq / d^2$$

Where:

**p** = proportion of population with OA (calculated using 50% (0.5) for unknown prevalence)

$$q = 1 - p = 1 - 0.5 = 0.5$$

**Z** = Standard normal deviation set at 1.96 (for 95 % confidence interval).

**d** = Degree of accuracy desired or degree of precision = 5 % (or 0.05)

Fischer's formula (Fischer's et al., 1991)  $n = z^2 pq / d^2$  was used to determine **n**.

$$n = z^2 pq / d^2$$

$$n = \frac{(1.96^2) (0.5) (0.5)}{0.05^2} = \frac{3.8416 \times 0.25}{0.0025} = 384.16 = 384$$

To determine the desired sample size **nf** when population is less than 10,000,

Fischer's et. al, (1991) recommends the following formula;

$$\text{Therefore, nf} = \frac{n}{1 + (n/N)} = \frac{384}{1 + (384/438)} = \frac{384}{1.87671} = 204.613$$

$$=204.613$$

$$=205$$

Where:

nf= the desired sample size (when population is less than 10,000).

n=the desired sample size, when the population is more than 10,000, which is 384.

N=the estimate of the population size at KORC which is 438.

#### **b. Sample Size Determination of Focus Group Discussions**

Two FGDs each composed of 8 OA patients were conducted in the hospital. The recommendation of Kombo and Tromp, (2009) that FGD'S should comprise of 6 to 8 individuals guided the determination of the OA patients involved.

#### **c. Sample Size Determination for the Key Informant Interviews**

Six key informant interviews (KIIs) were conducted as follows; 2 orthopedic doctors, 2 nutritionists and 2 clinical officers.



## **3.4 Sampling Procedures**

### **a. Sampling Procedure for the Cross Sectional Study Component**

KORC in Kiambu County was selected purposively while the OA patients were exhaustively selected from the hospital. Adult OA patients aged 18-74 years who attended the hospital during the three months of research (November 2011 to January 2012) were exhaustively selected until adequate sample size was attained.

### **b. Sampling for Focus Group Discussions**

The respondents who participated in the two Focus Group Discussions (FGDs) were conveniently sampled with the assistance of hospital health workers. The first group was composed of 3 males and 5 females while the second group was composed of 4 males and 4 females. The respondents were selected from adults aged between 18 and 74 years old who were suffering from OA. They included those who were part of the research sample.

### **c. Sampling for the Key Informant Interviews**

KII included 2 nutritionists, 2 orthopedic doctors and 2 clinical officers. They were purposively selected based on their in-depth knowledge of the disease and interaction with the patients.

### 3.5 Research Materials and Resources

Resources and materials that were required during the study are shown in table 1.

Table 1 : Research materials and resources

Personnel	Equipment
▪ Supervisor	▪ Bathroom
▪ Investigator	type scale
▪ Field assistants	▪ Lap tops
▪ Data Clerk	▪ Portable stadiometer

### 3.6 Inclusion Criteria

Adult osteoarthritis patients from Kenya aged between 18 to 74 years attending orthopedic clinic at KORC from November 2011 to January 2012.

### 3.7 Exclusion Criteria

All other OA patients not attending clinics at KORC; OA patients aged over 74 years old or under 18 years old and non-Kenyan OA patients at KORC were excluded. Patients who have undetermined arthritides, or mixed arthritis or too ill to participate were also excluded.

### 3.8 Data Collection Tools and Equipment

The tools for data collection included a semi-structured questionnaire, Focus Group Discussions guide and Key informant Interviews guide. Other equipments included a portable stadiometer and bathroom scale for weight measurement.

**Table 2: Tools and methods of data collection**

<b>Method of data collection</b>	<b>Tools of Data collection</b>
<b>Anthropometrics</b>	Portable Stadiometer
	Bathroom Weight scale
<b>Focus Group Discussions</b>	Focus group discussions guide
<b>Key Informant Interviews</b>	Key Informant Interview Guide
<b>Semi -structured Interviews</b>	Semi-structured questionnaire

### **3.9 Recruitment and Training of Research Assistants**

The principle researcher interviewed and deployed two undergraduate research assistants who were a male and a female with good command of English, Kiswahili and experience in data collection through recommendation from Kenya Institute for Public Policy Research and Analysis (KIPPRA). They were trained by the principal investigator prior to undertaking the data collection exercise. The training was carried out for three days at the hospital, and covered the following topics; obtaining informed consent from respondents, interpretation of the questionnaire, administration of the questionnaire, taking anthropometric measurements and interview techniques. The methods of teaching used included; lecture method, demonstration and return demonstration and role-play. The materials and equipments that were used included; masking tape, flip charts, markers, notebooks, pens and pencils, weighing scales and portable stadiometer.

**Table 3 : The OA study Training curriculum**

<b>Day</b>	<b>Training Narrative</b>	<b>Remarks</b>
<b>1</b>	<ul style="list-style-type: none"><li>-Introduction to the study objectives</li><li>-Introduction to the informed consent form</li><li>-Introduction to data collection tools</li><li>-Calibration of tools</li></ul>	Research Assistants carried out practical demonstration on the use of the research tools and materials
<b>2</b>	<ul style="list-style-type: none"><li>-Teaching on weight and height measurements</li><li>-Filling in the anthropometric data</li><li>-Filling in the questionnaire</li></ul>	Research Assistants demonstrated the use of Anthropometric equipment and all related calibrations
<b>3.</b>	<ul style="list-style-type: none"><li>-Assessment of each research assistant on the entire training using role play</li><li>Pre-testing</li></ul>	All research assistants effectively demonstrated appropriate use of all research material and tools.

### **3.10 Pretesting of Tools**

The questionnaire was pre-tested by applying it on 12 patients from KORC in the month of October 2011. The K11 and FGD guides were pre-tested on one (1) person each from KORC. The pre-test patients and informants did not include the final respondents or informants. The data collected from the pre-test were used to gauge validity of the data collection tools. The tools were modified based on data collected from pre-test, and this data was not included in the final research data.

### **3.11 Data Collection Techniques and Procedures**

Qualitative and quantitative data were collected. The data were collected using a pre-tested semi-structured questionnaire, Focus Group Discussion guide and Key Informant interview guide. Broadly, the data collected included socio-demographic characteristics, socio-economic status, nutritional knowledge (Taylor, 2011), dietary diversity (Fanta, 2006), BMI (WHO, 2000) and physical activity (WHO, 2009) of the OA patients.

### **3.12 Demographic and Socio-economic Characteristics**

This information was captured by administering a pre-tested semi-structured questionnaire. Data on socio-demographic and socio-economic characteristics collected include age, gender, marital status, county of origin, educational level, main occupation of the clients, monthly income, source of food and household composition (Appendix 3).

### **3.13 Level and Sources of Nutritional Knowledge**

Knowledge on nutrition, Vitamin C, D, Beta-carotene and omega-3 was sought; questions on basic nutrition for a healthy living were administered. This section of the questionnaire collected information on sources of nutritional knowledge and on the respondent's level of nutritional knowledge on dietary requirement for OA patients concerning reducing pain, inflammation and avoiding obesity. A total of nineteen questions were administered and the responses were given scores, each aspect was

scored to gauge knowledge per aspect and finally an aggregate score for all the sections were added up and converted into a percentage. The question on balanced diet carried three marks, the questions specifically related to OA carried two marks and the others carried one mark each. The weighting was different because the interest was in nutrition knowledge on OA (Appendix 4).

The nutritional knowledge was rated on percentiles and the respondents graded using three cut-off points (Taylor, 2011).

Low nutritional knowledge"<40"	-lower percentile
Average nutritional knowledge"40-69"	-median
High nutritional knowledge">70"	- upper percentile

### **3.14 Dietary Practices for OA Patients**

Dietary diversity data was collected by assessing OA patient's diet using dietary diversity questionnaire (WHO, 2002), food frequency questionnaire and qualitative 24-hour recall food record questionnaire both developed by NASR, (2001) (Appendix 4, 5 and 6).

The indicators for dietary practices were number of meals consumed per day, three times are recommended. The other indicator was dietary diversity score (8-12) food groups recommended per day (WHO, 2002) and food frequency based on a weekly assessment.

### **3.15 Nutritional Status**

The body mass index (BMI) and co-morbidities were used as the indicator for nutritional status (Appendix 7).

### 3.15.1 Body Mass Index

A portable stadiometer was used to measure the height and a portable bathroom scale was used to measure the weight. The following scale was then used to rate the nutritional status of the OA patients (WHO, 2000).

<18.5 -underweight	30-35-class I obesity
18.5-24.9-normal	35-40-class II obesity
25-29.9-overweight	>40-class III obesity

In assessing the height measurements, the respondents were required to stand straight on the height board with their feet together, knees straight, heels, buttocks and the shoulder blades in contact with the vertical surface of the stadiometer and the arms hanging loosely on the sides and the shoulders relaxed. The movable headboard was then gently lowered until it touched the crown of the head, gently but firmly compressing the hair and measurements taken to the nearest centimeter (WHO, 2000). Two readings were taken and an average recorded to the nearest 0.5 cm. If measurements differed by more than 0.5cm, a third reading was done. Only the two measurements with a difference within 0.5 cm were used to calculate the average.

In taking the weight, the machine was placed on a flat surface, checked for accuracy at the beginning of each session using a 2kg weight. The respondent stood unassisted at the centre of the platform looking straight ahead. Two different measurements were taken then the average recorded to the nearest 0.5kg. The BMI was calculated as a ratio of weight to height squared ( $\text{kg/m}^2$ ), a formula developed by statistician Belgium Adolphe Quetelet (WHO, 1995) (Appendix 8).

### 3.15.2 Co morbidities

To collect information on co-morbidities, the questionnaire had questions that were administered regarding other diseases that the patients suffered from and also the order of precedence between the co-morbidities and OA (Appendix 2).

### 3.16 Level of Physical Activity

A standard questionnaire was used to collect data on the respondent's activity level. The questionnaire sought to determine the frequency, nature and attitude towards physical activity. The General Practice Physical Activity Questionnaire (GPPAQ) that is used to assess adult (16–74 years) physical activity levels as described by WHO (2009) was used as follows;

>150 minutes per week	- Recommended
<150 minutes per week	- Low

The categories of physical activities included in the study were; activity at work, travel to and from places and recreation. The indicator for this assessment was the number of days (5 days are recommended) the respondents were involved in physical activity, the length of time (30 minutes daily are recommended) and the intensity of the activity as indicated by either vigorous or moderate.

The GPPAQ also assessed sedentary behavior as indicated by the number of hours the respondents spent sitting or reclining (resting in a leaning position) by considering total time spent at work or at home sitting, travelling in a car or train, playing cards, reading, watching television, using a computer, doing hand-craft like knitting and resting excluding time spent sleeping at night (Appendix 8).



### **3.17 Focus Group Discussions (FGDs)**

FGDs as described by the late sociologist Robert K. Merton (Wikipedia, 2012) were used to collect information from respondents on the disease self-management techniques including the factors considered in making food choices (refer to appendix 14).

### **3.18 Key Informant Interviews**

The key informant interviews (WHO, 2001) were used to collect in depth information from health providers and nutritionists, regarding the disease, its management and the role played by the key informants in assisting patients to reduce the progression of the disease (refer to appendix 13).

### **3.19 Data Quality Control**

Various data quality control measures were employed throughout the data collection process in the following sections:-

#### **a. Minimizing Bias**

To obtain accurate data, pre-tested and modified data collection tools were used for data collection. The weighing scale was always calibrated to zero before taking the weight to minimize instrument bias.

The respondents were informed on the importance, objectives and purpose of the research and were encouraged to give accurate information. They were assured of confidentiality of any information.

### **b. Training of Field Assistants**

To achieve both efficiency and accuracy in data collection two educated and well experienced field assistants were recruited through interview by the principal investigator. The quality of the data was controlled through training and close supervision of research assistants by the principal investigator throughout the period of study. The research assistants were advised on taking adequate time in filling the questionnaires to avoid errors.

### **c. Reviewing of the Questionnaires**

The questionnaires that were completed each day were cross checked for any anomalies. The principal investigator examined the questionnaires to check for completeness, accuracy in recording the measurements, consistency of the answers as well as the correct filling of the questionnaires. The errors encountered during the cross checking were corrected immediately.

### **d. Accuracy of Anthropometric Measurements**

Accuracy of anthropometric measurements was ensured through training and supervision by the principal investigator during the measuring exercise. The height and weight measurements were taken twice and then averaged to improve the precision of the field assistants. The widest acceptable difference in height and weight was 0.5cm and 0.5kg respectively.

### **e. Supervision**

All the activities during the study were closely monitored and supervised by the principal investigator. A supervisor from the University of Nairobi visited the study

site to validate the field work and provide guidance as required which ensured high quality data.

## **3.20 Data Management and Analysis**

### **3.20.1 Data Management**

The data was coded and entered into the computer as variables for analysis using the Statistical Programme for Social Sciences (SPSS) and Ms Excel. The data was cleaned prior to analysis. To avoid omissions the frequencies for all variables were generated before carrying out the statistical analysis. Quantitative data was crosschecked for erroneous entry and explored to check for outliers, which were eliminated in the final analysis. Qualitative information (key informant and focus group discussion information) was expanded to enhance the discussion of quantitative data results.

### **3.20.2. Data Analysis**

The main software package that was used for analysis is SPSS, version 17 and Ms Excel. Graphs and descriptive information were produced using SPSS version 17 and Ms-Excel Software. A descriptive analysis was undertaken to provide general information on the characteristics of the study population. This was carried out by running frequencies, means, cross tabulations and ranges. Bivariate analysis was carried out to determine the association between variables, for example Chi-square test was done to find out if there was an association between physical activity and nutrition status. Multivariate analysis was carried out to determine the two-way interaction between the variables. In all the analysis, the level of significance was set at  $p < 0.05$ .

To describe the demographic and socio-economic characteristics of the respondents, the data was grouped and processed according to Percentages, Proportion, Mean and Median. The data on knowledge level and score were grouped and analysed into percentiles and proportion.

The dietary diversity of the respondents as measured by the number of meals consumed in a day, dietary diversity score and food consumption frequency data were grouped and cut-off points were used in dietary diversity score, the data were analysed through percentages.

The BMI data was grouped according to cut-off points (<25 normal, <18.5 underweight and  $\geq 25$  overweight) and analysed according to percentages and mean. Physical Activity data was grouped according WHO recommendation (>150 minutes) per week (5 days) and analysed through percentages and mean. Data from FGDs and KIIs was analysed by a quick impressionist summary (Kombo and Tromp, 2009) that involved summarizing key findings, explanation, interpretation and conclusion.

### 3.20.3 Ethical and Human Rights Considerations

Prior to commencing the field data collection exercise, the principle researcher sought approval through a letter of recognition from the University of Nairobi, and subsequently obtained a research permit from the Government from Kenya. The local authorities in Kikuyu were informed about the study. The research assistants explained to the respondent the scope and purpose of the study, and further assured them of confidentiality. Consent was obtained from all individual respondents prior to the interview.

## CHAPTER FOUR: RESULTS

This chapter presents results realized by application of both descriptive and analytical procedures.

### 4.1 Demographic and Socio-economic characteristics

#### 4.1.1 Age and Gender of respondents

This study investigated a total of 205 OA patients, of which 73.2 % were female and 26.8 % were males. Forty three percent (43.4 %) were aged between 61-70 yrs and those aged below 20 years were 1.5 %. The mean age was  $54.84 \pm 1.50$  (Mean, SD) with a range 18 to 74 years (Figure 1).

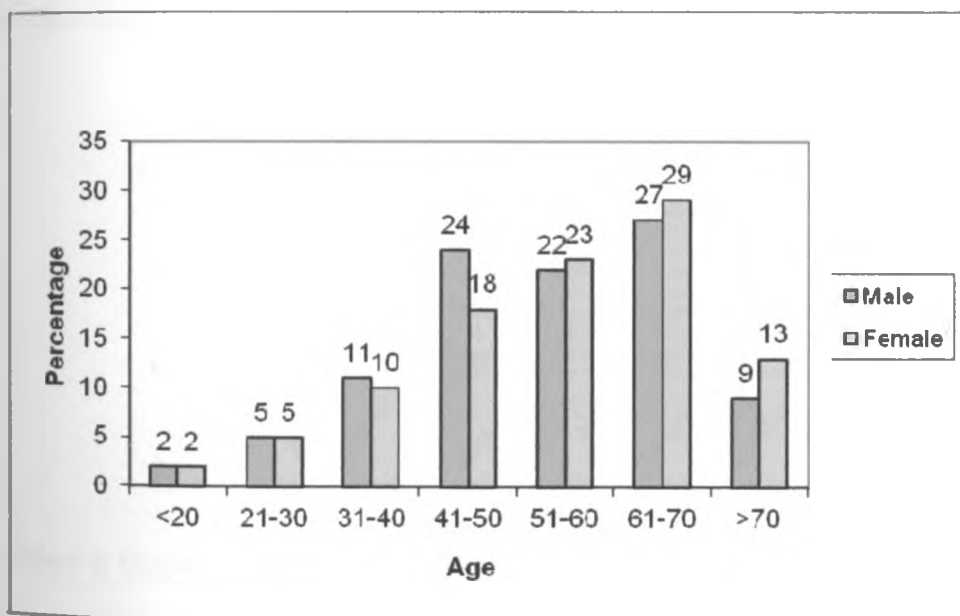


Figure 1: Distribution of study respondents by Age and Gender

#### 4.1.2 The counties where respondents originated from

The respondents originated from 19 of Kenya's counties, with the highest percent (31.2 %) originating from Nairobi County followed by Kiambu County (30.7 %). Kakamega, Kisii, Taita Taveta and Makueni had the least numbers of respondents each with 0.5 % (Figure 2).

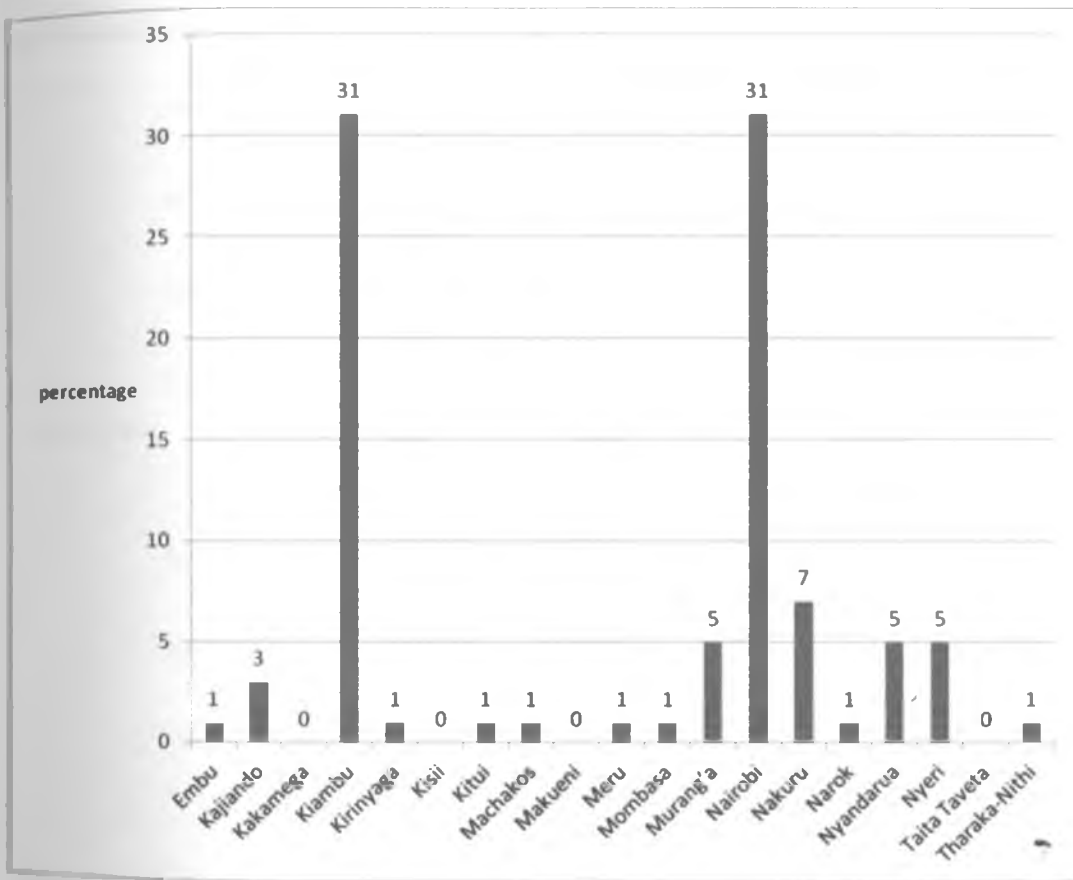


Figure 2: Respondents by county of origin

### 4.1.3 Level of education

Twenty seven percent (27 %) of the males and 45 % of the females OA respondents had attained primary education, while 64 % of males and 23 % of the females had attained secondary education. Nine percent (9 %) of males and 28 % females had no formal education. There were 4 % of the female OA respondents who had attained post secondary education (Figure 3).

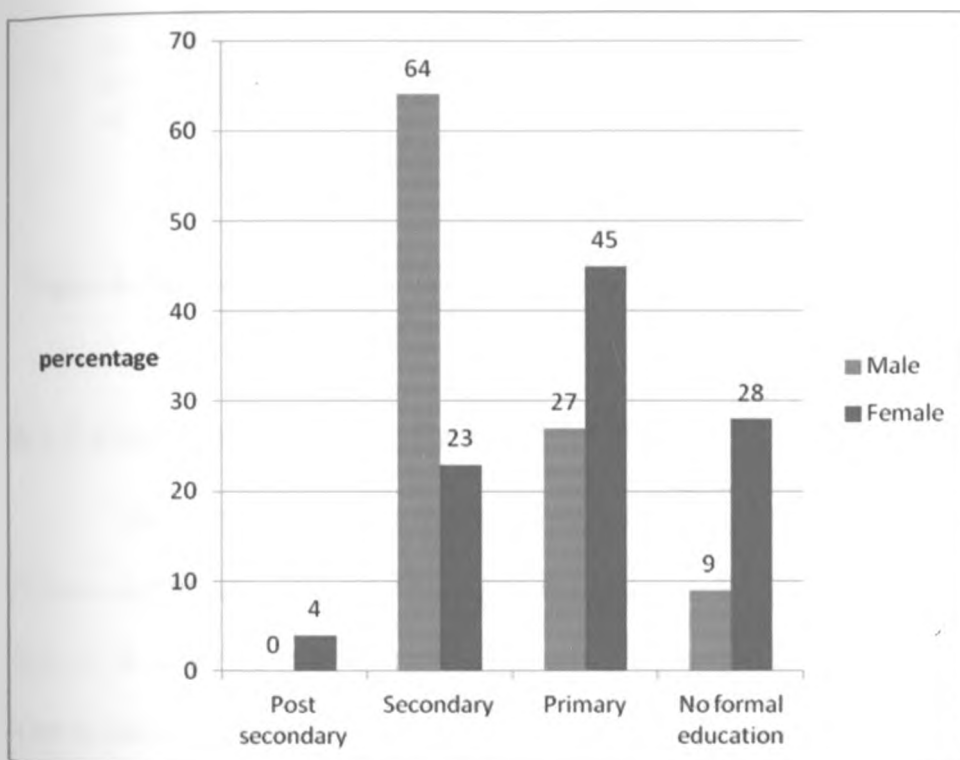
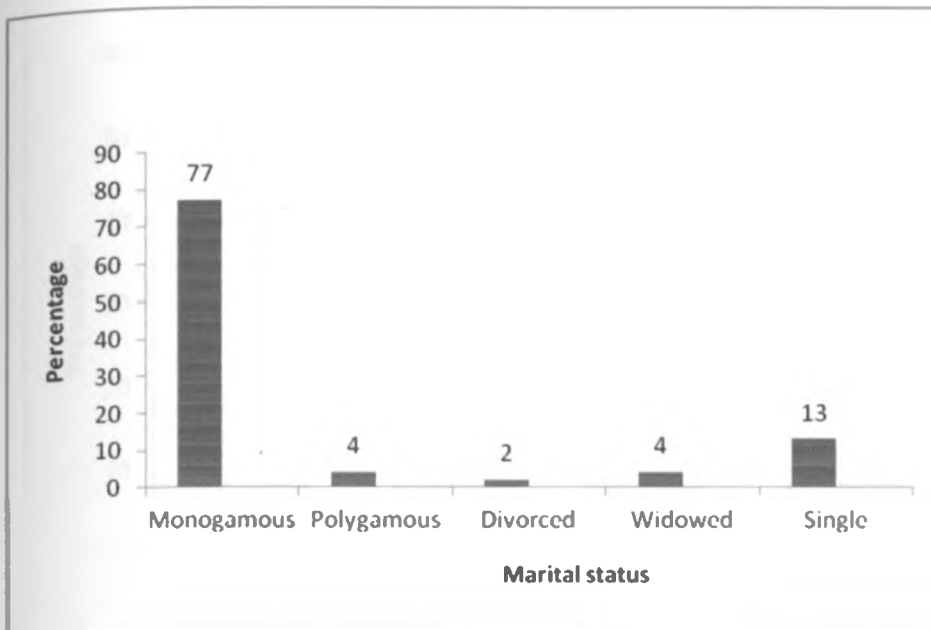


Figure 3: Education level of respondents by gender

### 4.1.4 Marital status

The study showed 77 % of the respondents were married in a monogamous family, 4 % were in polygamous family, 13 % were single, 4 % were widowed and 2 % were divorced (Figure 4).

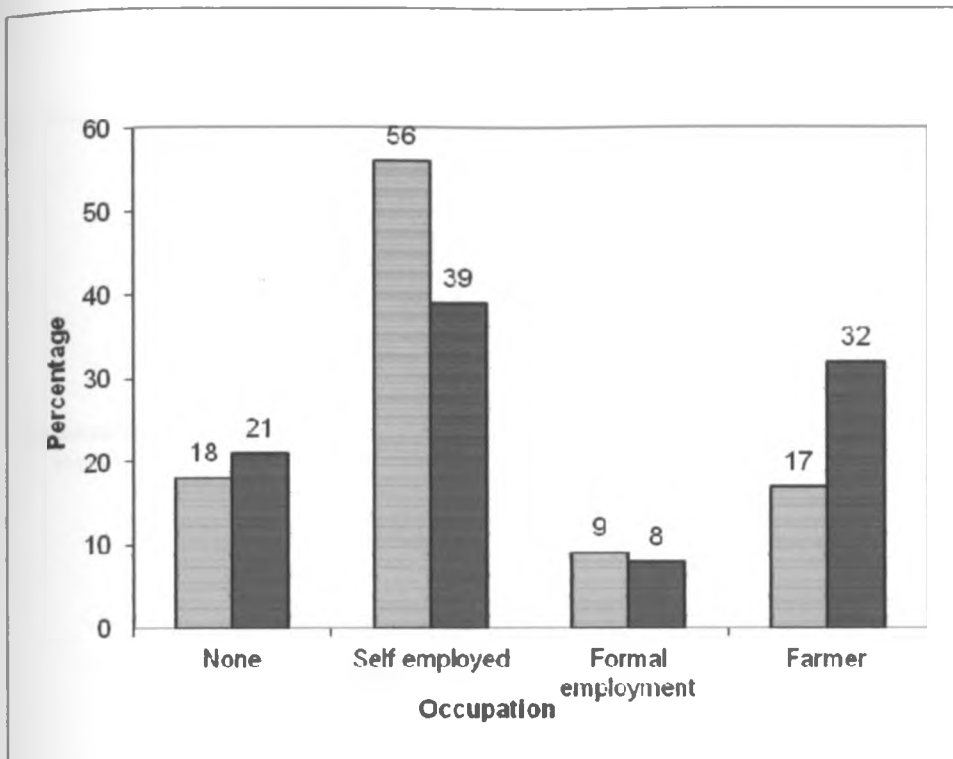


**Figure 4: Distribution of study respondents by their marital status**

#### **4.1.5 Occupation of the Respondents**

The highest number of respondents were self employed with 56 % and 39 % of males and females, respectively being self-employed. Those undertaking farming were 16 % males and 32 % of the females, 9 % of the male and 8 % of the females were in formal employment. The unemployed males and females were 18 % and 21 % respectively (Figure 5).

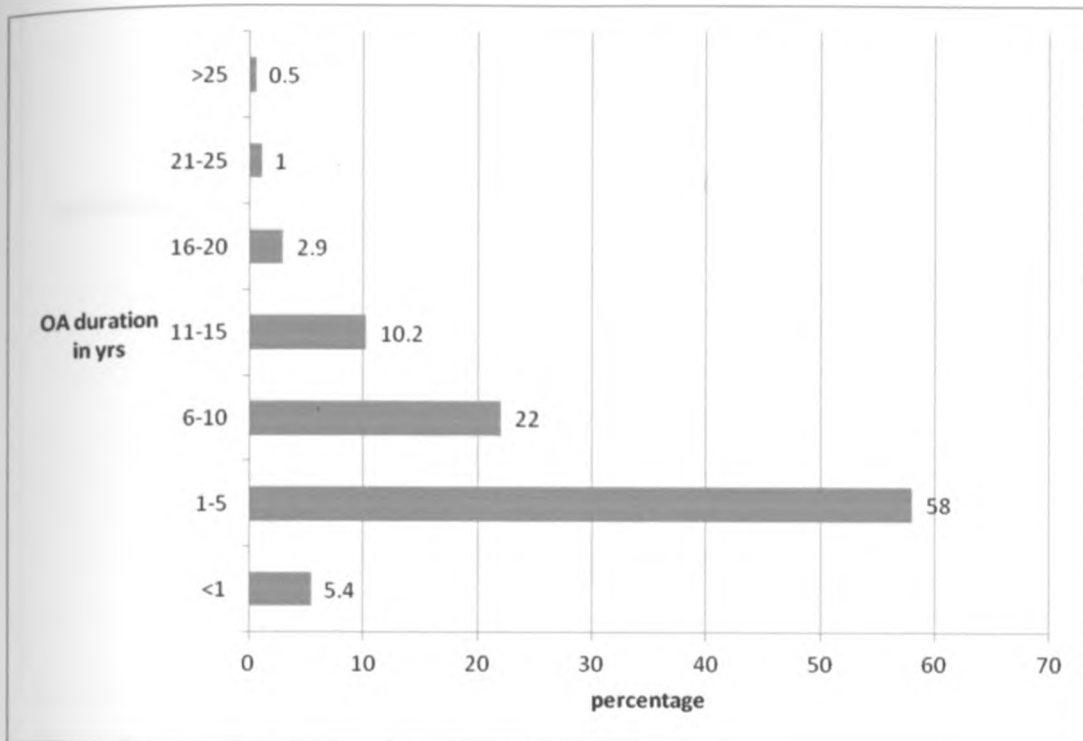




**Figure 5: Distribution of study respondents by occupation**

#### **4.1.6 Duration of time respondents have suffered from Osteoarthritis**

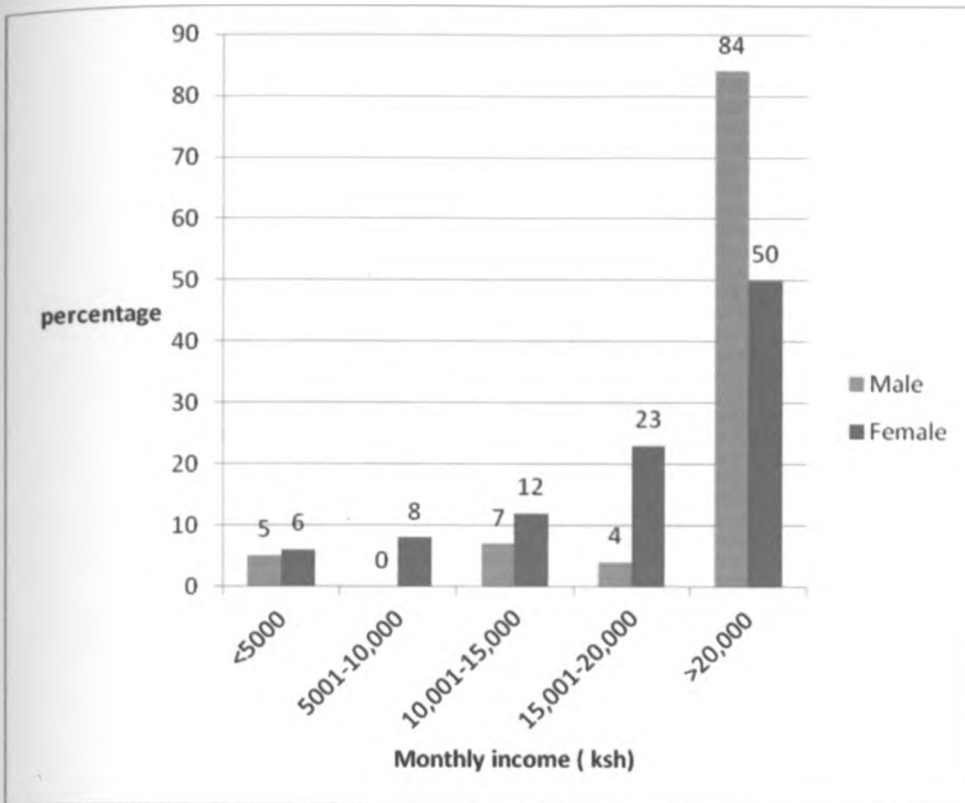
This study established that 58 % of the respondents had suffered from OA for a duration of between 1-5 years while 0.5 % of the respondents had suffered for over 25 years (Figure 6). The minimum disease duration was 3 months with a maximum duration of 40 years.



**Figure 6: Distribution of respondent's duration of OA**

#### **4.1.7 Respondent's household monthly income (Kshs)**

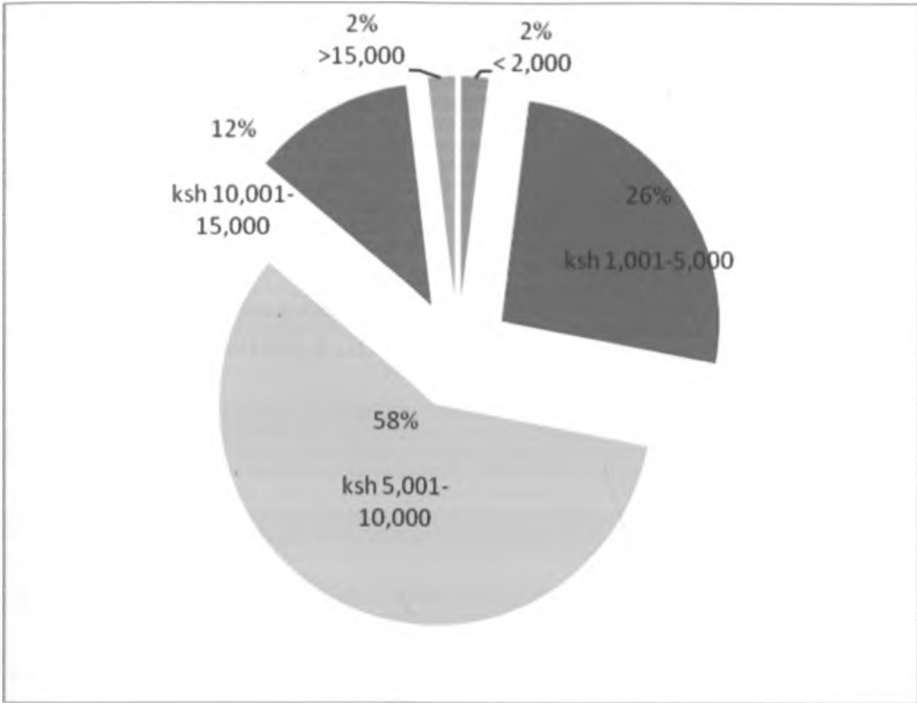
Majority of the respondents were in households that had a monthly income of more than Kshs 20,000 per month, in this category 84 % were male households and 50 % were the households (Figure 7). The minimum income for the respondents was Kshs 3800 and the maximum was Kshs 190,000.



**Figure 7: Respondents' household monthly income**

#### **4.1.8 Respondent's household proportion of income spent on food**

Fifty eight percent (58 %) of the households spent between Kshs 5,001 and 10,000 of their monthly income on food while those spending between Kshs 10,001 and 15,000 were 12.2 % (Figure 8). The mean amount of income spent on food was  $6824.64 \pm 5.754$  (Mean, SD) with a maximum of Kshs 27,000 and a minimum of Kshs 900.



**Figure 8: Respondents' household income proportion spent on food**

## 4.2 Nutritional Knowledge

### 4.2.1 Respondents nutritional knowledge levels on important nutrients

Seventy eight percent (78 %) of the patients had knowledge on sources of Vitamin D but few had knowledge on the sources of Vitamin C, Beta carotene and Omega 3 (Table 4).

There were nine percent (8.5 %) of the patients correctly described a balanced diet with 67 % describing a balanced diet as adequate amount of food. 73.8 % of the patients selected their food depending on availability, 11.3 % on seasonality of foods and 5.7 % on food affordability (Table 8). 83 % of the respondents lacked information on nutritional management of OA, with 7.6 % receiving information from nutritionists (Table 4).

**Table 4: The OA respondents' knowledge levels**

<b>NUTRITION KNOWLEDGE</b>	<b>Percent (n=106)</b>
<b>1. Knowledge on sources of;</b>	
Sources of Vit D	78
Vitamin C	26.4
Beta Carotene	22.6
Omega 3	17
Food preparation	28.3
Methods of cooking	34
<b>2. Factors considered when choosing food</b>	
Dietary needs of OA	4.7
Food availability	78.3
Food affordability	5.7
Food in season	11.3
<b>3. Meaning of balanced diet</b>	
Diet containing carbohydrates, proteins, fats vitamins and minerals	8.5
Diet containing carbohydrates, proteins and vitamins	16
Adequate amount of food	67
Do not know	8.5
<b>4. Main source of OA nutritional knowledge</b>	
Doctor	4.7
Nutritionist	7.6
Internet	2.8
Books	1.9
Newspaper	0
Lacked information access	83

## **4.2.2 Respondents knowledge score**

The study showed that more than two thirds (80.2 %) of the respondents had low level of knowledge by scoring between 0-40 % in the nutritional knowledge assessment test and 19.8 % had average knowledge by scoring >40-69 % in the test (Figure 5). None of the respondents had high level of knowledge scores of >70 % . The mean nutritional knowledge score was  $23 \pm 14$  (Mean, SD). The minimum score was 12 % while the maximum was 58 %.

The FGDs indicated that the low level of nutritional knowledge was due to lack of nutritional counseling.

## **4.2.3 Preferred source of nutrition education on management of OA**

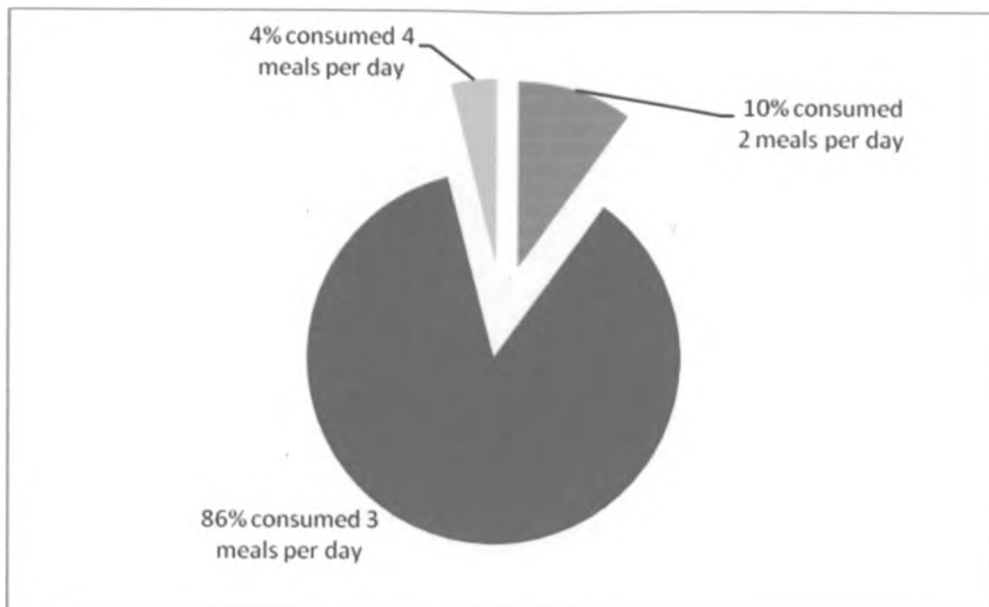
Sixty five percent (65 %) of the respondents preferred to obtain the information on dietary management of OA from a doctor while 35 % preferred to receive the information from a nutritionist (Figure 6).

The key informant's interviews indicated that nutritionists were the most suitable to offer nutrition education to the OA patients.

## **4.3 DIETARY PRACTICES**

### **4.3.1 Number of meals consumed in a day by OA patients**

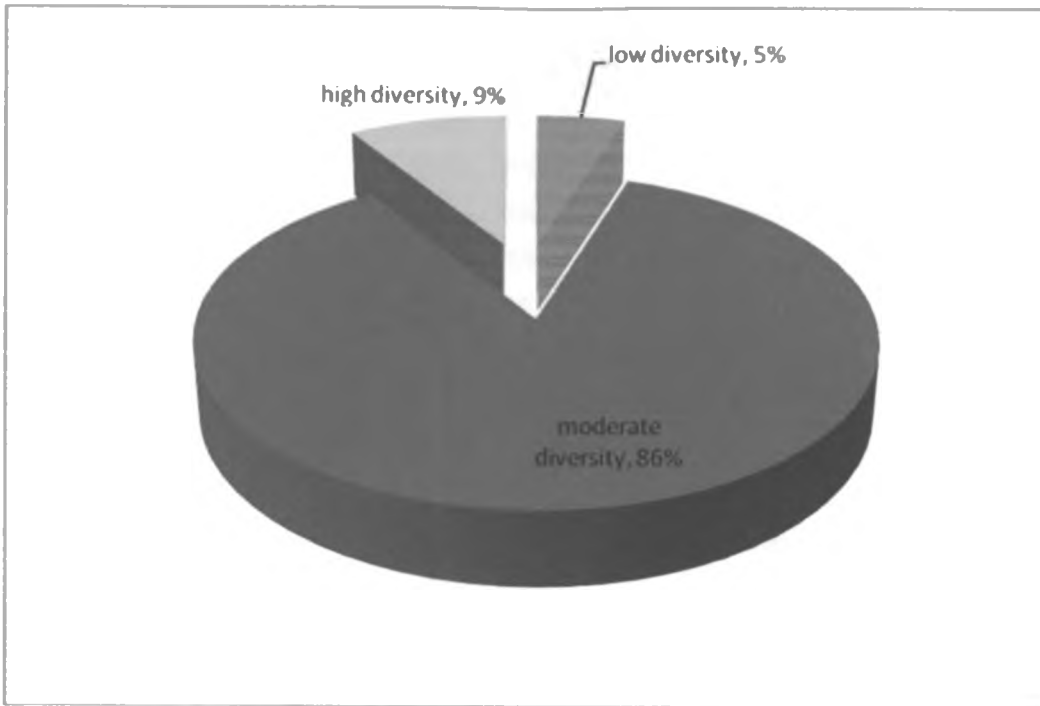
Eighty six percent (86 %) of the respondents consumed three main meals in a day, 10 % consumed two meals in a day while 4 % consumed four meals in day (Figure 9).



**Figure 9: Distribution of the number of meals consumed by respondents in a day**

### **4.3.2 Respondents dietary diversity score**

Majority of the respondents (86 %) had moderate dietary diversity scores (4-8 food groups consumed in a day), 9 % of the respondents had high dietary diversity scores consuming between 8-12 food groups while 5 % had low dietary diversity scores (less than four food groups consumed in a day) (Figure 10).

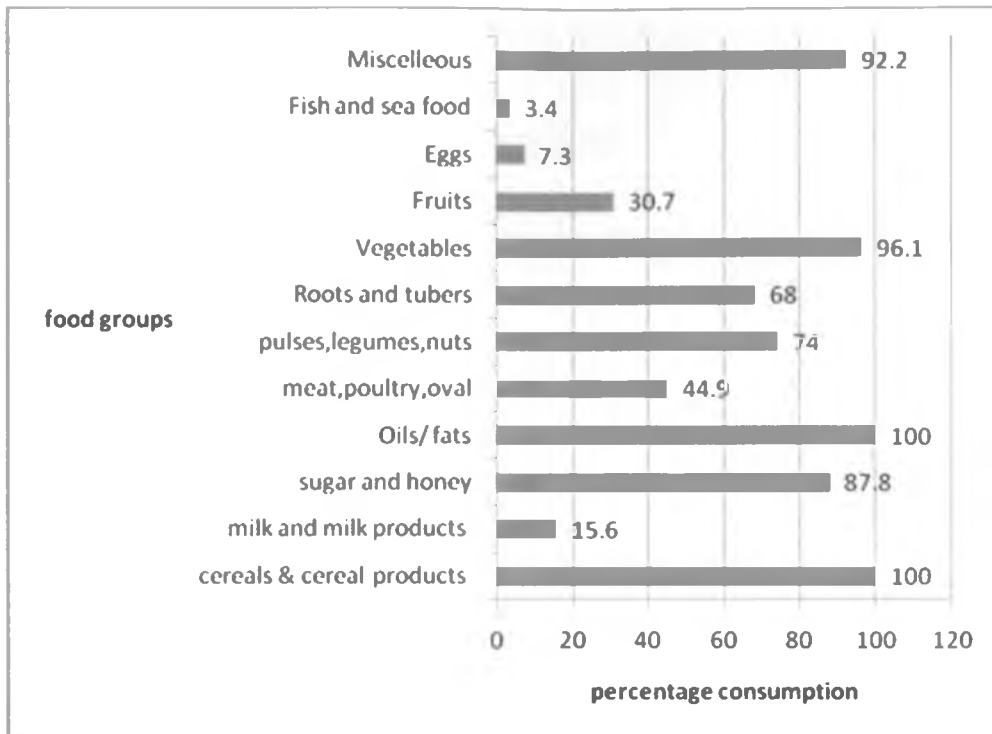


**Figure 10: Dietary diversity scores of OA patients from KORC**

### **4.3.3 Food groups consumed by the respondent's in a day**

Cereals and oil/fats were the most consumed food groups in a day by 100 % of the respondents, followed by vegetables (96.1 %), miscellaneous foods like spices, sweets and beverages were consumed by 92.2 %, sugar by 87.8%, meat/poultry/Oval by 44.9 % and fruits by 30.7 % of the respondents. There were only 15.6 % of the respondents who consumed milk and milk products, 7.3 % consumed eggs, and 3.4 % consumed fish and sea foods (Figure 11).





**Figure 11: Distribution of Food groups consumed by the respondent's in a day**

#### **4.3.4 Respondents weekly food consumption frequency**

The study established that cereal (90.8 %), vegetables (77 %), sugar/honey (64.4 %) and oils/fats (90.1 %), were the most consumed food groups every day within the week. Ten percent (9.5 %) of the respondents consumed fruits everyday of the week, 3.6 % consumed eggs and 1 % consumed fish 4-5 times during the week (Table 5).

**Table 5: Weekly food consumption frequency among OA patients in KORC**

FOOD GROUP	EVERYDAY Percent	4-5 TIMES/WEEK Percent	2-3 TIMES/WEEK Percent	ONCE A WEEK Percent
FRUITS	9.5	13.9	18.8	17.8
VEGETABLES	77	12.3	3.6	2.1
MILK & MILK PRODUCTS	8.4	4	11	3.6
LEGUMMES	42	25.4	8	11.7
MEAT PRODUCTS	1	51	8.8	24.2
CEREALS	90.8	5	3	1.2
ROOTS & TUBERS	46.6	11	21.6	16.8
OILS & FATS	90.1	1.9	7	0
EGGS	0.5	3.6	4.2	2.1
SUGAR & HONEY	64.4	16.6	5.2	6
FISH & SEA FOODS	0	1	2.9	1
MISCELLANEOUS (SPICES, TEA)	60	13.7	12.7	13.7

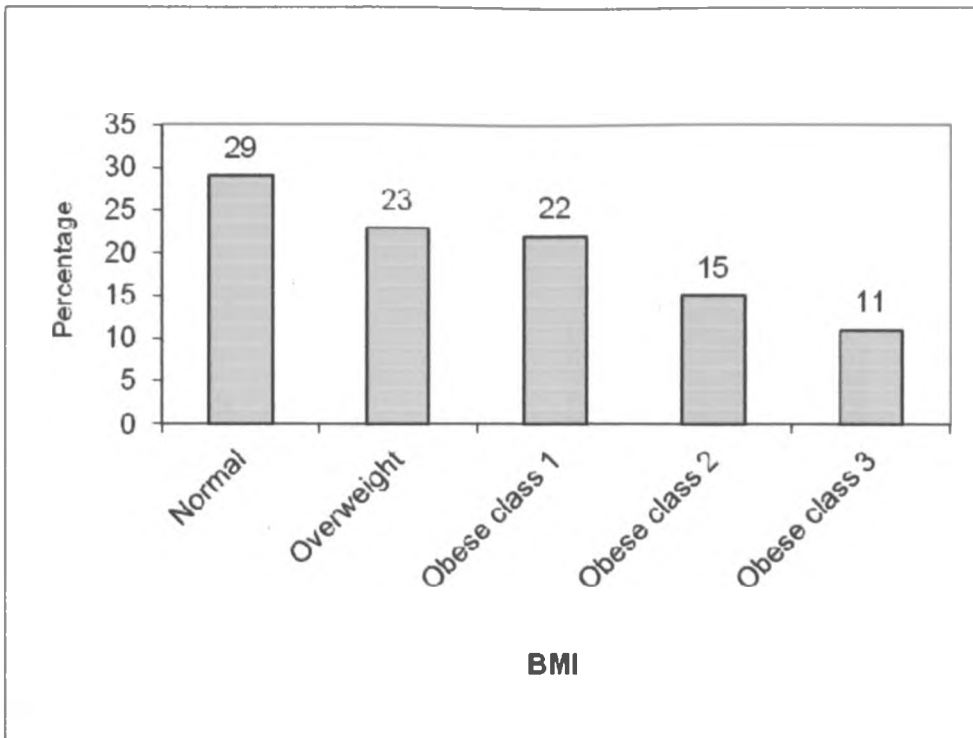
### 4.3.5 Concoctions Intake

Fifty seven percent (57 %) of the respondents consumed concoctions alongside the doctor's prescription while 43 % did not consume concoctions alongside the doctor's prescription.

## 4.4 Nutritional Status and Co-morbidities of Osteoarthritis Patients

### 4.4.1 BMI Measurement of respondents

Twenty nine percent (29.41 %) of the respondents had a normal BMI, 23.04 % were overweight, 22.06 % were obese class 1, 14.71 % were obese class 2 and 10.78 % obese class 3 (Figure 12). The key informant interview indicated that most OA patients were obese because of physical inactivity and poor eating habits.



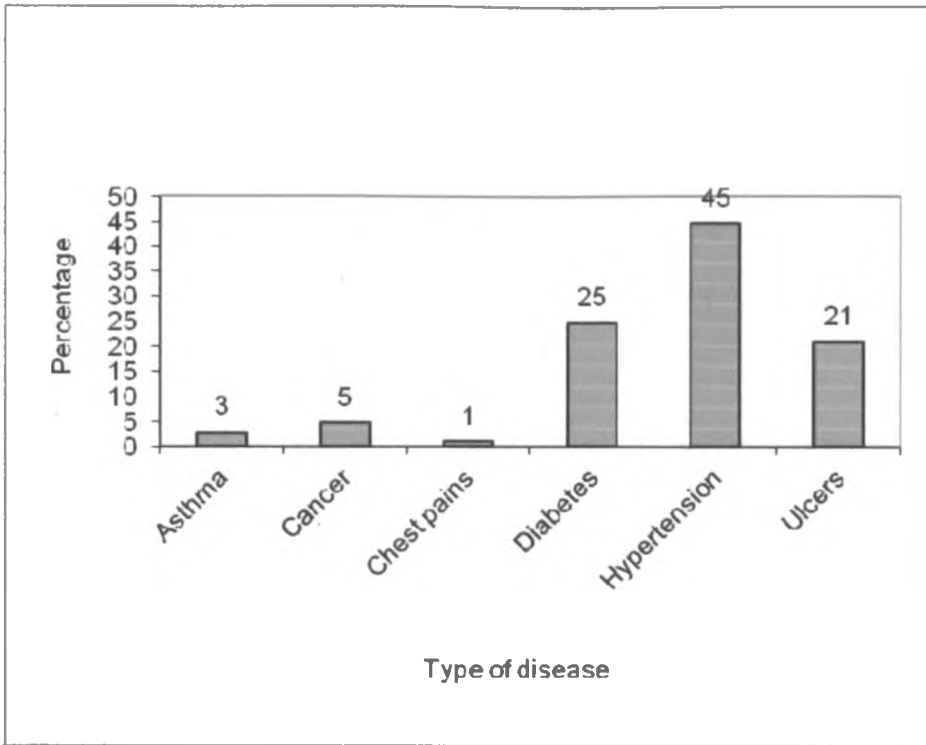
**Figure 12: Body Mass Indexes of OA patients attending KORC**

#### **4.4.2 Occurrence of Co- morbidities among the respondents**

Fifty percent (50.2 %) of the respondents reported that they suffered from other diseases while 49.8 % did not suffer from other diseases.

#### **4.4.3 Identified Co morbidities**

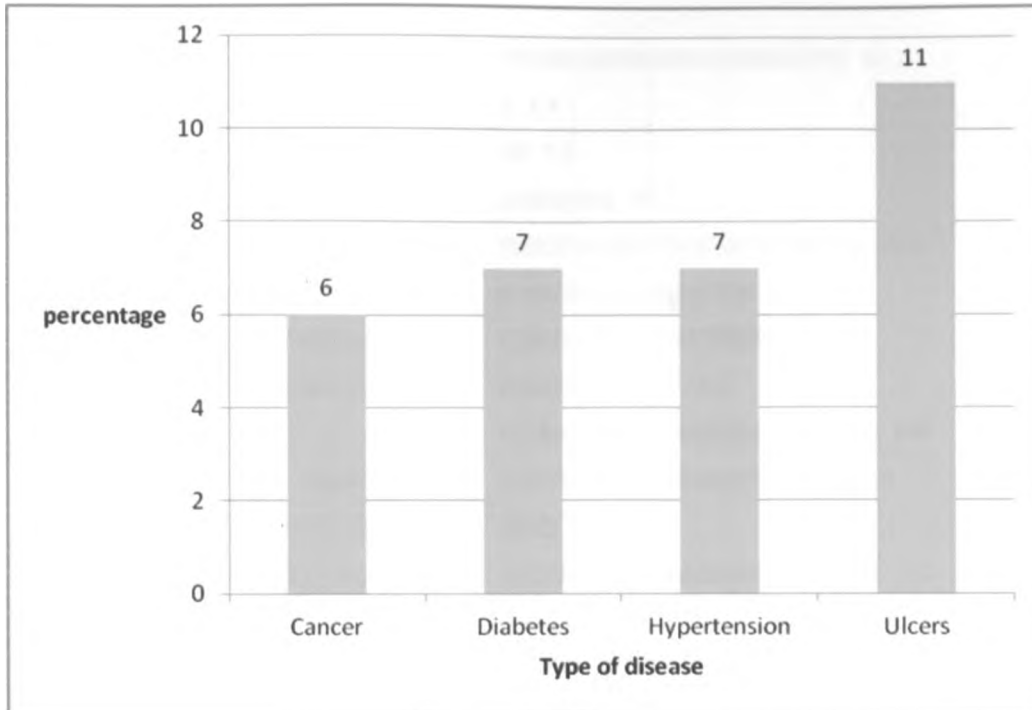
The co-morbidities identified by the respondents were hypertension (45 %), diabetes 25 %, ulcers 21 %, cancer 5 % and asthma 3 % (Figure 13). Therefore the common reported co-morbidities were hypertension, diabetes and ulcers.



**Figure 13: Self-reported co-morbidities among OA patients attending KORC**

#### **4.4.4 Disease precedence among the respondents**

There were seven percent (7 %) of the respondents who had contracted diabetes prior to OA. Those preceded by hypertension were 7 % while by cancer were 6 %, however 11 % had suffered ulcers prior to OA (Figure 14).



**Figure 14: Distribution of diseases preceding OA among study respondents**

#### **4.4.5 Occurrence of OA in respondent's family**

Half of the respondents (51 %) reported that other family members suffered from OA, while 49 % did not have other family members suffering from the disease.

#### **4.4.6 Relationship of respondent to family member with OA**

The highest number of family members suffering from OA were sisters (28 %), mother and grandmother were 26 % and 20 % respectively (Figure 15).

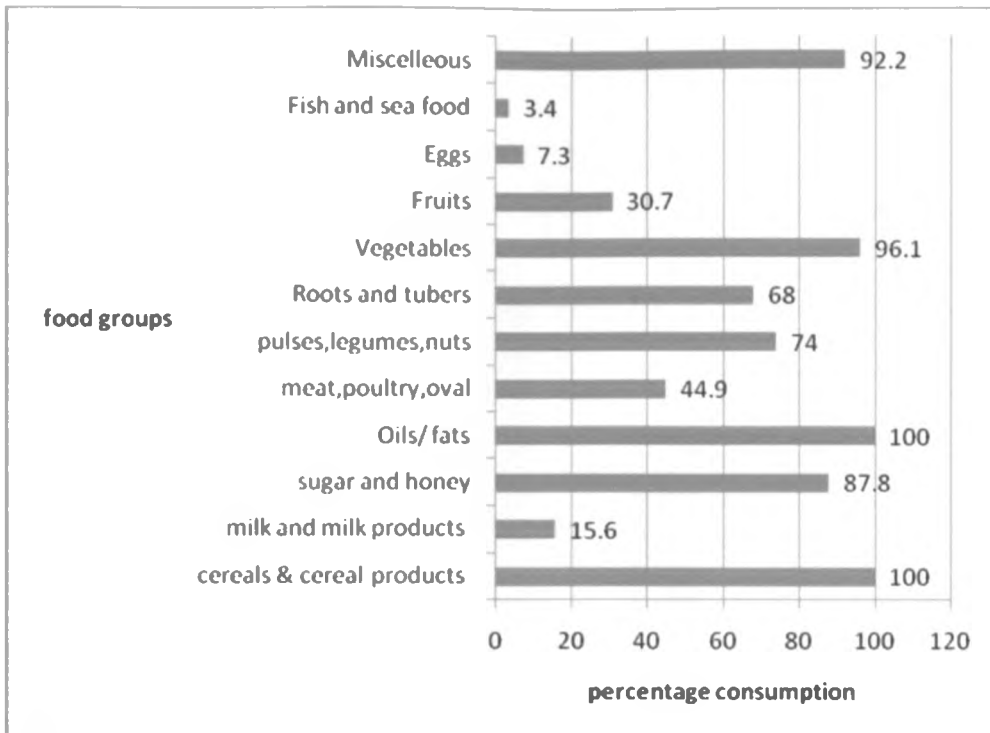


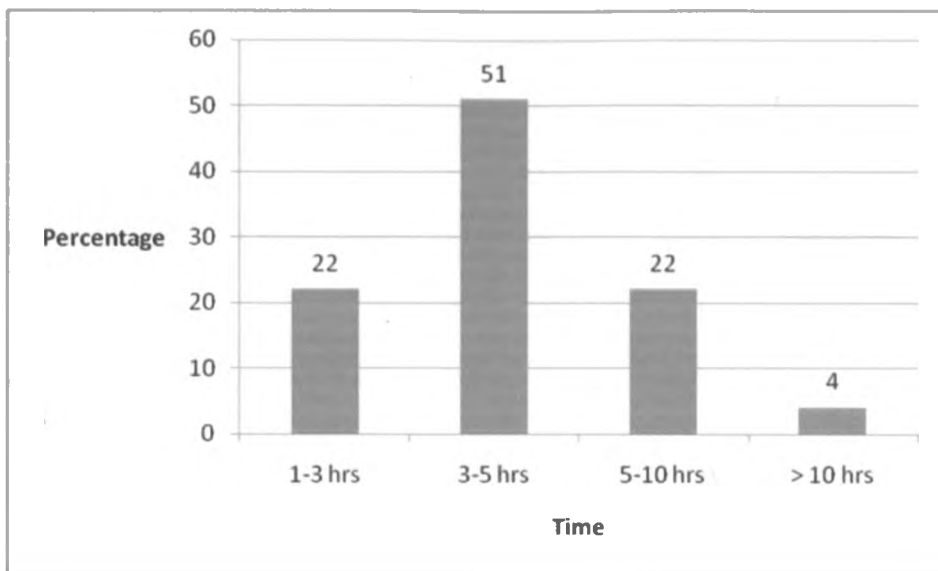
Figure 15: Relationship of respondent to family member with OA

## 4.5 Physical Activity

The study indicated that 47 % of the respondents did not attain 150 minutes per week of moderate physical activity recommended by WHO while 53 % attained. The mean time for physical activity was  $394.26 \pm 278.56$  (Mean, SD) minutes.

### 4.5.1 Sedentary behavior of respondents in a day

Twenty two percent (22 %) of the patients sat/reclined for 1-3 hours in a day (24 hours) while 51 % sat/reclined for 4-6 hours. Twenty two percent (22 %) spent 7-9 hours in sedentary behaviour and 4 % spent 10 or more hours. The mean time for sedentary behaviour is  $4.8 \pm 2.2$  (Mean, SD) hours with a range of between 1 to 10 hours (Figure 16).



**Figure 16: Duration of sedentary behavior among OA patients attending KORC**

#### 4.5.2 Sedentary behavior of respondents by Age

Sixty five percent (64.9 %) of the patients aged between 41 to 50 years spent 3-5 hours sitting or reclining in a day, 36.7 % of patients aged above 70 years spent 5-10 hours in sedentary behaviour while 5.6 % of patients aged between 21-30 years sat/ reclined for more than 10 hours (Table 6).

**Table 6: Time spent sitting or reclining in a typical day**

Age of respondent(years)	Time in hours			
	1-3 Percent	3-5 Percent	5-10 Percent	≥ 10 Percent
>70 (n=30)	20.0	40.0	36.7	3.3
61-70 (n=59)	15.3	49.2	30.5	5.1
51-60 (n=41)	31.7	53.7	9.8	4.9
41-50 (n=17)	21.6	64.9	8.1	5.4
31-40 (n=17)	23.5	41.2	35.3	0
21-30 (n=18)	22.2	55.6	16.7	5.6
<20yrs (n=3)	66.7	33.3	0	0
<b>Total Percent (n=205)</b>	<b>22.4</b>	<b>51.2</b>	<b>22.0</b>	<b>4.4</b>

## 4.6 Factors Affecting Nutritional Status, Knowledge and Practices of OA Patients

### 4.6.1 Factors Associated with Nutritional knowledge

There is a positive relationship between level of nutritional knowledge and level of education at  $p < 0.05$  ( $r = 0.419$ ,  $p = 0.024$ ) meaning that the higher the level of education the higher the nutritional knowledge among the patients.

The association between nutritional knowledge and dietary diversity was positive ( $r = 0.127$ ) and highly significant at  $p < 0.05$  ( $p = 0.04$ ). The respondents with high nutrition knowledge had a higher dietary diversity score.



Monthly income was not significantly associated with nutritional knowledge  $p < 0.05$  ( $r = 0.341$ ,  $p = 0.732$ ). There is no association between income and nutrition knowledge.

#### **4.6.2 Factors Associated with Dietary Practices**

There was significant positive correlation between the level of education and dietary diversity at  $p < 0.05$  ( $r = 0.539$ ,  $p = 0.002$ ), the higher the level of education the higher the diversification of the diet consumed.

The level of monthly income was significantly associated with dietary diversity score at  $p < 0.05$  ( $r = 0.136$ ,  $p = 0.011$ ), the higher the level of income the higher the dietary diversity score.

#### **4.6.3 Factors Associated with Nutritional Status**

The level of education was significantly associated with BMI at  $p < 0.05$  ( $r = 0.360$ ,  $p = 0.014$ ). This implied that the higher the level of education the better the nutritional status.

There is a significant difference between physical activity and nutrition status ( $\chi^2 = 10.129$ ,  $P = 0.030$ ). Those who did not attain 150 minutes of moderate physical activity were significantly more overweight and obese than those who did. The relationship was strong at  $p < 0.05$  ( $r = 0.055$ ,  $p = 0.039$ ). Therefore the longer the time spent in physical activity the better the nutritional status of the respondents (Table 7).

**Table 7: Relationship between Physical activity and Nutrition status**

PHYSICAL ACTIVITY	BMI			P VALUE
	NORMAL (%) n=60	OVERWEIGHT (%) n=47	OBESE (%) n=98	
<150 Minutes	11.7	27.7	77.6	0.270
>150 Minutes	88.3	72.3	24.4	0.030

Statistically significant at  $p < 0.05$

#### **4.6.3.1 Association of Nutrition Status with Demographic and Social-Economic Characteristics**

Multiple regression test was done to determine whether age, education level and income have any significance to nutritional status ( $R=0.673$ ,  $R\text{-Square}=0.429$ ). Approximately 42.9 % of the variance of nutritional status is accounted for by age, monthly income and education level; other factors that are not considered here contribute to 57.1 % of the nutritional status of OA patients.

## CHAPTER FIVE: DISCUSSION

### 5.1: Socio- Demographic characteristics of the respondents

The ratio of male to female for this study was 1:3 which was consistent with Adole *et al.*, (2011), a study conducted in Nigeria. However this finding disagrees with a research conducted at KNH which reported a ratio of 1:6 (Ekwom, 2011). This study established that 44 % of the OA respondents were above 61 years old which was consistent with Holford, (2008) that reported that over 90 % of persons aged 60 years above show OA evidence on x-ray. The mean age of the current differs with findings of the study conducted in Nigeria where the mean age was  $43.9 \pm 121.8$  years (Adole *et al.*, 2011) as well as the study conducted at KNH with a mean age of 60.6 years (Ekwom, 2011).

The prevalence of OA in this research was higher in females, which further increased with age which is similar to the research carried out in Nigeria where the prevalence among OA females was high and increased with age (Adole *et al.*, 2011). This OA study further established that male vulnerability to OA was dominant at below the age of 45 years (57 %), while female vulnerability increased at ages of above 45 years (63 %). This result agrees with other findings (Holford, 2008) which could be due to reduced calcium absorption after menopause in females, this as well explains why the disease occurrence was leaning on the female side of the family (Holford, 2008). Helmick and Hootman (2006) reported that osteoarthritis becomes more common with old age, younger people can develop it as a result of joint injury, joint malformation, or genetic defect in joint cartilage. Before the age 45 years, more

men than women have osteoarthritis but after the age 45 years OA is prevalent among women (Helmick and Hootman, 2006) which is consistent with results of the current study.

Education is a key determinant of the lifestyle and status an individual enjoys in the society (KNBS and ICF Macro, 2010). Studies have consistently shown that attainment of education has a strong effect on health behaviors and attitudes (KNBS and ICF Macro, 2010). This study established that 64 % of the OA male respondents had attained secondary school education as opposed to (23 %) of females. This compares well with the national level where more males (12 %) have attained secondary education than females (9 %) (KNBS and ICF Macro, 2010).

## **5.2 Nutritional knowledge**

Joshi, (2010) has recommended the role of a dietician in disseminating nutrition education. This study established that nutritional knowledge score for the OA respondents was poor with 80.2 % scoring low and 19.8 % attaining an average score. This is attributed to the lack of implementation of a self management plan at the orthopedic centre.

There are four (4) sources of information available to the OA patients namely, doctors, nutritionist's, internet and books. This study shows that 17 % of the OA respondent's accessed information from the sources outlined in section 4.2, which explains the role of diet within a treatment plan for OA patients, is not acknowledged. This finding agreed with the observational and qualitative studies by other researchers that most patients expected to have OA permanently and do not believe that a cure for

OA is likely or that there is an effective way of treating OA and thus they are reluctant to seek further help (National Collaborating Centre for Chronic Conditions (NCC-CC), 2008), according to FGD's majority of the patients are not aware of the benefits of proper diet regarding the disease.

The internet as modern source of knowledge is underutilized, as only 2.8 % of the respondents refer to the internet. This is partly attributed to the poor levels of literacy and also the advanced age of the majority of the respondents who are not in the modern information and communication technology generation.

Duff and Livingstone, (2003) acknowledges the relationship between nutrition and the development of chronic diseases, as well as the interaction between disease and nutritional status. In a study done in Ireland to examine the current status of nutrition awareness amongst general practitioner trainees throughout Ireland the respondents show little awareness that nutrition had been included in their medical training. The disparity between the perceived importance of nutrition and personal lifestyle behaviors concur with other studies. The general practitioner trainees were ill equipped to appreciate and value the extent of dietetic intervention for nutrition-related problems in clinical practice (Duff and Livingstone, 2003). This study agrees with these findings, the value of dietetic intervention in the management of OA was not acknowledged and implemented by the practioners.

The study showed a positive association between level of education and level of nutritional knowledge, where OA respondents with high level of education also had

higher nutritional knowledge. This shows that education plays a role in attaining nutritional knowledge.

The association between nutrition knowledge and diet diversity is significantly high, mainly because increase in knowledge on the sources of different nutrients, enhances the consumption of a diversified diet providing specific nutrients. This in turn improves the dietary intake of the respondents, thus raising the chances of meeting the Recommended Dietary Allowance (RDA) for every nutrient.

### **5.3 Dietary Practices**

The dietary diversity score of the respondents was moderate for 86 % of the OA respondents consumed 4-8 food groups in a day. The results indicate that consumption of energy giving foods was high and that of proteins was moderate while consumption of milk, fruits, eggs, fish and sea foods was low as indicated by both the 24 hour qualitative recall and the weekly food frequency intake. Fish and sea foods are the main sources of omega 3 and Vitamin D, this food group was consumed by 3.4 % of the respondents, thus a probable failure of OA patients from benefiting from the benefits of omega 3 such as its anti-inflammatory effects as well vitamin D necessary for effective calcium absorption and bone structure. According to Hand and Nicholas, (2011) low intake of Vitamin D leads to increased loss of cartilage and therefore it should be an important component of diet of individuals. The least consumption of food groups rich in omega 3 and vitamin D among the respondents is therefore wanting.

The consumption of eggs was low i.e. at 7.3 %, the egg yolk is a source of

Vitamin D and sulphur an important component of the cartilage (Balch, 2011), and the study results support Balch (2011), that the respondent's low intake of eggs could be a cause of loss of cartilage.

About a third (30.7 %) of the respondents consumed fruits. Fruits are rich in both Vitamin C and Beta- carotene; antioxidants which help reduce the progression of OA (Hand and Nicholas, 2011). This could be explained by the study findings that respondents are not aware of the dietary benefits of fruits and other foods recommended for the management of OA.

According to Popkin (2004), lack of dietary diversity is particularly a problem for poor and middle class population in the developing world because their diets are predominantly based on starchy staples which often include little or no animal products, few fresh fruits and vegetables (Popkin, 2004). This agrees with the study population where all the respondents consume starchy foods and they have moderate dietary diversity scores.

The level of education plays a key role in the improvement of dietary diversity of respondents as was observed in the current study. The level of income significantly influences the diversification of food consumed by respondents indicating that level of income determines the capacity to purchase different types of food.

## **5.4 Nutritional Status**

In this study, 23 % of the OA respondents were overweight, 48 % were obese and 29 % had normal BMI. There are many factors that contribute to overweight and obesity such as eating patterns, low physical activity and sedentary behavior (Welsh Assembly Government, 2003).

Healthy eating can be used to control obesity a definite risk factor for OA (Eustice, 2008). The study findings agree with the Welsh Assembly Government, (2003), and Eustice, (2008). In this study the population suffers from obesity and improper diet mainly due the absence of a dietary plan, sedentary behavior and also pain that discourages them from physical activity.

The prevalence of overweight and obesity is significantly higher among the OA patients who had low levels of physical activity. This is explained by the concept that physical activity is major factor in weight control.

## **5.5 Co-morbidities**

The OA respondents suffer from other diseases (50.2 %), which further complicate their nutritional status. The presence of other diseases was partly attributed to obesity and average level of physical activity among the patients this agrees with studies which reveal that osteoarthritis creates obstacles to proper nutrition, following the necessity to eat every time a patient is taking medicine, thus leading to excess weight gain (Dava and Arthur, 2006).

The presence of co-morbidities in this study agrees with the findings of Dunstan et al., (2008) in which the meta-analysis determined statistically significant associations for overweight with the incidence of type II diabetes, all cancers except esophageal (female), pancreatic and prostate cancer, all cardiovascular diseases (except congestive heart failure), asthma, gallbladder disease, osteoarthritis and chronic back pain (Dunstan *et al.*, 2008).



## 5.6 Physical Activity

Exercise is one of the best treatments for osteoarthritis and it improves mood and outlook, decrease pain, increase flexibility, strengthen the heart and improve blood flow, maintain weight, and promote general physical fitness (Arnold *et al.*, 2008). Physical inactivity was identified as the fourth leading risk factor for global mortality. The physical inactivity levels are rising in many countries with major implications on the prevalence of non-communicable diseases (NCDs) and the general health of the population worldwide (WHO, 2010).

Physical activity in the study involve movement (walking and cycling), working and recreational activities. The activities include walking, farming, construction work, lifting light loads, riding a bicycle, sporting, fitness, recreation and swimming. From this study 47% of OA respondents, do not attain the recommended 150 minutes of vigorous to moderate physical activity every week. According to FGD's the adult patients lack awareness on the level of physical activity required to derive health benefits and unaware of the recommendations, this agrees with the research findings of NHS (2008) where adults lack information on physical activity recommendations (NHS, 2008).

The moderate level of physical activity among the study population was attributed to lack of counseling to underline the benefits of exercise, advanced age of the patients and also painful joints that make it difficult to move around. Overweight and obesity could also make it difficult for patients to engage in sustainable physical activities.

In this study the level of physical activity was associated with the nutritional status of the respondents, the higher the level of physical activity, the better the nutritional status of the patient. This was mainly because physical activity is important in energy expenditure and thus plays a role in reduction of weight.

## **5.7 Sedentary behavior**

A sedentary lifestyle is one characterized by high levels of sedentary behavior, irrespective of an individual's level of moderate or vigorous physical activity. Sedentary behavior is a risk factor for chronic disease and that it is possible for an individual to accumulate high levels of both physical activity and sedentary behavior. Sitting too much is not the same as exercising too little (Hamilton *et al.*, 2008). The respondents on this study spend 4.8 hours on average sitting or reclining.

The sedentary lifestyle of the patients agrees with the report of NCC-CC (2003) that people with the osteoarthritis have some degree of limitation of movement and cannot perform their major activities of daily life (NCC-CC, 2003), similarly the study findings agree with findings of other researchers that regardless of age, gender or body weight, living an active lifestyle is associated with a higher quality of life and reduced risk of disease and death (Colley *et al.*, 2010).

## **5.8 Factors affecting nutritional status, knowledge and practices of osteoarthritis patients.**

The study findings established that the level of education contributed significantly to nutrition knowledge, dietary practices and nutritional status. This can be explained by the fact that, when individuals are educated they are exposed to variety of knowledge sources that increase their nutrition knowledge and therefore they are capable of diversifying their diet. Through employment educated people earn money that enables them to purchase various foods and this too improves their nutritional status. The level of physical activity contributed significantly to the nutritional status, for the reason that physical activity helps in weight reduction.

# CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

## Conclusions

It is concluded that;

The elderly persons (61-74 years) are more susceptible to OA.

High level of education influences the nutritional knowledge, nutrition status and dietary practices of OA patients in a positive way. The higher the level of education the better the nutritional knowledge, dietary practices and nutrition status

The nutrition knowledge of OA patients is low and they do not recognize the role of diet and weight control in the management of the disease, however their dietary diversity is moderate with low consumption of the food groups containing Vitamin C, Vitamin D and Omega 3.

The nutritional status of OA patients measured by BMI is poor due to overweight and obesity which were common among OA patients and this increases their chances of developing other non-communicable diseases.

Physical activity is important in improving the nutritional status of OA patients as it curbs obesity which is a cause and a co-morbidity of OA.

## Recommendations

The Kenyan population is aging and therefore the prevalence of osteoarthritis which is mainly age related will increase. There is need to educate the public on healthy habits such as having a balanced diet and exercising.

Patients diagnosed with osteoarthritis should modify their lifestyles and adopt the recommended diet and weight management program.

A nutritionist working with the medical team to achieve holistic care of the patient is recommended by this study.

The results indicate the need to improve basic nutritional knowledge and its application in clinical practice. To improve patients nutritional status the healthcare providers should develop a management plan in partnership with the patients, this will help the patients to play their part in the treatment process.

There is need for increased awareness among patients and the public on the effects of obesity which is a contributing factor and a co-morbidity of OA.

Further research should be undertaken to explore the effect of diet in regenerating the joint cartilage.

There is emerging evidence showing that sedentary time predicts a number of adverse health outcomes in adults. This study recommends additional research to validate a quantitative recommendation on daily sedentary time for maintaining a healthy body weight and the prevention of OA and obesity.

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# Appendices

## Appendix 1: Informed Consent Form

### REQUEST FOR CONSENT TO PARTICIPATE IN THE STUDY

Name of client .....

Gender.....

Age.....

Address.....

I would like to request you to allow the study team to ask you a few questions regarding your feeding and other osteoarthritis management aspects. As part of the study, eligible people visiting Kikuyu Orthopaedic and Rehabilitation Centre are being asked to provide information about their nutritional status, knowledge and practices.

#### Benefits

The aim of the study is to raise awareness of the public, patients and care providers on the relationship between osteoarthritis and nutritional status and practices of the patients.

The results of the study will assist decision makers and programme planners at the Ministry of Health to come up with appropriate response on the prevention, care and management of osteoarthritis.

#### Risks

There are no risks associated with your participation in the study.

#### Confidentiality

The information which you will give will be kept confidential and it will not be linked with your identity. Your identity will not be disclosed in any public reports or publication or any other parties.

Do you have any questions?

Do you agree to be a respondent in this study? Yes..... No .....

Date: .....

Name of respondent .....Signature/ Thumb print

.....

Name of interviewer: .....Signature: .....

## Appendix 2: Socio-Economic and Demographic Characteristics

County.....Location.....Respondent No.....

Name of Interviewer.....Date of  
interview...../...../2011

Respondent's name.....

**Use the code provided at the bottom of this page to fill in the table, for others specify in the space below the codes**

### The socio – Economic profile for OA respondents

No	Names of household members	Relation to HHH 1.	Age in Years 2	Gender 3	Education 4	Occupation 5	Religion 6	Marital status 7
1								
2								
3								
4								

#### Relationship to HHH Status

HHH=1  
Monogamous=1 Single=2  
Polygamous=2  
Spouse=3  
Child=4

Windowed=5

Grandchild=5  
(specify) =7  
N/A=5  
Worker=6

#### Education

Post secondary =1  
Secondary=2  
Primary=3  
No formal Education=4  
Graduate=5

Other (specify) =6

#### Marital

Divorce=3  
Separated=4

Single=6  
Other

**Occupation**

- None=1
- Self-employed =2
- Formal-employment =3
- Other (specify) =4

**Religion**

- Christian=1
- Muslim =2

**Gender**

- Male=1
- Female=2

A8 Monthly income of the household.....

A9 Proportion of income spent on food.....

A10 When you were first diagnosed with OA?  
.....

A11 Do you suffer from other disease(s)? 1= Yes      2=No

A12 If yes, which one(s)? .....

A13 If so, which preceded the other? OA or the other disease(s).....

A14 Does any of your family member/s suffer from OA?.....If yes what is the relationship.....

A15 Do you have an insurance cover?      1=Yes      2=No

A16 What influences your choice for a health provider? 1=Cost    2= Referred    3=Others (Specify).....

## Appendix 3: Nutrition Knowledge Test Marking Guide

### Questions

**Marks=25**

B1. Do you attend any nutritional session?      Yes        No  
(2)

If no go to Q4

B2. What have you learned from these sessions?  
(1)

1= About nutrients

2=About physical activity

3=Possible causes of OA

4= Management of OA (Specify)

4=Others (Specify)

B3. What nutritional knowledge you have gained from the time you started the sessions?  
(1)

1=Sources of vitamin D, C Beta-carotene and Omega 3

2=Food preparation

3=Methods of cooking

4=Others (Specify)

B4. What do you consider when choosing food for consumption?  
(1)

1= Dietary needs (OA status )

2=Availability

3=Affordability

4=Seasonality

5= Others (Specify)



B5. What factors do you consider before preparations of any meals?

(1)

1= Nutrient preservation

2=Standing time

3= Others ( Specify )

B6. Are there any changes in your feeding habits ever since you knew of OA?

(1)

1=YES

2=NO

B7. Which foods reduce pain and inflammation?

(2)

1=Omega 3

2=Sea food

3= Fruits and Vegetables

4=Rice bran oil

5= Others (Specify)

B8. Which foods worsen pain and inflammation?

(2)

1=Omega 6 fatty acids

2=Saturated fats

3=Trans fatty acids

4=Simple refined carbohydrates

5= Others (Specify)

B9. Which foods provide Vitamin C to your body?

(1)

1=Oranges

2=Guavas

3=Broccoli

4=Kales

5=Grapes

6= Others (Specify)

**B10. Which foods provide Vitamin D to your body?**

(1)

1=Sunlight

2= Cod liver oil

3=Egg

4=Salmon

5=Mackerel

6=Vitamin D fortified cereals

7= Others (specify)

**B11. Which foods provide Beta carotene to your body?**

(1)

1=Carrots

2=Spinach

3=Kale

4=Tomato

5=Mango

6=Passion fruit

7= Avocado

8= Oranges and loquats

9=pumpkin

10=Orange-fleshed sweet potato

11= Others (Specify)

**B12. Which foods provide Omega-3 to your body?**

(1)

1=Salmon

2=Soybeans

3=Tofu

4=Olive oil

5=Others (Specify)

B13. Which foods provide proteins to your body?

(1)

1=Eggs

2=meat (specify)

3=beans (specify)

4=Milk

5=Fish

6= Others (Specify)

B14. Which foods provide Carbohydrates to your body?

(1)

1=Cereal grains (specify)

2=Legumes (specify)

3= Starchy Vegetables (specify)

4=Fruits (specify)

B15. How do you prepare your vegetables before cooking?

(1)

1=Washing them under running tap water

2=Cutting them after washing

3=Cutting them before washing

4=Soaking them

5= Others (Specify)

B16. Which method of cooking do you use for your vegetables?

(1)

1=Steaming

2=Frying

3=Boiling

4=Others (Specify)

B17. What do you understand by the term 'Balanced Diet'

(3)

1=Diet containing carbohydrates, proteins, fats, vitamins and minerals

2=Adequate amount of food

3= Others (Specify)

B18. Where do you get nutrition information regarding OA from?  
(2)

1=Health facilities

2=Media

3=Reading

4=Group discussions

5=Others (Specify)

B19. What are the effects of obesity on OA patients?  
(1)

1=Increased joint pain

2=Immobility

3=Development of other diseases (Specify)

4= Others (Specify)

## Appendix 4: The OA respondents dietary practices

Investigating Food frequency the food frequency for OA respondent.

Question; How many times on average do you eat the following foods in an ordinary week?

Food type	Frequency(per week)	Food type	Frequency(per week)
Bread		Cowpeas	
Potatoes		Pigeon peas	
Sweet potatoes		Ground nuts	
Arrow roots		Cabbage	
Matoke		Broccoli	
Cassava		Kales	
Ugali		Traditional vegetables	
Rice		Other vegetables	
Sugar		Oranges	
Uji		Mangoes	
Mutton		Bananas	
Goat		Lemons	
Beef		Guavas	
Pork		Water melon	

Chicken		Milk	
Rabbit		Yoghurt	
Fish		Spices	
Eggs		Cooking oil	
Beans		Margarine	
Lentils		Cakes	
Mukimo(maize, peas potatoes)		Jam	
Githeri(maize & beans)		Others(Specify	

## Appendix 5: Qualitative 24-Hour Recall Food Intake Record

Time	List of Food
Breakfast	
Mid-morning snack	
Lunch	
4 O'clock snack	
Dinner	
Bedtime snack	

## Appendix 6: 24 hr Household Dietary Diversity

<b>Food group consumed:</b> What foods groups did members of the household consume in the past 24 hours (from this time yesterday to now)? Include any snacks consumed.	Did a member of your household consume food from any these food groups in the last 24 hours? 1=Yes 0= No
<b>Type of food</b>	
Cereals and cereal products (e.g. maize, spaghetti, rice, bread)?	
Milk and milk products (e.g. goat/cow fermented milk, milk powder)?	
Sugar and honey?	
Oils/fats (e.g. cooking fat or oil, coconut milk, butter, ghee, margarine)?	
Meat, poultry, offal (e.g. goat, beef; chicken or their products)?	
Pulses/legumes, nuts (e.g. beans, lentils, green grams, cowpeas; peanut, )?	
Roots and tubers (e.g. sweet potatoes, , cassava, arrowroot Irish potatoes)?	
Vegetables (e.g. green or leafy vegetables, tomatoes, carrots, onions)?	
Fruits (e.g. water melons, mangoes, grapes, bananas, lemon)?	
Eggs?	
Fish and sea foods (e.g. fried/boiled/roasted fish, lobsters)?	
Miscellaneous (e.g. spices, chocolates, sweets, beverages, etc)?	

C1 Do you take any concoctions? .....

C2 Who supplies the concoctions? .....

C3 In your opinion who should give you nutrition education regarding OA? .....

.....

## Appendix 7: Anthropometric Measurement Form

No.	Age (years)	Weight (kg)	Height (m)	BMI (kg/m <sup>2</sup> )
1st reading				

2nd reading				
Average				

Final BMI measurement .....

## Appendix 8: Physical Activity Questionnaire

<b>Physical Activity</b>			
<b>Questions.</b>		<b>Response</b>	<b>Code</b>
<b>Activity at work</b>			
1	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like (carrying or lifting heavy loads, digging or construction work) for at least 10 minutes continuously?  (INSERT EXAMPLES) (USE SHOWCARD)	Yes            1  No              2    if No, go to p4	P1
2	In a typical week, on how many days do you vigorous-intensity activities as part of your work?	Number of days	P2
3	How much time do you spend doing vigorous-intensity activities at work on typical day?	Hours: minutes	P3
4	Does your work involve moderate-intensity activity that causes small increases in breathing or heat rate such as brisk walking (or carrying light loads) for at list 10 minutes continuously?	Yes            1  No              2    If No, go to 7	P4
5	In a typical week, on how many days do you moderate-intensity activities as part of your work?	Number of days	P5

6	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours: minutes	P6
<b>Travel to and from places</b>			
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way travel to and from places. For example to work, for shopping, to market, to place of worship. (insert other examples if needed)			
7	Do you walk or use a bicycle for at list 10 minutes continuously to get to and from place?	Yes 1 No 2	P7
8	In the typical week, on how many days do you walking or bicycling for at least 10 minutes continuously to get to and from place?	Number of days	P8
9	How much time do you spend walking or bicycling for travel on a typical day?	Hours: minutes	P9
<b>Recreation activities</b>			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreation activities (leisure), (insert relevant terms).			
10	Do you do any vigorous-intensity sports fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like (running or football) for at least 10 minutes continuously?  (INSERT EXPLAINS) (USE SHOWCARD)	Yes 1 No 2 If No, go to p 13	P10
11	In a typical week on how many days do you do vigorous-intensity sport, fitness or recreation (leisure) activities?	Number of days	P11



1 2	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hour: minutes	P12 (a-b)
<b>Physical activity (recreational activities) contd.</b>			
<b>Question</b>		<b>Response</b>	<b>C o d e</b>
1 3	Do you do any moderate-intensity sport, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, volleyball,) for at least 10 minutes?	Yes 1  No 2 If No go to 14	P 1 3
1 4	In a typical week, on how many days do you do moderate-intensity sport, fitness or recreational (leisure) activities?	Number of days	P 1 4
1 5	How much time do you spend doing moderate-intensity sport, fitness or recreational (leisure) activities on a typical day	Hours: minutes	P 1 5
<b>Sedentary behavior</b>			
The following question is about sitting or reclining at work, at home, getting to and from place, or with friends including time spend (sitting at a desk, sitting with friends, traveling in a car, a bus, train, reading, playing cards or watching television), but do not include time spend sleeping. (INSERT EXAMPLES) (USE SHOWCARD)			
1 6	How much time do you usually spend sitting or reclining on a typical day?	Hours: minutes	P16

## Appendix 9: Key informant interview Guide

Date.....

Gender.....

Job title.....

Name of Health Facility.....

- How do you identify yourself with OA patients?
- What are the causes of OA?
- What services do you provide to OA patients?
- What challenges do you encounter in delivering the services to them?
- Do you offer them any nutritional and physical activity education?
- How do you ensure that they adhere to the guidelines of this education?
- What factors influence the type of foods OA patients consume?
- What is the role of diet in the management of OA?
- What is the role of medication in the management of OA?
- Have the patients been sensitised adequately across the country on the management of OA?
- What should be done to prevent or to slow the progression of OA?
- Do your patients have an insurance cover?

## Appendix 10: Focus Group Discussion Question Guide

Date.....

Name of Health Facility.....

- Do you receive any nutritional education regarding OA?
- Who should provide this nutritional education?
- Are there some challenges regarding nutrition and OA that need to be addressed?
- What factors do you consider when choosing the food to consume and the preparation method?
- What foods do you avoid and why?
- What do you understand by a balanced diet?
- What herbal medication do you take and what are the benefits?
- What food supplements do you take and what are the benefits?
- What do you know about exercises?
- What are the causes of OA?
- What other disease(s) do you suffer from?
- Which preceded the other, the disease or OA?
- Do you have an insurance cover?
- What determines your choice for a service provider?

## Appendix 11: Nutrient Composition

Vitamin C Sources	Mg
Red bell pepper, 1 cup	280
Guava, 1 medium	165
Broccoli, 1 cup	120
Orange, 1 medium	120
Green bell pepper, 1 cup	120
Cauliflower (cooked), 1 cup	100
Papaya, 1 medium	95
Strawberries, 1 cup	90
Kale (cooked), 1 cup	85
Cabbage greens (boiled), 1 cup	80
Orange juice, 3/4 cup	75
Kiwi, 1 medium	60
Grapefruit juice, 3/4 cup	60

Beta Carotene Sources	IU
Sweet potato (baked), 1 medium	28,058
Carrots (cooked), 1 cup	26,835
Spinach (boiled), 1 cup	22,916
Kale (boiled), 1 cup	19,116
Pumpkin pie, 1 slice	12,431
Carrot (raw), 1 medium	8,666
Butternut Squash (boiled), 1 cup	8,014
Spinach (raw), 1 cup	2,813
Mango, 1 cup sliced	1,262
Oatmeal, 1 pack instant	947
Tomato juice, 6 oz	819
Peach, 1 medium	319
Red pepper, 3" ring	313

<b>Vitamin D Sources</b>	<b>IU</b>
Cod liver oil, 1 Tbsp	1,360
Salmon, 3.5 oz	360
Mackerel, 3.5 oz	345
Tuna (canned), 3 oz	200
Sardines (canned), 1.75 oz	250
Milk, D-fortified, 1 cup	100
Egg (or egg yolk), 1 medium	41
Cereals, D-fortified, 1 cup	40
Vitamin D supplement	200-400

<b>Omega-3 Sources</b>	<b>Grams</b>
Flaxseeds (ground), 2 Tbsp	3.5
Walnuts, 1/4 cup	2.3
Atlantic salmon, 3.5 oz	2.0
Albacore tuna, 3.5 oz	1.5
Soybeans (cooked), 1 cup	1.0
Tofu (raw), 4 oz	0.4
Olive oil (uncooked), 2 Tbsp	0.2