UNIVERSITY OF EDUCATION, WINNEBA

INVESTIGATING THE NUTRITIONAL QUALITY OF THE DIET OF THE ELDERLY IN JASIKAN DISTRICT

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DECLARATION

Student's Declaration

I, **Bernice Mawufemor Agbedor**, hereby declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and that it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE …….

DATE……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this dissertation were done in accordance with the guidelines for supervision of thesis laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: MS. COMFORT KUTUM MADAH

SIGNATURE: ……

DATE:……..

DEDICATION

To my lovely kids: Emmanuel, Senyam, and the entire family.

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ABSTRACT

The nutritional needs of elderly people in society appears to be ignored or not sufficiently prioritized. This study was conducted in Jasikan community. It investigated the diet quality of the elderly. The research methods used for the study were survey, and observation. The study employed the cross-sectional design. Ninety-eight (98) elderly people were sampled via multistage sampling technique for the study. Questionnaire with Crobanch's alpha 0.775, and observation checklist were used as research instruments to collect data. The quantitative data was analysed using Statistical Package for Social Sciences (SPSS) version 22 software. The study revealed that breakfast, snack, lunch and supper meals eaten by the elderly in Jasikan were relatively large in quantity or portion size but poor in protein, vitamin and mineral contents. The poor diet quality of the elderly was linked to food insecurity and low income levels. It was evidenced that Hypertension, type 2 diabetes and constipation were the most prevalent nutritional disorders among the elderly in Jasikan community The study identified dietary and lifestyle modification strategies for improving the diet quality of the elderly. In this regard, the study recommended that caretakers and families of the elderly in Jasikan should always provide adequate food to the elderly people. They should improve the feeding practices and nutrient content of foods given to elderly by feeding them with the right amount of carbohydrate, protein, and vitamin-giving foods three times or more in a day and also give them adequate fresh fruits, vegetable and water.

CHAPTER ONE

INTRODUCTION

1.0 Overview

The chapter discusses the background to the study, statement of the problem, purpose and objectives of the study and research questions. It also talks of the significance of the study, delimitations of the study, limitations of the study, and organization of the study.

1.1 Background of the study

The society in which we live at the present time is an aging one. The number of older adults in the world (≥ 65 years) is growing exponentially, from 461 million in 2004 to an estimated 2 billion by 2050 (Clegg, *et al.*, 2013). Not only is 1 in every 8 older than 65 years, but a person aged 65 can expect to live an average of 18 more years. People aged 85 years and over are the fastest-growing group, and the proportion of these ―oldest old" is expected to triple between now and the year 2030. In Ghana, the situation follows a similar trend with about 5% of the population constituting the elderly; and this proportion is expected to increase in subsequent years (Ghana Demographic and Health Survey, 2003).

The elderly, between the ages 65 to 80, in Jasikan town are mostly farmers and civil servants who are on retirement. Their economic conditions are such that they are likely not to be classified as being within the middle-income group since they are either on retirement or doing subsistent farming. The elderly population in Jasikan live mainly on grains, especially maize. This situation can be as a result of the influences of social and

environmental variables including educational level, previous job status and family size. This has implications on their diet quality.

Diet quality refers to the condition of one's diet compared to established dietary guidelines, and the extent to which food or dietary patterns closely meet dietary guidelines, and ~~h~~how diverse the variety of healthy choices is within core food groups (Wirt & Collins, 2009) as based on U.S Dietary Guidelines from the 2010 Healthy Eating Index [HEI] (2010) and Diet Quality Index (DQI) proposed by the United States (US). In the views of Ledikwe *et al.* (2006), different socio-economic indicators appear to have similar, although independent, effects on nutrition and diet. Diet quality is affected not only by age and sex, but also by occupation, education, and income levels (Groth *et al.,* 2001).

Generally, ageing is associated with changes in activity levels, which affect eating habits of the elderly as well as the health and functioning of elderly population. These changes are influenced by many factors — biological, demographic, social and environmental factors. The factors which affect the dietary habits of the elderly include food insecurity, individual food preferences, dietary awareness and time constraint. With a growing ageing population Office of National Statistics, (2007), it is more important than ever to ensure their needs and care are adequately met. One of the basic needs of the elderly is quality nutrition or diet. This is because nutrition is one of the major determinants of successful aging. Food is not only critical to one's physiological well-being, but also contributes to social, cultural and psychological quality of life (Center for Disease Control and Prevention, 2009).

A healthy diet is an important part of a healthy lifestyle for people of all ages, including the elderly. This is because a healthy diet with adequate calories and appropriate levels

of essential nutrients is needed to meet basic metabolic and nutritional requirements in order to maintain physical and mental functioning and growth as stated by Laparra and Sanz (2009). On the other hand, inadequate nutrition due to poor diet quality can lead to loss of functioning and development or progression of disease (Canella, Savina & Donini, 2009). Deficiencies in essential nutrients can lead to health and development problems, for example, vitamin D deficiency, which can cause bone health problems among the elderly Horwath, *et al* (2010).

Good health is affected by many factors, but nutrition is one of the most important determinants of successful aging. Nutrition may have a significant influence on adults aged ≥65 years. This implies that nutrition is the bedrock of good care for older people who are mostly at a risk of malnutrition (Potter, 2008). Older adults who consume a more varied diet have better health outcomes. Some individuals will make positive dietary changes following the on-set of certain chronic health conditions, however, dietary restrictions associated with chronic diseases can contribute to compromised nutritional status among the elderly as stated by the World Health Organization (WHO, 2003). Many old people suffer from debilitating conditions that could have been largely prevented had they known and applied nutrition principles. Similarly, among the top eight leading causes of death, five are nutrition related (Berstein & Munoz, 2012).

Aging cannot be stopped but the process can considerably be slowed down through healthy lifestyle choices and behaviours (Reese, 2007; Ahluwalia & Ahluwalia, 2005). One of these healthy lifestyles is healthy dietary habits, including eating quality diets. Adequate nutrition and good health are the rights of all individuals, including the elderly. In order to promote healthier eating habits and consequently improve health

status of the elderly, it is first vital to understand what makes elderly people follow particular dietary patterns and equally which factors contribute to their choices.

The growth in the population of the elderly requires that global initiatives are targeted towards food security and quality diet for this vulnerable group. This is to help improve health and nutritional challenges of the elderly people in society. Quality nutritional care is very important because it may help in the management of the most common nutritional disorders such as hypertension, congestive heart failure, diabetes, dyslipidemia, coronary artery disease, osteoporosis, malignancies, and renal failure. These are very common conditions 87% of adults 65 years of age or older have at least one of these conditions (Berstein & Munoz, 2012). By monitoring diet quality, these chronic diseases associated with aging may be prevented, delayed, or more properly managed (Kamp, 2010). For adults over 50 years old, the benefits of healthy eating include increased mental acuteness, resistance to illness and diseases, high energy levels, faster recuperation times and better management of chronic health problems.

Globally, continued good health of the elderly population is a major challenge to individuals and society. It is therefore advisable for older adults to make behavioural changes to maintain their health and independence into advanced old age. Among the most important self-care behaviours are those that involve the quality of diet. In view of this, the researcher deems it fit to assess the effect of diet quality on the elderly in Jasikan located in the Jasikan District of Ghana.

1.2 Statement of the problem

The elderly population in the Jasikan District of Ghana are most unlikely to eat a balanced diet to meet the nutrient needs of their changing physiologic state (Jasikan Health Directorate, 2018). This is because they are mostly food insecure. This food

insecurity spans across food unavailability and insufficiency, inaccessibility and poor utilization in terms of ingestion and digestibility. This implies that the diet quality of the elderly in the district is poor. Food accessibility as an index includes the functional capabilities to obtain the food, whereas food utilization considers the physiological ability to digest and assimilate nutrients for proper health (Nsia Asare, 2018). Hence, most of them are vulnerable to poor nutrition and health. Poor nutritional status among older people is well documented by the European Nutrition for Health Alliance [ENHA] (2005). This suggest that the nutrition and overall state of health of the elderly in Jasikan District is a serious issue which warrants urgent attention. In Ghana, few studies have been done on the elderly but there has been limited research examining diet quality of the elderly in Ghana. Therefore, studies examining diet quality have been limited. Additionally, there are no published studies that assessed the diet quality of the elderly in Jasikan District. This creates a knowledge gap which needs to be filled by the current work.

1.3 Purpose of the study

The purpose of this study was to investigate the diet quality of the elderly in the Jasikan District.

1.4 Objectives of the study

The study sought to:

1. identify the types of food eaten by the elderly in Jasikan District.
2. investigate the factors affecting or influencing the choice of diet quality of the elderly in the community.

3. identify the nutritional related health challenges of the elderly in the community.
4. identify measures to improve the diet quality of the elderly in the community.

1.5 Research questions

The following research question have been formulated to guide the study:

1. What types of food are eaten by the elderly in the Jasikan District?
2. What factors that influence the choice of diet quality by the elderly in the community?
3. What are the diet challenges of the elderly's health in the community?
4. What measures can be put in place to improve the diet quality of the elderly in the community?

1.6 Significant of the study

Theoretically, the findings of the study would fill the knowledge gaps on the diet quality of the elderly in the Jasikan District. It is also hoped that other researchers will find the information in this study useful in their research. Policy wise, the findings from this study would not only support advocacy towards policy on nutrition for the elderly but it would also inform other researchers and organizations in planning programmes for similar groups elsewhere. This study would provide some basic information on the diet quality for the Ministry of Health and other stakeholders in designing and implementation of policy interventions to improve the diet quality of the aged in the Jasikan District.

1.7 Delimitation of the study

Creswell (2009) defines delimitation as ~~h~~how the study will be narrowed in scope. Even though the problem under investigation has a national dimension, this study is delimited to the elderly in the Jasikan only. The study focused on ninety-eight (98) elderly between the ages of 65 and 80 years in both the rural and urban towns of Jasikan. This means that the accessible population for the current study involved only 98 (2.5%) out of a population of 3,960 elderly in the study setting. This represents just a small number of the target population considering the total number of the elderly in the district. Hence, the findings of the study might not be generalized to the elderly population below age 65 and above age 80.

Content wise, it focused on the diet quality of the elderly. However, the views expressed by the sampled did not substantially and significantly differ from that of the larger population of the elderly in the district, other districts in Ghana and elsewhere because of homogeneity of the population.

1.8 Limitations of the study

The researcher encountered a number of difficulties during the conduct of this study. The researcher conducted this study on only 98 elderly people in the Jasikan District only. The sample size was also relatively small considering the population of the elderly in the district and Ghana as a whole. Failure to study the entire or a large population of the elderly in the district and country reduced the generalizability of the findings. Hence, the results of this study were limited to the views of the elderly in the district.

Another challenge was that it was difficult to collect data from some of the respondents. The researcher had to make several follow-ups before retrieving the completed questionnaires. This delayed the work. Again, a few respondents were given some money before information was retrieved from them. This was an additional cost to the researcher. There was also a challenge of unwillingness on the part of some of the respondents to provide the information for fear of the outcome of the research. However, the respondents were assured of their confidentiality. They were also briefed on the purpose of the research and that the results were to be used for research only. In this regard, they willingly provided the information.

1.9 Definition of terms

The following terms were defined theoretically and operationally as follows:

Diet quality

Theoretically, diet quality is the condition of one‘s diet compared to the established dietary guidelines. In assessing diet quality, food patterns are scored to determine how closely it meets the dietary guidelines and ―how diverse the variety of healthy choices is within core food groups" (Wirt & Collins, 2009, p. 2473). In this study, diet quality of the elderly is operationally measured with a Healthy Eating Index (HEI) based on the 2010 U.S. Dietary Guideline commendations.

Dietary intake

Theoretically, dietary intake is defined as an individual‘s average daily intake of food and drink. Operationally, the 2010 U.S. Dietary Guidelines will be used as a benchmark to assess the amount of servings such as portion size and dietary intake of the elderly using the 24-hour food recalls.

Health Eating Index (HEI-2010) Score

Theoretically and operationally, the diet quality scores of the elderly is calculated based on individual's intake of foods and drinks in the dietary components as specified by the US Health Eating Index [HEI] (2010). There are 12 food components; each component has a score range from 0 to 5, 0 to 10, or 0 to 20. Sub-scores will be combined to get a total score, and the total of the components scores will be summed up to a possible 100 points. The recommended amounts of each food components will be assigned with a score. A person who has a higher component score is indicative of a higher diet quality and one's actual intake based on the U.S. Dietary Guidelines.

1.10 Organisation of the study

This study is organized into six chapters. Chapter one, the introduction, covers the background to the study, statement of the problem, purpose and objectives of the study, research questions, hypotheses, significance of the study, delimitation, limitation and organisation of the study. Chapter two reviews related literature. Chapter three, the methodology, contains the overview, research design, population, sample size and sampling techniques, instrumentation, validity and reliability of the instruments**,** data collection procedures, data analysis, and ethical considerations. Chapter four is results. Chapter five is the discussion of findings. Chapter six gives the summary of the study, conclusion, recommendations based on the results of the study and suggestions for further research/studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

A literature review is a critical analysis of the literature, or research, related to a specific topic or research question. In literature review, information is obtained from both primary (first-hand information is obtained from direct sources) and secondary sources (from surveys, books, scholarly articles, and any other sources) relevant to a particular issue, area of research, or theory. By so doing, it provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated. In the opinion of Creswell (2009), review of related literature concerns itself with all relevant written documents with information linked to the research problem. It provides a framework for establishing the importance of the study as well as a benchmark for comparing the results with other findings. The literature review is important because it a) describes how the proposed research is related to prior research in statistics; shows the originality and relevance of a research problem and justifies the proposed research methodology; and demonstrates the preparedness of a researcher to complete the research. This chapter reviewed literature under the following themes:

a. Theoretical framework.
b. Diet quality of the elderly
c. Factors affecting the diet quality of the elderly.
d. Nutritional related health challenges of the elderly.
e. Measures to improve the diet quality of the elderly in the district.

2.2 Theoretical frameworks

The theoretical framework adopted for this study are the Health Belief Model (HBM) Hochbaum, Rosenstock and Kegels (1950) and the Stages of Change Theory proposed by Prochaska and DiClemente (2002). The HBM was first developed in the 1950s by social psychologists, Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services. The HBM is a psychological model that attempts to explain and predict health behaviours. The underlying concept of the original HBM is that health behaviour is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958).

The HBM has been applied to a broad range of health behaviours and subject populations. Three broad areas can be identified):

1. Preventive health behaviours, which include health-promoting (for example, diet, exercise) and health-risk (for example, smoking) behaviours as well as vaccination and contraceptive practices.

2. Sick role behaviours, which refer to compliance with recommended medical regimens, usually following professional diagnosis of illness.

3. Clinic use, which includes physician visits for a variety of reasons (Conner & Norman, 1996). Specifically, the HBM consists of four major constructs as explained below.

Perceived susceptibility: The greater the perceived risk, the greater the likelihood of engaging in behaviours to decrease the risk. Perceived susceptibility motivates people to be motivated against influenza (Chen *et al.,* 2008) to use sunscreen to prevent skin cancer, and to floss their teeth to prevent gum disease and tooth loss. Unfortunately, the

opposite also occurs. When people believed they are not at risk or have low risk of susceptibility, unhealthy behaviours tend to result. This is exactly what had been found with adults and hypertension prevention behaviour. This is because adults generally perceive themselves to be at risk of hypertension.

Perceived benefits: The construct of perceived benefits is the person‘s opinion of the value or usefulness of a new behaviour in decreasing the risk of developing a disease. People tend to adopt healthier behaviours when they believe the new behaviour will decrease their chances of developing a disease. According to the New York Presbyterian Hospital (2006), perceived benefits place an important role in the adoption of secondary prevention behaviours such as screening.

Perceived barriers: This construct addresses the issues of perceived barriers to change. This is an individual‘s own evaluation of the obstacles in the way of him/her adopting a new behaviour. According to this construct, in other for a new behaviour to be adopted, a person needs to believe that the benefits of the new behaviour outweigh the consequences of continuing the old behaviour (Centre for Disease Control and Prevention, 2004). Some of these barriers include difficulty in adopting a new behaviour, fear of not being able to perform behaviour and embarrassments (Umeh & Rogan-Gibson, 2001).

Perceived severity: The construct of perceived severity speaks to an individual‘s belief about the seriousness of a disease. Even though the construct of perceived severity is often based on knowledge, it may also come from beliefs that a person has about the difficulties a disease will create or the effects it would have on his/her life in general (McCormick-Brown, 1999). For example, most of us view the flu as a relatively minor ailment. We get it, stay at home for few days and get better. However, if you have

asthma, contracting the flu could land you in a hospital. In this case, your perception of the flu might be that it is a serious disease. Or if you are a self-employed, having the flu might mean a week or more of lost wages.

Modifying variables

The four major constructs of perception are modified by other variables such as culture, educational levels, skills, past experiences, to mention a few. These are individual characteristics that influence personal perception. For example, if someone is diagnosed of basal cell skin cancer and has been successfully treated, he or she may have a heightened perception of susceptibility because of this past experience. Conversely, this past experience could diminish the person perception of seriousness because the cancer was easily treated and cured.

Cues to action

In addition to the four major beliefs or perception and modifying variables, the HBM suggests that behaviour is also influenced by cues to action. Cues to action are events, people or things that move people to change their behaviour. Examples include illness of a family member, media reports (Graham, 2002), reminder postcard from a health care provider (Ali, 2002), or health warning label on a product. Knowing a fellow church member with a prostate cancer is a significant cue to action for African American men to attend prostate cancer educational programmes (Weinrich *et al.,* 1998).

An addition to the HBM is the concept of self-efficacy or one‘s confidence in the ability to successfully perform an action. This concept was added by Rosenstock and others in 1988 to help the HBM better fit the challenges of changing habitual unhealthy

behaviours, such as being sedentary, smoking, or overeating. According to Umeh and Rogan-Gibson (2001), unless a woman believes she is capable of performing breast self-exam (BSE) that is, has a BSE efficacy, this barrier will not be overcome and BSE will not be practiced.

In conclusion, the HBM theory emphasizes on the perceptions of individuals on the danger posed by a health problem, the possible gains of avoiding the threat and the factors that influence their decisions. The ideal principle of this theory is for an individual to adopt new health behaviour or amend his/her current health behaviour. However, this depends on four factors as proposed. These include the costs of taking action compared against the benefits; believe they are susceptible to the condition; believe that changing their behaviour will reduce their susceptibility to the condition or its severity; and the belief that the condition will have serious consequences (Rosentock, Strecher & Becker, 1988). Health behaviour change, in this theory, is also influenced by exact elements that prompt action, such as a reminder from one‘s provider or when the individual is confident in his/her ability to successfully perform an action (Shikany, Bragg & Ritchie, 2009). According to the HBM, modifying variables cues to action and self-efficacy affect our perception of susceptibility, seriousness, benefits and barriers and therefore our behaviour.

Another theory which is relevant for this work is the Stages of Change Theory by Prochaska and DiClemente (2002) and it proposes that the changes in human behaviour seem to be a process but not an event. The theory further explains that individual‘s effort to change his/her behaviour is influenced by five processes. These include maintenance, pre-contemplation, preparation, contemplation, action and maintenance (Prochaska & DiClemente, 2002). With the pre-contemplation process, the individual

within the period of six months has no or less intention to take any nutritional decisions or action. With the contemplation process, the individual takes nutritional actions or decisions based on foreseeable future implications. In the preparation process, the individual decides to take actions within the next 30 days. In the action process, the individual fruitfully changes his or her behaviour for a brief period of time. At the maintenance stage, the individual changes his or her behaviour for longer period; that is, at least six months (Prochaska & DiClemente, 2002).

2.3 Diet quality of the elderly

Diet quality is a broad term that encapsulates both perceived and actual practices, personal preferences and cultural diversity. Diet quality relates to the types of foods being ingested, snacking and other eating habits (Preedy *et al.,* 2006). It is the condition of one‘s diet compared to the established dietary guidelines such as the Diet Quality Index (DQI) and Healthy Eating Index (HEI) based on the 2010 U.S. Dietary Guideline commendations.

Measuring dietary quality can be problematic and includes investigating food types, the number or size of portions or their frequency. In assessing diet quality, food patterns are scored to determine how closely the food pattern meets the dietary guidelines and ―how diverse the variety of healthy choices is within core food groups" (Wirt & Collins, 2009). Manufactured beverages and fast food may also be included as well as microbiological quality and attempts to improve single food items such as meats or vegetables.

There are components of diet quality. Dietary energy density is one index of the overall quality of the diet (Andrieu, *et al*, 2006). Diets high in whole grains, lean meats, fish,

and fresh vegetables and fruit have a low energy density (defined as the available dietary energy per unit weight) and a high content of vitamins and minerals (Andrieu *et al.,* 2006). Their consumption has been associated with better health (James, Nelson, Ralph & Leather, 1997). Conversely, diets high in refined grains, added sugars, and added fats tend to be energy-dense but nutrient-poor (Mendoza, Drewnowski & Christakis, 2007). Such diets have been associated with higher energy intakes and with lower intakes of several micronutrients (Mendoza *et al.,* 2007). Their consumption has been associated with higher disease risk and higher mortality rates (James *et al.,* 1997). In some studies, dietary energy density is an independent predictor of obesity and the metabolic syndrome (Rolls & Bell, 1999).

Energy-dense foods and energy-dense diets may predispose the consumer to overeating (Drewnowski, 2003). This can be explained by its palatability. Energy-dense foods, especially mixtures of sugars and fat, tend to be more palatable than foods of low energy density and high water content (Rolls, Morris & Roe, 2002). A reduced volume of energy-dense foods is said to suppress satiation and satiety. For the same amount of food, a greater quantity of energy is consumed when the food is high in energy than when its energy density is low (Rolls *et al.,* 2002). The combined effects of high-energy density and large portion size may also lead to excess energy intakes and body weight gain (Darmon, Briend & Drewnowski, 2004). Reducing the energy density of the diet by replacing added sugars and fats with fresh vegetables and fruit has become a standard strategy for weight management. However, low-energy-density diets can entail substantially higher diet costs (Loughley, *et al*, 2004).

To quantify overall diet quality, several indices have been developed to assign scores to individuals based on their diet records. Two of the most popular of these are the Diet

Quality Index or DQI (Patterson, et al 1994) and the Healthy Eating Index or HEI (Kennedy, et al 1995). Both are based on the US dietary guidelines. Both these indices have undergone various updates and adaptations over the years, including adaptation to conform to diet quality elsewhere. Earliest measures of diet quality are mostly concerned with malnutrition and nutrient deficiency diseases. Current measures of diet quality, such as the Diet Quality Index and the Healthy Eating Index (HEI), are more concerned with issues of over nutrition and focus on dietary moderation, variety, and balance (Haines et al., 1999).

The Diet Quality Index

The Diet Quality Index was first developed as a sixteen-point scale (zero being the best score and sixteen the worst) by Patterson, Haines and Popkin (1994). They determined that lower (that is, better) DQI scores were associated with higher vitamin and mineral intake and lower fat intake among American adults (Patterson *et al*., 1994). Other studies have had mixed results studying the relationship between DQI and various health outcomes (Nkondjock & GhadirianDubois, 2007; Fung *et al.*, 2005; Seymour *et al.*, 2003; Girard & Bergeron, 2000).

In 1999, the DQI was updated by Haines, Siega-Riz and Popkin (1999) to reflect changes in nutritional guidelines in the US, resulting the ~~r~~evised" DQI or DQI-R. The new index is a 100-point scale with 100 being a perfect score, thus improving interpretability and ease of use. It also added a dietary variety component. Haines *et al.* (1999) found that there was statistically significant improvement in all components of the DQI-R moving from the lowest to highest scores in American adults (Haines *et al.,* 1994). DQI-R scores have been shown to be related to breast cancer risk (Nkondjock &

Ghadirian Dubois, 2007), but no links to lipid biomarkers (Fung, McCullough, Van Dam & Hu, 2007).

A global diet quality index (DQI) assesses the quality and variety of the entire diet and evaluates the extent to which individuals adhere to theoretical criteria of nutritional health or dietary guidance (Kant, 2010). Since sub-optimal or inappropriate intakes rarely occur in isolation, a tool that measures global DQ can communicate more about dietary adequacy and disease risk than the intake of single nutrients or foods (Kant, 2010) and permit the examination of relationships between overall food consumption and health (Wirt & Collins, 2009).

Alternative indexes of dietary quality have been based on compliance with dietary recommendations and guidelines. Higher values of the Healthy Eating Index (Patterson *et al.,* 1994), Diet Quality Index (Worsley, et al 2003), dietary variety (Kant & Graubard, 2007) and diversity (Robinson *et al.,* 2004) scores, and other diet-quality measures (Ledikwe, Blanck & Khan, 2006) have all been associated with higher socio-economic status (SES) which include education, income, and/or occupation. The same positive relation with SES is observed for dietary patterns (Huot, Paradis & Ledoux, 2004). Similarly, studies of household food purchases, a proxy for food consumption, found a positive relation between household SES and the diet quality (Thiele & Weiss, 2003) and variety (La Vecchia, *et al* 992) of purchased diets.

The Healthy Eating Index [HEI] (2010)

The Healthy Eating Index [HEI] (2010) is a measure of overall diet quality in terms of conformance with United States (US) Federal dietary guidelines. The Healthy Eating Index was developed in concert with the US Department of Agriculture (USDA) as a

measure of compliance with American dietary guidelines. The original HEI was developed by Kennedy *et al.* in 1995, and was based directly on USDA recommendations at the time. All versions of the HEI are scales of 100 points, with 100 being the best score. Kennedy *et al*. (1995) showed that HEI scores are associated with various nutrient intakes in a study of Americans (Kennedy *et al.,* 1995). In 2008, Guenther Reedy and Krebs-Smith (2008) updated the HEI using USDA guidelines introduced in 2005, resulting in the HEI-2005. The original HEI has been found to be associated with various nutrient intakes and biomarkers, as well as healthy lifestyle variables and risks of some diseases (Reedy *et al.,* 2008; Shatenstein *et al.,* 2005; Weinstein, Vogt & Gerrior, 2004; Dubois, Girard & Bergeron, 2000).

The HEI-2010 is made up of 12 components, nine adequacy components and three moderation components. The 12 HEI-2010 components are summed for a total possible score of 100 points. Higher scores indicate greater dietary intake, except for SFA, sodium, and solid fats, alcohol, and added sugars (SoFAAS), in which higher scores indicate lower intake. Each component score is calculated by dividing the total component intake by the total energy intake and multiplying by 1000. Scores are energy-adjusted on a density basis (per 1000 kcal), which allows for characterization of diet quality while controlling for diet quantity. For the purpose of this study, HEI-2010 scores will be categorized into quartiles to help express the diet quality; the first quartile representing the lowest quality and the fourth quartile representing the highest quality. The highest quartile of HEI-2010 scores will be chosen to be the reference group. Each of the HEI-2010 component scores will be analyzed as dummy variables. The HEI is a summary measure of people‘s overall diet quality. It is an excellent tool both assessing the quality of diets and for understanding better the influence of food choices on health. It is acceptable to use the total HEI-2005 score for distinguishing very high scoring

diets from very low scoring diets (Guenther *et al.,* 2013). Therefore, to assess overall diet quality of the elderly participant in this study, a Healthy Eating Index (HEI-2010) score will be calculated based on work by Guenther *et al.* (2013). Several studies have examined the HEI-2005 with respect to various health outcomes as well (Guenther *et al.,* 2008).

Dietary quality can be assessed using the Healthy Eating Index 2010 (HEI-2010), which was developed by the USDA Center for Nutrition Policy and Promotion (United States Department of Agriculture Center for Nutrition Policy and Promotion, [USDACNPP], 2014). This index measures compliance with 12 components of the Dietary Guidelines for Americans 2010. A higher score indicates a high quality diet, which can reach a maximum of 100 points. The food categories in the adequacy component of the HEI-2010 are: total fruits, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fatty acids. Sodium, refined grains, and empty calories are part of the moderation component. Standards for maximum and minimum scores are based on the 2010 Dietary Guidelines. For foods in the adequacy component, intakes at or above the standard level receive the maximum amount of points, and an intake of zero receives a score of zero. For items in the moderation component, intakes at or below the standard level receive the maximum amount of points, and the minimum score is based on percent energy intake (Guenther *et al.*, 2013).

The number of adequacy and moderation components remained the same in both indexes, but a few of the food categories changed. The food groups in the HEI-2005 that are not seen in the 2010 version include dark green vegetables, orange vegetables, and legumes, total grains, milk, meats and beans, oils, saturated fat, and calories from

solid fats, alcoholic beverages, and added sugars (Guenther *et al.,* 2013). Available evidence suggests that the consumption of whole grains, lean meats, fish, low-fat dairy products, and fresh vegetables and fruit is consistently associated with components of quality diet besides plasma biomarkers of dietary exposure which provide additional evidence of diet quality.

Deierlein, *et al* (2014) analyzed diet quality scores of 1,300 independent older adults in the New York City area. Forty percent of the participants were between the ages of 60 and 70, 38% were 71-80 years old, and 22% were 81-99 years old. Results indicated that the total HEI mean diet quality scores were 72 for women and for men. Diet quality scores were not separated by age; therefore, it is difficult to distinguish possible discrepancies between the age groups. Nevertheless, scores in this range suggest a need for improvement (Deirelein *et al.*, 2014). On a larger scale, the USDA discovered that the fruit, total grains, meats, and beans categories were of the highest quality in an older adult‘s diet. Saturated fats, alcohol, sodium, and added sugar intake were high, and therefore lowered the overall diet quality score, according to the HEI-2005.

Diet quality and nutritional status in the elderly (older adults)

Ageing, nutrition and health are interrelated. A nutritionally adequate diet is considered a critical component of a lifestyle aimed at promoting healthful and active aging (Bartali *et al*., 2003). Nutrition is recognized as one of the major determinants of successful ageing, defined as the ability to maintain three key behaviours: low risk of disease and disease related disability, high mental and physical function, and active engagement of life (Krondl *et al,* 2008). A good diet and physical activity help to minimise potential health problems and accelerate recovery from illness” (Walker Trust, 2004, p.11). There is now general agreement that a balanced healthy diet should:

a. Be rich in complex carbohydrates, for example, whole meal bread, wholegrain rice.
b. Include five servings of fresh fruits and vegetables per day.
c. Be low in salt and saturated fat.
d. Be low in sugar and refined carbohydrates.
e. Include "good" fats like olive oil, nuts and oily fish.
f. Include protein sources like lean meat, oily fish, low fat dairy products, eggs and vegetarian sources of protein [legumes, beans, tofu] (WHO, 2002).

If a person is eating a healthy balanced diet, they should be able to get enough macronutrients such as carbohydrate, protein and fat, as well as sufficient quantities of micronutrients (British Nutrition Foundation, 2010). The nutrients that are important and commonly deficient in older people are vitamin D, calcium, folic acid, iron, vitamin B12, vitamin B6 and vitamin C (British Nutrition Foundation, 2010). So, it is important to consider the diet quality of the elderly.

Nutritional status is the condition of a person that is influenced by nutrient intake and utilization, which greatly contributes to an older adult‘s health and functionality (Amarantos, Martinez & Dwyer, 2001). In fact, two-thirds of the older adult population does not consume the recommended amount of calories, vitamins, and minerals as part of a daily diet (Bernstein & Munoz, 2012).

Diet quality is a strong indicator of nutritional status and nutrient intake in older adults. Overall energy intake tends to decrease with age, which can also lead to a decrease in nutrients. In particular, older adults are at risk for low levels of iron, calcium, vitamin D, vitamin E, vitamin B12, potassium and zinc. Vitamin B12 levels in older adults are

inadequate mainly because of malabsorption; the other vitamins and minerals previously listed are insufficient due to intake (Bernstein & Munoz, 2012).

Older adults who consumed higher amounts of added fats, sugar, and sodium tended to under consume fiber, calcium, magnesium, potassium, zinc, folate, and vitamins A, B6, C, D, and E. This puts older adults at a greater risk for poor nutritional status and obesity as a result (Kamp, 2010). Because of the key role of food and nutrient intakes in maintaining health, it is important to investigate key predictors of diet quality and good nutritional status.

The functional capacity and health of the elderly depend, to a greater extent, on their nutritional status and food security, which are the cornerstone in determining nutritional wellbeing. The International Conference on Nutrition (ICN), held in Rome in 1992, defined food security as _access by all people at all times to the food needed for a healthy life' (FAO/WHO, 1992). The elderly are particularly vulnerable to food insecurity due to their reduced income and physical capabilities, as well as increased rates of some chronic diseases, which predispose them to poverty. The focus now is to increase the span of healthy life, that is, life that permits independent function, not just a longer life (Frankle & Owen, 1993).

Malnutrition in the elderly

Malnutrition is a state of nutrition in which a deficiency, excess, imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue, body form (bodyshape, size, and composition), body function and clinical outcomes (ENHA/BAPEN, 2006). Malnutrition in the form of undernutrition is a particular risk

for older people (Wilson, 2009; Stanga, 2009; NHA/BAPEN, 2006; Ritz, 2001), particularly those over the age of 75 (Volkert, 2002).

Globally, the elderly in society are vulnerable to malnutrition. Malnutrition is an age related challenge facing the elderly globally. Malnutrition in elderly occurs when there is lack of stability between nutritional intake and nutritional needs. Malnutrition is also viewed as inadequate intake of important nutritional elements. Similarly, it also regards protein-energy malnutrition which can be primary or secondary issue. Primary issues is a result of inadequate food intake while secondary issues is caused by disease (Söderhamn, *et al.,* 2013). The early signs are not easily detectable with elderly, who live at home because there is lack of regular screening system coupled with insufficient health care professional visit (Lahmann, *et al*, 2015). The signs include weakness, dullness, poor concentration, infection risk (Lahmann *et al*., 2015). According to Merrell *et al.* (2012), malnutrition is referred to lack of nutrients such as energy, protein and minerals which lead to malfunction of the body composition and function, clinical results.

Malnutrition does not only lead to nutrient deficiencies (Caroline Walker Trust, 2004), but can adversely impact recovery from illness (Ritz, 2001) and is associated with higher morbidity and mortality (Vetta, 1997). For example, inadequate nutrition can contribute to the progression of chronic diseases like cardiovascular disease and osteoporosis in older people with those conditions and malnourished older people are also at greater risk of infection (Volkert, 2005). In addition, older people are at greater risk of not being able to recover from malnutrition (Pirlich *et al.,* 2005).

Protein-energy malnutrition (consumption of too few calories and too little protein), which is rather common amongst older people with estimates that 1 in 10 people are

malnourished (ENHA/BAPEN, 2006), has been shown to decrease immunity (Cosquéric *et al.*, 2006).

Physiological changes to the digestive system affect appetite which can affect nutrient intake (Stanga, 2009). Changes in dental status can also negatively affect nutrient intake as studies have shown that independently living older people who are edentulous (have dental prosthetics) consume lower quantities of non-starch polysaccharides, protein, calcium, iron, niacin, and vitamin C than those who still have their own teeth (Marcenes *et al.,* 2003).

One predictor of good nutritional status in older adults is food security, which is defined as having access to adequate and nutritious foods at all times (Lee & Frongillo, 2001). Currently, 6% of households with older adults have experienced some form of food insecurity that has prevented adequate intake of foods. Food insecurity is more prevalent in Hispanic (15%) and African Americans (19%) compared to Caucasian elders (4%), which can be attributed to lower incomes among the minority groups (Kuczmarski & Weddle, 2005). In fact, 26% of all older adults are in the low-income group (Kamp, 2010), 9% are below the poverty level, and an additional 5% are considered ~~–n~~ear-poor" (Bernstein & Munoz, 2012). Those that are poor and near-poor are three times more likely to be food insecure compared with older adults who live above the poverty line (Ziliak & Gundersen, 2011). People in the low-income category tend to eat lower amounts of fruits, vegetables, dairy, lean, high-quality protein and overall calories than adults with higher incomes, indicating an association between diet and income (Wunderlich, Brusca, Johnson-Austin, & O'Malley, 2012).

Poor functional status and poor nutritional status are directly related to each other in a circular fashion. If older adults are not consuming adequate amounts of high quality

protein, muscle mass will decline, which leads to frailty and impaired mobility (Allard, 2001). A poor quality diet low in antioxidants, for example, can lead to an inflammatory response, which can exacerbate a chronic condition and affect functional ability (Bernstein & Munoz, 2012). Lower quality diets are associated with lower extremity immobility (Gopinath, Russell, Flood, Burlutsky & Mitchell, 2014). At the same time, disabled seniors who are incapable of carrying out IADLs such as food shopping, driving or taking public transportation are at a greater risk of insufficient food intake (FIFARS, 2012). Even if older adults are able to buy food independently they may have difficulties preparing and cooking meals, and require assistance from a family member (Kamp, 2010).

Large-scale national surveys, including the USDA Food Consumption Surveys NHANES I, II and III and the national Diet and Nutrition Survey in Britain found inadequate intake of many nutrients in high percentages of older people. These dietary elements include energy, fat, riboflavin, calcium, zinc and vitamins B6, A and C (Briefel *et al.,* 2000). The Baltimore Longitudinal Study of Aging, are consistent with data from cross-sectional studies, such as the National Health and Nutrition Examination Survey (NHANES), found that there is a substantial decline in food intake with advancing age (Drewnowski, 2001). As indicated by NHANES III data, energy intakes between ages 25 and 70 years can decline by as much as 1000 to 1200 kcal/day for men and 600 to 800 kcal/day for women. By age 80, 1 in 10 men consumed less than 890 kcal/day whereas 1 in 10 women consumed less than 750 kcal/day.

Reduced energy intakes can lead to inadequate intakes of protein, vitamins, and minerals. NHANES III data show potentially important decreases with age in median protein and zinc intakes (down by about one third in men) as well as intakes of calcium,

vitamin E, and other nutrients (Wakimoto & Block, 2001). Risk for inadequate nutrient intakes was especially acute for older men. As many as 10% of older men obtained only one fifth to one third of the recommendations for protein, zinc, calcium, vitamin E, thiamin, riboflavin, vitamin B6, and vitamin B12. In contrast to the general decline in micronutrient intakes, estimated intakes of carotene, vitamin A, and vitamin C tended to increase with age, especially for women.

Wakimoto and Block (2001) also examined the nutrient density of diet (consumption of a given nutrient expressed per 1000 kcal). Although the absolute intake of a nutrient may decrease with age, the absolute intake of energy decreases even more, such that the observed proportion of the nutrient in the diet is higher than that for younger groups. One question is whether dietary guidelines for older adults should be formulated in terms of absolute intake or in terms of nutrient density. There is no consensus as to how dietary requirements change as a function of age. However, some evidence suggests that because of declining metabolic efficiency and bioavailability, requirements for some micronutrients might actually be higher for older adults than for younger people.

Although clinical studies revealed few overt nutrient deficiencies among elderly adults (Blumberg, 1997), subclinical deficiencies can adversely affect health and physical functioning. Diet and exercise modulate the rate of functional decline with age and can be used to delay or postpone the onset of disability or dysfunction. For example, the prevalence of osteoporosis goes up with age, roughly doubling with each decade.

Blumberg (1997) further pointed out that in women 50 years and older, 37% to 50% had osteopenia whereas 13% to 18% had osteoporosis. The risk of osteoporosis, a major cause of fractures in postmenopausal women and elderly adults, is reduced by a combination of diet and exercise. Similarly, optimal diets have been associated with

lower risk of chronic diseases, notably coronary heart disease, obesity, diabetes, and some forms of cancer.

It should be noted that socio-economic factors play a very important role in the development of malnutrition in older people (Wilson, 2009). These factors include low income (Krondl *et al*., 2008), availability and accessibility of food shops, social isolation, depression, lack of cooking skills and motivation (Wilson, 2009).

The importance of diet quality on the health of elderly

Healthy life means a full range of functional capacity at each life stage, from infancy to old age. Health and functioning of older adults are influenced by many factors other than biological factors. Demographic, social, and environmental factors, including physical activity and dietary habits, play a major role. Fortunately, many of these societal factors are amenable to public health and nutrition interventions and programmes (Omenn, 1997). More than any other age group, older adults are seeking health information and are willing to make behavioural changes to maintain their health and independence into advanced old age (U.S. Department of Health and Human Services, 1998). Among the most important self-care behaviours are those that involve physical activity and diet quality.

Health knowledge and lifestyle behaviours, including smoking, drinking and food habits, differ by gender among elderly, with consequences for diet. In the current generation of older adults (OA), women are typically responsible for food preparation, conditioning food knowledge and ability to prepare healthful meals. In their senior years, men pay less attention to their diet than their female peers and often eat in restaurants when alone (Hughes *et al.,* 2004). Because a healthy diet can reduce risk of

morbidity and mortality from age-related chronic diseases judicious food choices are central to maintenance of health and quality of life with aging.

Age-associated changes in metabolism or physiological function may be partly responsible for the observed decline in energy intakes as well as for shifts in dietary choices and eating habits (Morley, 2001). Reduced muscle mass results in lower energy requirements. As noted by Morley (2001), aging has been associated with altered sensations of thirst, hunger, and satiety and with incomplete adjustments for day-to-day variations in food intake. The observed deficits in taste and smell may lead to a reduced sensory enjoyment of foods by elderly adults (Rolls & Drewnowski, 1996). The lack of sensory-specific satiety (a variety-seeking mechanism) may explain why some elderly people restrict food choices and adopt a monotonous diet.

Some of these phenomena may be mediated by an age-associated increase in the levels of the satiety hormone (cholecystokinin). A decline in testosterone levels is reported to lead to increased levels of leptin and therefore reduced food intakes by older men. Studies of aging rodents further point to reduced activity of dynorphin (kappa opioid) and neuropeptide Y systems, both of which influence food intake. Mild inflammatory disorders that result in the release of cytokines may also lead to age-associated anorexia. Loss of appetite and anorexia are the key predictors of malnutrition in clinical settings (Morley, 2001). Among independently living elderly adults, low nutrient density of the diet and inadequate intakes of protein, vitamins, and minerals are the chief areas of nutritional concern (Blumberg, 1997).

Poor health, medications, and medically prescribed diets affect dietary choices, eating habits, and nutrient intakes (Drewnowski & Warren-Mears, 2001). Impaired mobility, inability to feed oneself, or poor oral health may alter eating habits and further

contribute to dietary inadequacies. Other studies suggest that the observed drop in energy requirements is only partly due to physiological factors such as reduced muscle mass and lower metabolic rate. Recent studies based on the doubly labelled water methodology by Westerterp and Meijer (2001) suggest that the primary reason for reduced energy needs is the sharp drop in physical activity that also occurs with advancing age.

Indexes of health-related quality of life (HRQL), a relatively new concept, expand the morbidity- and mortality-based definition of health to include a personal sense of physical and mental health, social functioning, and emotional well-being (Diener, 2000). These permit researchers to compare the health status of different groups over time and assess the effectiveness of public health interventions and programmes via diet quality.

2.4 Factors affecting the diet quality of the elderly

A number of factors positively or negatively influence the diet quality of people, including the elderly. These factors include by age and sex, occupation, education, income levels, psychosocial factors, , poor social support, loss of interest in life, and mental health and mobility problems which could affect appetite, hunger and functional abilities. Factors contributing to nutritional inadequacy in the old are low income, physiological decline, age-related diseases, medications and insufficient food consumption.

Diet quality is affected not only by age and sex, but also by occupation, education, and income levels (Groth *et al.,* 2001) the conventional indexes of socio-economic status (SES) or social class (Lallukka *et al.,* 2007). The different socio-economic indicators

appear to have similar, although independent, effects on nutrition and diet (Ledikwe *et al.,* 2006). However, a convincing causal relation between socio-economic indicators and diet quality still remains to be established. Given that socio-economic variables are likely to affect all aspects of energy balance, from access to healthy foods to opportunities for physical activity, there is a pressing need to address them.

Factors influencing diet and their interactions become more complex with age (Payette & Shatenstein, 2005). These include physiological changes, poor dental status, increased prevalence of chronic health conditions, cognitive decline, age-related psychosocial factors, income constraints, poor social support, loss of interest in life, and mental health and mobility problems which could affect appetite, hunger and functional abilities, the capacity to obtain and prepare food, and eat independently which constrains the ability to select and consume an adequate diet (Elsner, 2002).

Studies conducted with the Healthy Eating Index suggested that elderly women had the highest scores, reflecting high consumption of grains, vegetables, and fruits. Healthy Eating Index scores increased with age, education, and income, again showing that the quality of the diet is largely determined by social and environmental variables (Kennedy *et al.,* 1995). The success of dietary strategies for health promotion is commonly measured in terms of compliance with Dietary Guidelines for Americans or with the U.S. Department of Agriculture Food Guide Pyramid (Kennedy *et al.,* 1995; Haines *et al.,* 1999).

Physiological and social factors also affect older people‘s nutrition. Biological ageing results in physiological changes that make it more difficult for older people to get all the nutrients they need from a balanced diet. Nutrients considered particularly

important for older people's health include vitamin D in combination with calcium, vitamin B12 and folic acid [folate] (Cannella, 2009).

As people age, particularly once they get into their 70s, physiological changes occur that have an effect on nutritional intake and needs. These changes include loss of taste and smell, changes in body composition and bone density, in the basal metabolic rate, to the immune system (Martin, 2000; De Groot *et al.,* 2001; Volkert, 2002; Wardwell, 2008; Stanga, 2009) and to the digestive system (Donini *et al.,* 2009). The loss of taste and smell accompanied by an increase in the taste buds which detect bitter or sour tastes (Volkert, 2002) can result in older people finding food unappetising, which can put them off eating and reduce their overall food intake (Schiffman, 1997).

Older people's body composition changes through a decrease in lean body mass (muscle), known as sarcopenia, and an increase in body fat (Ritz, 2001), which has an effect on the basal metabolic rate (BMR), the rate at which the body uses up energy (Cannella, 2009). The BMR decreases proportionately with the decrease in muscle, which is the most metabolically active tissue (Cannella, 2009; Ritz, 2001). A study by Ritz (2001) shows, however, that maintaining or increasing physical activity can reverse the decline in BMR in older people.

There are other physiological factors which can affect nutritional intake and status of the elderly. These include disabilities, such as problems with eyesight and joints, which may affect the ability to prepare and eat food (Darmon *et al.,* 2004) and problems with personal physical mobility can make food shopping difficult (Department of Health, 2004). Dental health and oral function are also of concern as dental status can affect nutritional status (Walls & Steele, 2004). For example, 58% of the over 75s wear dental

prostheses and many wearers report difficulties in eating certain foods, particularly fruit and vegetables which can lead to lower nutrient intake (Bradbury *et al.,* 2006).

Older people are more likely than other ages to suffer from disease, some of which can increase energy expenditure due to factors like metabolic stress and fever, while reducing energy intake, through bed rest and physical inactivity, and lead to a negative energy balance, or weight loss (Ritz, 2001). In addition, where older people have chronic diseases, they will often need to take medication (prescribed and non-prescription), which can cause anorexia, nausea, diarrhoea, constipation and dry mouth, all of which can suppress food intake (De Groot *et al.,* 2001; Volkert, 2002).

Immune system of the elderly

The responsiveness of the immune system decreases with age, a process known as immunosenescence (Wardwell, 2008). Immunosenescence is characterised by decreased proliferation of T lymphocytes and impaired T-helper activity which can lead to impaired cell mediated immune defence (Volkert, 2005). This can make older people more susceptible to infection - the fourth most common cause of death in old age (Chandra, 2004) - less able to fight disease (Volkert, 2005; Martin, 2000), and reduce the effectiveness of vaccination (Martin, 2000). Lower cholesterol levels have been associated with improved immune function (Tufts, 2003), thus giving people another reason to make dietary changes to improve their health.

Digestive system of the elderly

Ageing related changes to the digestive system can lead to gastrointestinal disorders or simply digestive discomfort (Donini *et al.,* 2009) such as bloating, flatulence, abdominal pain and altered bowel habits. These changes can affect appetite as well as

absorption of nutrients, for example, vitamin B12 absorption is impaired with age (Buttriss, 1999). Lactose intolerance, which occurs when a person is deficient in lactase, the enzyme which process, is more common in older people (Hamilton-Miller, 2004) and its symptoms include bloating, cramping and diarrhoea. As well as unpleasant symptoms, lactose intolerance can result in calcium deficiency through avoidance of dairy products by the National Institutes of Health (NIH, 2010).

Hypochlorydria (reduction in the secretion of stomach acid) is relatively common in older people (Hurson, 1990) often resulting from atrophic gastritis, and can decrease the bioavailability and absorption of some nutrients such as calcium, iron, folate and vitamin B12 (De Groot *et al.,* 2001). Atrophic gastritis is present in a large minority of older people, for example, a Dutch study found that 32% of 74-80 year olds in the Netherlands are affected by it (De Groot *et al.,* 2001). In addition, medicines commonly prescribed to older people such as proton pump inhibitors can cause a reduction in gastric acid secretion (Logan *et al*., 2010).

Age related changes in the gastrointestinal tract combined with changes in diet and immune system reactivity affect the composition of gut microbiota, leading to increased numbers of facultative anaerobes, decreased number of beneficial organisms like anaerobic lactobacilli and bifidobacteria (Donini *et al.,* 2009). The consequence of these changes can be an impaired digestive function with increased transit time, increased putrefaction of the colon and a greater susceptibility to disease (Donini *et al*., 2009). It is also worth pointing out that intestinal complaints such as constipation, flatulence and bloating are common in older people and can have a considerable impact on their quality of life (Donini *et al.,* 2009; Gage, 2009). Increasing dietary fibre along with the use of probiotic or prebiotic supplements or functional foods, have been

suggested to improve digestive and immune health in older people (Donini *et al*., 2009; Gage, 2009; Ouwehand, 2009).

Bone health of the elderly

Older people, especially older women, are susceptible to bone health problems primarily osteoporosis due to loss of muscle and reduced bone density (Bonjour et al., 2009; as sited in Gennari, 2001). Osteoporosis is a disease which is characterised by decreasing bone density and increasing fragility of bones due to micro-architectural deterioration (bones become porous), which increases the risk of fracture; WHO (2003). Osteoporosis is a risk factor in 90% of fractures in the over 65s (Buttriss, 1999). Osteoporosis is exacerbated by malnutrition, low weight, poor intake of vitamin D and calcium, and in women, low levels of sex hormones (Stanga, 2009).

There are two key nutrients that are essential to bone health: vitamin D and calcium; Bischoff-Ferrari & Staehelin, 2008; Heaney, 2007; Gennari, 2001 as sited in (Bonjour et al., 2009). Calcium is one of the main bone forming minerals (Bonjour *et al.,* 2009; Bischoff-Ferrari & Staehelin, 2008; WHO, 2003) and vitamin D is essential for bone health because it is required for calcium absorption (Bischoff-Ferrari & Staehelin, 2008). The efficiency of calcium absorption declines in older adults (British Nutrition Foundation, 2003; Gennari, 2001). It is therefore more important for older people, especially women, to have adequate intake of calcium and vitamin D to maintain bone health and help prevent osteoporosis (Bonjour *et al.,* 2009; Dawson-Hughes & Bischoff-Ferrari, 2007; Rao & Alqurashi, 2003).

Older people are more vulnerable to vitamin D deficiency because their skin is less able to synthesise previtamin D3 and declining kidney function can impair the synthesis of active metabolites of vitamin D (Zochling *et al.,* 2005). As well as reduced ability to

synthesise vitamin D from sunlight, older people spend less time in the sun (Cannella, 2009; De Groot *et al.*, 2001). Belgian research shows a high prevalence of vitamin D inadequacy in post-menopausal osteoporotic women, even among those taking vitamin D supplements (Neuprez *et al.,* 2007).

Vitamin D can be obtained from the diet, but research shows that ―Western" style diets typically provide around 25-50% of the required vitamin D, thus supplementation in older age might be desirable (De Groot *et al.,* 2001). Clinical trials have shown that calcium and vitamin D supplementation reduces the risk of fracture in vulnerable older women (Buttriss, 1999). Research in Spain concluded that vitamin D supplementation would be advisable for sections of the population at risk of osteoporosis, such as older people and postmenopausal women (Del Campor *et al*., 2005).

Gariballa *et al.* (1998) stated that socio-economic factors can have more bearing on the person's health than nutritional status alone, but the two are interlinked. In addition, there are a number of socio-economic factors which can influence diet and nutritional intake making it difficult for older people to access, prepare and eat a healthy diet (Wilson, 2009). These factors include:

a. Social isolation, for example, feeling lonely rather than merely living alone leading to depression, which is linked to decreased interest in food (Krondl *et al.,* 2008).
b. Living situation, for example, living alone increases the risk of malnutrition (Krondl *et al.,* 2008) and eating in company can result in higher energy intakes (Mathey *et al.,* 2000).
c. Bereavement, for example, a widower living alone who is not able or not used to cooking for himself (Krondl *et al.,* 2008; Wilson, 2009).

d. Low income in older age can result in older people having less money to spend on food (Wilson, 2009; Chernoff, 2001).
e. Food accessibility including availability of transport.

Some mental health problems are also highly correlated with malnutrition, in particular dementia and depression, which is one of the most important causes of weight loss in the very old (Vetta, 1997).

Most elderly people sometimes skip meals or reduce their food intake because they have difficulty in chewing. Appollonio *et al*. (1997) reiterated that dental conditions such as missing teeth and ill-fitting dentures could make chewing difficult which negatively affects the eating of an individual.

Food insecurity may be a crucial problem among the elderly in our society taking the elderly of Jasikan as a reference point. The main determinants of food insecurity include age, gender, income spent on food, fair/poor appetite, number of meals per day, regular consumption of street foods, frequency of eating lunch, loneliness, chronic disease conditions, chewing difficulties, regular medications, and inability to seek medical attention.

There is considerable evidence that some diets, for example, the Mediterranean diet (Hu *et al.*, 1999; Masala, 2007), have a positive influence on health and can reduce the risk of developing certain diseases, for example, cardiovascular disease and some cancers (WHO, 2003; Trichopoulou *et al.,* 2009). A life course approach to healthy eating and good nutrition means that they remain as important for older people as for their younger counterparts.

2.4.1 Relationship between socioeconomic factors and diet quality of the elderly

Food insecurity has been linked to sociodemographic and economic conditions that limit the household resources available for food acquisition (Alaimo *et al*., 1998). This study incorporated these predicting factors together with lifestyle patterns, health status, physical activity and dietary patterns to assess the nutrition situation of the elderly.

The disproportion in numbers between elderly male and female reflects the fact that females are more open to expressing their needs than males. Another reason could be that females live longer than males (Brown *et al*., 2008). Low income is a common problem among the elderly, especially females. This, coupled with increasing health needs, result in greater monetary resource needs (Lee & Frongillo, 2001; Heuberger, 2009). Christakis (2003) associated widowhood with increased disability, morbidity and mortality in both elderly males and females.

Marital status is also thought to have a justifying influence on healthy aging, especially in older men. Reasons attributable to this trend may involve decreased social isolation, spousal aid in procuring foods, cooking, and serving meals; or increased care giving in general (Schone & Weinick, 1998). It is, therefore, likely that all or a greater proportion of married males are food secure. Conversely, Larrieu *et al*. (2004) pointed out that unmarried or widowed men living alone are more likely to have poorer intakes which affect their nutritional status. Weight loss due to lack of food is an indicator of undernutrition and a poor nutritional status (Lee & Frongillo, 2001).

Living arrangements can also have an impact on nutritional status. Older adults who live with a spouse consume a higher quality diet compared to elders who live alone. Specifically, men who live alone tend to have a tougher time preparing meals, while women are less likely to cook and prepare food for themselves (Deirlein *et al.,* 2014).

According to Heuberger (2009), women become widows early and struggle through life alone, thus large proportions of elderly females are living without the assistance or company of a spouse. Waite (2004) put the situation into perspective by stating that the situation faced by older men on the dimension of companionship is substantially better than that faced by older women, because most men remain married until they die, while most women experience the death of their husbands and end their lives as widows.

Older adults who live alone are at an increased risk of depression, which can lower appetite and food consumption as a result. Furthermore, management of an elder‘s diet may be more difficult if there are no other family members present (Payette & Shatenstein, 2005). Caregivers who live in the household can help with food shopping, meal preparation, and feeding if an older adult is unable to carry out activities independently. However, caregivers may lack the nutritional knowledge to choose foods that provide adequate amounts of nutrients, which is why nutrition education and counseling may be beneficial in improving diet quality (Bernstein & Munoz, 2012).

Grocery shopping provides a source of social interaction for older adults, but there are barriers to a satisfactory food shopping experience (Elsner, 2002). The size of a supermarket can be off-putting to elders because it is challenging to walk around and find certain foods. Some older adults even feel that they are a burden to other shoppers and staff at grocery stores, and do not feel comfortable asking for assistance when needed. Food items that are placed too high or low on the shelves may be out of reach, making it difficult to choose and purchase items. Reading food labels can also pose a problem. Part of the natural aging process involves poor vision, which can make it impossible to read small print on various food items (Meneely, *et al* 2009).

Inability to shop for food can greatly affect an older adult‘s health. If seniors cannot buy food they may resort to convenience foods that are higher in fat, calories, and sodium. It has been observed that two thirds of older adults do not follow the recommended dietary guidelines and are therefore consuming low quality diets (Bernstein & Munoz, 2012).

2.5 Nutritional related health challenges of the elderly

The extra years can be marked by declining health, reduced mobility, depression, isolation, and loneliness (Rolls & Drewnowski, 1996). Increased longevity is associated with an increase in multiple chronic conditions that sometimes translate into functional disability and need for assistance (Ory & Cox, 1994). Therefore, continued good health of the elderly population is a major challenge to public health (Jackson, 1994).

With advancing age, the mortality risk of being underweight increases, whereas mild overweight is associated with lower mortality rates (Morley, 1997). The most common reason for weight loss in this population is under nutrition, namely decreased energy intake. Decreased intake may stem from fundamental alterations in appetite regulation that occur with aging. Roberts (1995) and Roberts, Fuss and Dallal (1997) showed that, after under-feeding, older people returned to a lower weight upon re-feeding and to a higher weight after over-feeding compared with younger people who, in both situations, returned to their baseline weight.

The most common chronic health problems among the elderly, in order of prevalence, are: hypertension, arthritis, heart disease, cancer, diabetes, asthma, emphysema, and stroke. A few of these chronic health conditions are also part of the leading causes of death among the elderly, which include: heart disease, cancer, chronic lower respiratory

disease, stroke, Alzheimer‘s, diabetes, influenza, and pneumonia. Over the past 30 years, however, death rates from heart attack and stroke have decreased by 50%, which is mainly because of changes in health behaviors over time and increased access to health care (Kuczmarski & Weddle, 2005). Diabetes, on the other hand, is not decreasing; more than 25% of older adults have type 2 diabetes. The CDC estimates the prevalence of type 2 diabetes to double in the next 20 years, partly because of the growing elderly population. Diabetic complications put older adults at a higher risk for functional impairment and institutionalization, which is why screening and other preventive measures need to take place early on (Kirkman *et al.,* 2012). Another disease that contributes to low functional status and dependent living is Alzheimer‘s. An estimated 5 million older adults have this illness as of 2014, with the majority (82%) in the 75 and older age group (Alzheimer‘s Association [AA] (2014).

Chronic illnesses are long-term and rarely curable, and create a heavy cost burden on the health care system. In 2008, $368 billion dollars were spent on caring for the elderly, with heart conditions as the most common diseases (Soni & Roemer, 2011). Health care costs increase with age as well. Older adults between the ages of 65 and 74 on average cost $7,000 annually to treat, while adults over the age of 85 cost $19,000, on average. Even though 93% of older adults have Medicare for health insurance coverage, 94% had to pay out-of-pocket for health care services.

Most elderly people suffer from higher rates of obesity, diabetes, cardiovascular disease, osteoporosis, dental caries, and some forms of cancer. All of these diseases have a direct link to nutrition and diet (James *et al.,* 1997). It has been suggested, more than once, that dietary factors may help explain some of the observed social inequities in health (Drewnowski & Darmon, 2005). The more affluent population subgroups are

not only healthier and thinner, but they also consume higher-quality diets than do the poor (Galobardes, Morabia, & Bernstein, 2001).

Consuming an excessive or insufficient amount of calories puts people at risk for chronic illnesses (Deirelein *et al.,* 2014). Inadequate energy and protein consumption leads to a reduction in muscle mass and strength, which can increase the occurrence of falls and impair functional status. In addition, the ability to fight infection can become compromised because inadequate protein intake can weaken immune function (Allard, 2001).

Obesity

Up to the age of 75, obesity and being overweight are more prevalent than malnutrition in the form of undernutrition (Volkert, 2002) and a higher BMI (body mass index) is correlated with morbidity and mortality (Stanga, 2009) because of disease risk factors linked to cardiovascular disease such as high cholesterol (WHO, 2003). Obesity is an increasing health problem for a younger cohorts of older people, typically those ages 55-70, which can lead to metabolic syndrome which has links to diabetes and cardiovascular disease (Krondl, 2008; Cabrera *et al.,* 2007).

However, once people get even older, typically over the age of 70 (Darmon *et al.,* 2009), being underweight poses greater health risk than obesity (Wilson, 2009). This means that even when a person over 75 is overweight and would like to lose weight, eating less could result in nutrient deficiencies which may cause more health problems than being overweight. Darmon *et al.* (2009) say that exercise is probably more important than dietary restriction for the health of overweight and obese older people. It is around the age of 70 that low BMI starts to become more highly correlated with

mortality than a high BMI (Stanga, 2009). Flegal *et al.* (2005) point to a U-shaped mortality curve where the risk of mortality is higher with a very low BMI, then decreases with weight gain, as an underweight person attains a normal weight, then increases as BMI moves from normal to overweight or obese.

Cardiovascular health

Age is the most powerful independent risk factor for cardiovascular disease and the risk of stroke doubles every decade after the age of 55 (WHO, 2003). In men, reaching 55 means that their risk of cardiovascular disease increases (Pocock *et al.,* 2001), so attention to risk factors including high LDL cholesterol, obesity and increasing blood pressure is highly desirable (Lloyd-Jones *et al.,* 2006). Using the data from the Framington Heart Study, Lloyd-Jones *et al.* (2006) found that the absence of established risk factors at 50 years old is associated with low lifetime risk for CVD and longer survival. This age group will, over the next decade of its life, be subject to physiological changes associated with ageing that could negatively impact their nutritional status and immune functioning (Wardwell *et al.,* 2008), so now is arguably the time to focus on maintaining good health to prevent or limit potential future health problems.

Coronary heart disease and stroke are major causes of death and disability in older people (Howarth *et al.,* 1999). 40% of deaths among the over 65s are caused by coronary heart disease or stroke (Caroline Walker Trust, 2004) so any measures that can be taken to prevent or reduce the progression of such conditions should be welcomed. Older people are more likely to develop ~~"~~metabolic syndrome", a group of risk factors including abdominal obesity, high cholesterol, high blood pressure, and elevated fasting glucose levels, all of which are cardiovascular risk factors (Krondl *et*

al., 2008; Bo *et al.,* 2008). Hypertension (high blood pressure), which is a major risk factor for stroke and coronary heart disease (WHO, 2003), can be reduced by decreasing dietary sodium (salt). Interestingly enough, sodium reduction is more effective in lowering blood pressure in older hypertensive people, but attention must be paid to salt reduced food still being appetizing to older people whose sense of taste has often diminished with age, as if not, this can lead to appetite reduction which brings its own health concerns (Darmon *et al.,* 2009). Older women are also at greater risk of coronary heart disease due to losing the cardio-protective effect of oestrogen after the menopause (Korzen-Bohr & O'Doherty, 2006).

High cholesterol is risk factor for cardiovascular disease, including coronary heart disease, but one that can be improved through diet including in older people, for example, by reducing saturated fat intake and including "good" fats like olive oil and oily fish containing omega-3 fatty acids. Innovation in food science has also led to the development of functional foods that help lower cholesterol (Chen, 2008) such as margarine containing plant sterols.

However, it is important to note that high cholesterol is a risk factor for cardiovascular mortality until after the age of 65, whereby the correlation between the two decreases as the person gets older (Darmon *et al.,* 2009) and total cholesterol tends to decrease (Volpato *et al.,* 2001). Volpato *et al.* (2001) have undertaken clinical research which suggests that poor health status is responsible for lower cholesterol in people over 65 years old.

There is a common perception that changing dietary habits in older age (over 65) will not bring any health benefits (Chernoff, 2001). However, in many areas, including cardiovascular health, this is not true. Ellingsen *et al.* (2008) demonstrated that an

increased intake of fruit and berries is inversely associated with carotid atherosclerosis (narrowing of the arteries due to fatty deposits) in older Swedish men at high risk of cardiovascular disease. Tyrovolas and Panagiotaka (2009) found that data from a number of European countries supports a Mediterranean diet being cardio protective for older people.

Diabetes

There are two types of diabetes, type I, and type II. Type I diabetes usually begins in childhood or adolescence and is a result of the body not producing enough insulin, and although there is a strong genetic component, it is not yet known what triggers the condition (Daneman, 2006). Type II diabetes is lifestyle related and more common in older people, with some countries reporting 10-20% of the over 65 population having the condition. One of the reasons that type II diabetes is more prevalent in older people is that ageing is associated with a reduced ability to metabolise glucose from food (Howarth *et al*., 1999).

Obesity and in particular central adiposity (weight gain around the waist) are strongly associated with the development of type II diabetes. Increased abdominal obesity in older people can cause metabolic changes which lead to insulin resistance, a key risk factor in the development of type II diabetes (Ritz, 2001).

Type II diabetes can be prevented by lifestyle modification (WHO, 2003) and there is evidence that a healthier lifestyle can contribute to managing the condition. For example, studies have shown that replacing saturated fats with unsaturated fats improves glucose tolerance, even if total fat intake does not change (WHO, 2003). In addition, a good intake of non-starch polysaccharides, that is, wholegrains, legumes, fruit and vegetables may protect against type II diabetes (WHO, 2003).

Cancer

In both men and women, the likelihood of developing cancer increases with age. Only a small proportion of cancers are known to be inherited; environmental factors including nutrition, physical exercise and body composition are far more important (WCRF, 1997). Obesity, in particular, is linked to several cancers including breast cancer (WCRF, 1997). There is significant data to show that a diet rich in fresh fruit and vegetables, unprocessed cereals and pulses reduces the risk of many cancers (WCRF, 1997). There is also evidence that diets high in red meat, processed meat (for example ham), refined carbohydrates and sugar is linked to higher risk of colon cancer in both men and women (Slattery *et al*., 1998).

2.6 Measures to improve the diet quality of the elderly

As a result of the increased risk of malnutrition for older people, the Department of Health have recommended that except in cases of obesity, older people should have energy intakes in order to make sure they get enough calories and do not lose weight unnecessarily (Department of Health, 1992). In addition, older people may need higher quantities of some nutrients, for example, calcium, vitamin D and vitamin B12 (Tufts, 2003) due to physiological changes making absorption of nutrients more difficult. Studies show that calcium, vitamin D, folate, iron and vitamin B12 are the most important micronutrients in which deficiencies commonly occur in older people (Tufts, 2003; Biesalski *et al.,* 2003). Eating less also means that there is a greater possibility that nutrient intake will be insufficient or even dangerously low.

The Elderly Nutrition Program (ENP), created under Title III-C of the Older Americans Act, is the largest programme that focuses on providing nutrition services for older

adults (Gollub & Weddle, 2004). Services include congregate meals, home-delivered meals, nutrition education, and counseling. Congregate nutrition services, established in 1972, provide meals in congregate facilities in community locations, as well as a source of social interaction to participants. In 2010, congregate nutrition services provided 96.4 million meals to 1.7 million older adults, while home-delivered nutrition services provided 145.4 million meals to 868,076 participants (AOA, 2013b). Overall, 236 million meals are served to 2.6 million elders per year, which is less than 5% of the older adult population (Kamp, 2010). Health services also offered to older adults in need consist of medical screenings, homemaker assistance, and social activities. Anyone over the age of 60 is eligible for congregate meals, but the ENP's emphasis is on adults who are frail, homebound, and therefore unable to buy and prepare food independently (Millen, *et al* 2002). Home-delivered meals assist homebound older adults who may not be receiving proper nutrition on a daily basis when functional limitations interfere with meal preparation and cooking (Anyanwu, *et al* 2011).

In fact, 41% of homebound older adults who participate in the ENP are unable to prepare meals, and 85% have difficulties with at least one IADL (Wellman, Rosenzweig, & Lloyd, 2002). However, nearly half of the meal delivery programmes across the United States have waiting lists, preventing many elders from joining (Anyanwu *et al.,* 2011). The home-delivery meal programme benefits older adults in numerous ways. The foods provide nutrients that elders may not be consuming independently, while the people delivering the foods provide a source of social interaction. The ENP also provides nutrition education and counseling to promote nutrition knowledge among older adults (Bernstein & Munoz, 2012). Part of nutrition education involves teaching program participants proper diet and exercise behaviors

that will either prevent or keep chronic illnesses from progressing (Thomas, Ghiselli, & Almanza, 2011).

Older adults who are nutritionally at risk for certain health problems can benefit greatly from a food assistance programme (Kamp, 2010). The meals provided by the ENP make up 30-50% of the participant‘s daily nutrient intakes, which is significant for older 14 adults who are unable to prepare nutrient dense foods independently (Millen *et al.,* 2002). Frongillo and colleagues (2010) discovered that older adults who are part of a home-delivered meal programme have a higher intake of fruits and vegetables compared to nonparticipants. Elders tended to be deficient in vitamins found in fruits and vegetables, which suggests that meal programs can improve nutritional status (Bernstein & Munoz, 2012).

Assistance Programme (SNAP) is available to older adults. Previously known as the Food Stamp Program, SNAP helps low-income individuals and families purchase foods in order to maintain a healthy diet. Elders receive fewer benefits compared to adults and children because they do not qualify according to the asset tests, thereby lowering the application rate.

Households that only contain older adults without earnings participate in SNAP significantly longer than households without elders (United States Department of Agriculture [USDA], 2013). Research is needed to determine reasons why food security in elders is unaffected by SNAP participation, while it has proven to be effective in children and adults.

The Commodity Supplemental Food Program (CSFP) provides USDA foods specifically to low-income older adults in order to improve nutritional status. The CSFP provides both home-delivered and congregate food packages, which consist of canned

fruits, vegetables, meat or fish, juice, instant dry milk, pasta or rice, dry beans or peanut butter, and cereal. Heights and weights can be measured, along with a screening checklist to assess nutritional risk. Results indicated that 80% of participants were at moderate to high nutritional risk based on the screening tool.

. A study conducted by Kunkel, Luccia, and Moore (2003) involved evaluating a SFMNP in South Carolina. The researchers mailed out a survey to a random sample of 1,500 older adults participating in the SFMNP, and 658 surveys were completed and returned. Overall, 64% of participants reported that having the coupons to spend at farmers‘ markets has changed the way they eat. Seniors also indicated the primary reason they did not use coupons was because there were no farmer‘s markets in their area, creating a barrier to participating in the program. Eighty-six percent stated they eat more fresh fruits and vegetables, and 56% said they learned a new way to prepare or cook these foods. Based on this research, it appears that the SFMNP is associated with improved eating habits and therefore nutritional status in older adults (Kunkel, Luccia, & Moore, 2003). Due to the relatively small scale of this study, however, further and more up-to-date research is needed to fully assess SFMNP effectiveness.

Despite the benefits that food and meal programs can offer to seniors, accessibility and participation across the United States is limited. Some older adults are unaware of the programs that are available, while others believe the application process is too complicated and not worth the effort. Elders also feel that there is a social stigma associated with receiving government aid, and they believe support is not necessary as a result (Bernstein & Munoz, 2012). In addition, food programs may not be available in certain locations due to inadequate funding, which contribute to low participation rates.

Increasing awareness of the Elderly Nutrition Program and adjusting the sign up process to make it less complex for older adults are just a few simple ways to improve the program and overall participation rates (Choi, Lee, & Goldstein, 2011). Also, waitlists occur in 35% of home-delivered meal programs, making it difficult for older adults to participate in the first place. Funding for the ENP has not increased with the increasing demand for meals, which is the main cause of waitlists. Furthermore, there is little research on the demographics of program participants, especially those who are put on the waitlist to receive meals (Lee *et al.,* 2011).

Nutrition and food intakes in older adults have been documented, which typically involve objective measures to assess results. Nutritional status can be measured objectively using blood and urine tests, while diet quality can be assessed using the Healthy Eating Index (Bernstein & Munoz, 2012; USDACNPP, 2014). Predictors of nutritional status and diet quality, such as food security, functional status, and living arrangements, are usually measured subjectively using surveys in an interview setting (FIFARS, 2012). The few studies documenting meal program effectiveness utilized both objective and subjective measurements to analyze data. Frongillo and colleagues (2010), for example, measured the height and weight of each participant, along with a 24-hour dietary recall and food-insecurity questionnaire to gain subjective insight from the individuals (Frongillo & Wolfe, 2010). Koughan and Atkinson, researchers analyzing older adults in the CSFP, used a nutritional risk screening checklist in addition to height and weight measurements (CSFP, 2004). However, all of these factors related to nutrition do not take one important measurement into account, and that is quality of life.

A person‘s quality of life, generally defined as overall life satisfaction, can be greatly impacted by diet quality and nutritional status, which is why it is an important variable to explore. In this regard it is important to consider the following dietary recommendations for older people. It is important to note that there is no consistency in the literature as to at what age some dietary recommendations are supposed to apply. While the use of 65 as a benchmark age is more common than others, many studies merely refer to –older people" or –elderly people" without actually specifying age. This means that recommendations based on the dietary data and health status of a year old are being applied to an 80 year old, whereas their nutritional needs and habits could be markedly different due to physiological, social and economic factors.

Ritz (2001) pointed to a particular paucity of data on the dietary habits of the over 80s. This is no doubt linked to the fact that life expectancy has increased significantly in recent decades in a way that was not expected, that is, most researchers did not realise there would be so many 80 year olds around today whose dietary habits could be studied! However, it is clear from the literature that there is agreement that the oldest older people, that is, the over 75s, have some particular nutritional needs that differ from the rest of the population. For the reasons outlined above, it is appropriate to further segment the age groups of the elderly as follows: people aged 55-64; people aged 65-74; people over 75 years old

People aged 55-64

There are no special dietary recommendations for people aged 55-64, but instead they are expected to follow the same healthy eating guidelines that apply to younger adults. The importance of maintaining a healthy weight, and avoiding overweight and obesity

are as valid for this age group as for younger adults (Krondl *et al.,* 2008). Nutritional guidelines for adults:

a. Include plenty of complex carbohydrates, for example, whole meal bread, whole grain rice.
b. Include five servings of fresh fruit and vegetables per day.
c. Aim for a diet low in salt, saturated fat, refined carbohydrates and sugar.
d. Include "good" fats like olive oil, nuts and oily fish.
e. Include protein sources like lean meat, oily fish, low fat dairy products, eggs and vegetarian sources of protein [legumes, beans, tofu] (Department of Health, 2004; WHO, 2002)

However, the COMA2 guidelines (Department of Health, 1992) does not set totally uniform energy (calorie) requirement for this age group: aged 51-59 = 2550 calories for men, 1900 calories for women; aged 60-64 = 2380 calories for men, 1900 calories for women. Although the 55-64 age group does not have special nutritional needs as such, this age group would be well advised to start paying extra attention to healthy lifestyle including diet, in relation to the future risk of chronic diseases and to best prepare themselves for healthy older age. For example, once women are postmenopausal, as most are in this age group, there is an increased need to ensure appropriate vitamin D and calcium intake to maintain bone health and help to prevent osteoporosis (Heaney, 2007; Gennari, 2001) and an increased risk for cardiovascular disease due to lower levels of oestrogen (Korzen-Bohr & O'Doherty Jensen, 2006).

Health promotion in older people both in relation to diet and keeping physically active can produce results (Chernoff, 2001). The main aim of healthy diet and lifestyle (including physical activity) in this age group would be to maintain good health, to

reduce the risk of chronic disease and strengthen or maintain immune function to avoid health problems later.

People aged 65-74

The dietary recommendations for this age group are not hugely different to those for people aged 55-64, as long as people remain in good health. However, the risk of developing a chronic disease is higher for this age group than the previous one; studies in the USA show that 75% of the over 65s have one chronic disease and 50% have two or more (Hasler *et al.*, 2000). Those individuals already suffering health problems, particularly those that increase the risk of chronic disease or people who already have a chronic disease, may need to make further more changes to their diet, for example:

a. A person with high cholesterol may need to further reduce their saturated fat intake to reduce the risk of coronary disease or to prevent existing coronary heart disease from progressing.
b. A person identified as having reduced bone density may need to increase their calcium and vitamin D intake to reduce the risk of osteoporosis or to prevent its progression.
c. The COMA energy requirements for this age group are the same as for 60-64 age group, namely 2330 calories for men and 1900 calories for women.

People aged over 75

The physiological changes associated with the ageing process and the associated health problems that can arise, which are discussed earlier on, start to have an effect on most people aged 75 and over. This means that a more age specific approach is required for this age group which could include:

a. In general, consuming a more nutrient rich diet in order to obtain the nutrients needed from a lower calorie intake which results from both physiological and socio-economic factors.
b. A switch of focus from the risk of obesity to the risk of malnutrition, especially given that in this age group, a lower BMI is more highly correlated with morbidity and mortality than a higher BMI.
c. Additional nutritional support to ensure acceptable levels of key micronutrients due to lower intake and uptake, for example, vitamin D.

The COMA recommendations (from 1992) on energy intake for the over 75s, now appear to be in out of date in recommending a lower energy intake for this age group than their younger counterparts. More recent research does not recommend a lower energy intake for the over 75s, although there is acknowledgement that it often happens. However, because there is very little data about dietary habits of specific sub-groups of older people for the later age groups of older people, that is, those over 80 (Ritz, 2001) and the nutritional recommendations for ~~–~~older people" that differ from the rest of the population are not age specific, further research is clearly needed here.

Nutraceuticals, food supplements and functional foods for the elderly

There are many definitions of a functional food, but as Arvanitoyannis (2005) informs us, there is no universal precise definition. However, it is possible to pick out a number of common themes which include providing an additional health benefit, containing specific ingredients to confer a health benefit, and looking like a conventional food product, that is part of a normal diet. Functional foods are generally considered to be those food products which provide a specific health benefit over and above their basic or traditional nutritional value (Abdel Salam, 2010; Buttriss, 2010). In relation to the

conventional nature and use of functional foods, Lydesdale (1997) stated that functional foods are similar in appearance to conventional foods that are consumed as part of a normal diet while Buttriss (2010) described them as foods that are similar in appearance, smell and taste to a conventional food, that is consumed as part of a usual diet (Buttriss, 2010). In Japan, where functional foods have a legal definition as foods for specified health uses; they are defined as per the regulation that governs them as foods containing ingredients for health and officially approved to claim its physiological effects on the human body (Japanese Ministry of Health and Welfare, 2010).

A functional food can be explained as a conventional food product modified in some way to give a health benefit above and beyond basic nutrition. Modification here also includes enhancement, for example, fruit juice with vitamin D. This definition excludes some food products for which a functional claim is made, for example, soy products which make cholesterol reducing claims. Such products would not meet our definition as the soy protein referred to as naturally occurring in the soy beans used to make the product, and has not been modified, manipulated, or added to the product. Some definitions that refer to providing additional health benefits include:

Confusion can arise when it comes to other food products with functional roles such as nutraceuticals and food supplements. Food supplements are clearly defined in a way that distinguishes them from functional foods in relation to their form and usage. In a number of jurisdictions food supplements are defined in law. For example, in the EU, a food supplement is defined in Directive 2002/46/EC (whereas 1), as a foodstuff whose purpose is to –supplement the normal diet" and which is made of –econcentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in

combination, marketed in dose form", that is, capsules, pills, powders, drops, and taken in ~~"m~~measured small unit quantities" (p.1).

In the United States, a food supplement is defined according to US Dietary Supplement Health and Education Act 1994 (cited in Zeisel, 1999) as a product in capsule, powder or pill form, that is not a conventional food product and is ~~"i~~ntended to supplement the diet to enhance health" and contains ~~"a~~ vitamin, mineral, amino acid, herb, or other botanical". It is therefore quite clear that a food supplement and a functional food are not the same. However, when it comes to nutraceuticals, there is often confusion. Nutraceutical" is a term first coined by Dr Stephen DeFelice of the Foundation for Innovation in Medicine in 1989 (Kalra, 2003) and is an amalgamation of ~~"n~~utrition" and ~~"p~~harmaceutical".

Arvanitoyannis et al (2005) stated that the definition of functional foods is occasionally confused with that of nutraceuticals. Kalra (2003) pointed out that although the term ~~"n~~utraceutical" is used in marketing, there is no regulatory definition and some people including Lang (2007) regard ~~"n~~utraceutical" as another term for functional foods, whereas others imbue them with almost pharmaceutical type properties (Zeisel, 1999).

If one takes the view that a nutraceutical is different to a food supplement and a functional food, Health Canada's definition as cited in FAO (2007, p. 3) of a nutraceutical as: ~~"a~~ product isolated or purified from foods that is generally sold in medicinal forms not usually associated with foods" is the most sensible. An example of a nutraceutical under this definition would be black radish juice sold in ampoules for improving digestive functioning and Echinacea sold in several formats to prevent or treat common colds.

Functional foods are developed originally to identify and correct nutritional deficiencies, for example, breakfast cereals with folic acid, but many have now gone further to become food products that improve physical and mental well-being (Siro *et al.,* 2008) and reduce the risk of chronic diseases (Abdel-Salam, 2010) or even manage disease (Hasler *et al.,* 2000).

A normal type of food with an additional ingredient that provides a health benefit beyond satisfying traditional nutritional requirements" (Food-info.net, 2010). It has beneficial effects on target functions in the body, beyond adequate nutritional effects, in a way, that is relevant to health and well-being and/or reduction of disease" (Katan, 1999). It offers the potential of reducing the risk of chronic disease beyond basic nutritional functions (Buttriss, 2010; FAO, 2007; Arvanitoyannis *et al.,* 2005).

The component or ingredient that the functional food contains that provides the additional health benefit (the ~~–~~function") can be a non-nutrient, or a nutrient (FAO, 2007). An example of a non-nutrient would be plant sterols to reduce cholesterol. Where a micronutrient is a functional food ingredient, it should be in quantities that are higher than daily recommendations, should be directly linked to the health and well-being of the person including disease risk reduction (FAO, 2007; Roberfroid, 2000). For example, vitamin D, which is added to fruit juice to raise dietary vitamin D levels in a target population, such as postmenopausal women who are at risk of developing osteoporosis (Heaney, 2007).

Healthy foods in a broad sense are food products which have a desirable nutritional content and are usually recommended to be eaten as part of a normal healthy diet. This means that a healthy food product is not necessarily functional, but a functional food could be considered a healthy food. According to the relevant EU legislation 4, the

starting point for regulatory approval of a functional food is that the food product must meet certain nutritional standards, known as ―nutrient profiles". The European Commission advised by the European Food Safety Authority (EFSA), sets nutrient profiles for different types of food products and in doing so must take into account:

Fat, saturated fat, trans-fatty acids, salt/sodium and sugars, excessive intakes of which in the overall diet are not recommended, as well as poly- and mono-unsaturated fats, available carbohydrates other than sugars, vitamins, minerals, protein and fibre (Regulation 1924/2006, p. 2). This means that the starting point for submitting a request for approval of a health or nutritional benefit to EFSA is that the food product concerned meets the relevant nutrient profile. The rationale for establishing nutrient profiles is to prevent a food with an unhealthy nutrient profile being able to have a health or nutritional claim, or as a 2006 position on the draft regulation 5 put it only foods that have a desirable nutrient profile and thus truly contribute towards a healthy diet should be allowed to bear claims" (Eurocoop ,2006). It should be noted that complying with the nutrient profile does not ensure that a claim will be approved.

It is important to remember here, that we are focusing on foods that are functional foods in accordance with the definition: a conventional food product modified in some way to give a health benefit above and beyond basic nutrition. The most common functional foods are those which target the following health functions: gastrointestinal function, cardiovascular disease and bone health (FAO, 2007). This includes probiotic and prebiotic functional foods.

The most commonly used definition of probiotics is ―living food supplements or components of bacteria that have been shown to have beneficial effects on human

health (Weichselbaum, 2009; Sheil *et al.,* 2007). Probiotics are also available in food supplement form (pills or capsules).

The most common type of probiotic functional foods are dairy products such as yoghurts and yoghurt/dairy drinks which have been modified by the addition of a particular strain of live microorganism in the form of lactobacteria such as *Lactobacillus* and *Bifidobacterium* and in some cases prebiotics such as inulin as well. The additional health benefits claimed by probiotic dairy products are related to the gastrointestinal functions and include improving digestion and immunity and managing digestive disorders such as IBS (irritable bowel syndrome) and diarrhoea.

Prebiotics are non-digestible oligosaccherides added to food, the most common being oligofructose and inulin (Roberfroid, 2007). The health claim made for prebiotics is that they stimulate beneficial digestive activities including growth in the number of bifidobacteria (Roberfroid, 2007).

Cholesterol-lowering functional foods

There is now a broad range of cholesterol-lowering functional foods available which contain added esterised fat soluble forms of phytosterols or stanols (plant extracts). The additional health benefit of these functional foods is to help lower cholesterol through the action of the added sterols/stanols.

Omega-3 functional foods

Omega-3 fatty acids, which occur naturally in foods such as oily fish and some plant and seed oils, are the latest substance to be added to a variety of food products including margarine, milk, fruit juice and eggs to make functional foods. Omega-3 fatty acids can contribute to reducing the risk of cardiovascular disease, so the additional

health benefit from omega-3 containing functional foods is to increase omega-3 fatty acids intake for cardiovascular risk reduction effect.

Calcium and vitamin D enriched functional foods

The food products which provide high levels of calcium and/or vitamin D are mostly fortified food products. Some are fortified only with calcium or vitamin D and others with both nutrients. This includes calcium enriched fruit juice, for example,tropicana calcium containing orange juice; calcium and vitamin D enriched soya milk, for example, Alpro, So Good; calcium fortified breakfast cereal (many varieties); vitamin D and calcium fortified orange juice; vitamin D fortified milk; vitamin D enriched margarine 6; calcium and vitamin D enriched yoghurt.

The elderly and nutrient supplement intake

Consistent with other studies, supplement use is more prevalent among women than men (Schwarzpaul *et al*., 2006). Studies have shown that micronutrient status changes with age (Ahluwalia & Ahluwalia, 2005; Heuberger, 2009) for vitamin D, vitamin B12, and calcium due to the decline in absorption, use, or activation of these nutrients (Bueche, 2009; Brown *et al*., 2008).

Schwarzpaul *et al*. (2006) also documented that men most often supplemented magnesium, vitamins C and E while women mostly supplemented magnesium, vitamin E and calcium. Vitamins A and E are antioxidants, which are believed to protect the cells from free radical damage, hence, prolonging life (Ahluwalia & Ahluwalia, 2005).

Nevertheless, the elderly are likely not to consume enough nutrient dense foods to meet their requirements for beneficial nutrients like vitamin D, vitamin B12 and calcium (Wardlaw *et al*., 2004), hence, the need for supplement intake. In this study, 39% of the

participants used supplements with frequency of intake ranging from once a week to daily.

Lifestyle and social patterns of the elderly

Some studies suggest that moderate alcohol consumption compared to abstention was beneficial for healthy aging (Brown *et al*., 2008). The interactions between alcohol intakes at varying levels with diet, exercise, and other issues are extremely complex.

Heuberger (2009) suggested that, it would be better if alcohol intakes were avoided in later years of life. In view of these complex issues regarding the intake of alcohol, moderation is the key. According to Brown *et al*. (2008) any type of alcohol _in moderate amounts‘ can be preventive against stroke while excessive amounts increase risks drastically. With regard to smoking, a substantial body of literature associates non-smoking with healthy aging (Haveman-Nies *et al*., 2003; Newman *et al*., 2001).

It is health promoting for the elderly to actively engage in social activities like weekly church going, weekly attendance of meetings and other social organizations as well. This practices enhance socialization and keeps them healthy. The effect of such behaviours is put in view by Boyle (2003) who reported that older persons thrive in situations where love, understanding, shared responsibility, and mutual respect are nurtured.

The elderly and physical activity behaviour

Generally, elderly females are more physically active as compared to their male counterparts. This is probably because the females are more engaged in household activities such as cooking and cleaning, which the male is likely to refrain from because it is a _woman‘s job‘. Daily walking has the potential to control blood glucose levels of

carbohydrate rich foods if it is done after eating (Håstmark *et al*., 2006; Nygaard *et al*., 2009). Clearly, since walking is a preferred choice it should be encouraged among the elderly to help especially those who are diabetic. Non-communicable chronic diseases can be improved through good nutrition and simple physical activity such as walking (Hickson, 2006; Reese, 2007; Nygaard *et al*., 2009). It is important that the elderly eat healthy so as to maintain their nutritional status.

Physical activity behaviours of elderly is ideal for disease risk reduction. As well maintaining physical and mental capacity, the link between diet and the incidence chronic disease is now widely accepted (WHO, 2003). In particular, diet can play a role in reducing the risk of developing cardiovascular disease, some cancers, osteoporosis, inflammatory conditions (WHO, 2003; WCRF, 2007; Arvanitoyannis, 2005; Hu, 2000; Danini *et al,* 2009) and Alzheimer's disease (Gu *et al.,* 2010). For example:

a. High cholesterol (largely diet influenced) is a risk factor for coronary heart disease (Chernoff, 2001).
b. Adequate intake of calcium and vitamin D has been shown to help prevent or slow down the onset of osteoporosis (WHO, 2003)
c. A diet high in high glycaemic (usually refined) carbohydrates is associated with an increased risk of Type II diabetes (Hu *et al.,* 2000).
d. Mediterranean" and "Asian" traditional diets (high in whole grains, fresh fruit and vegetables, low in red meat and high fat dairy products) are associated with lower rates of coronary heart disease than the typical American diet (Hu *et al.,* 2000; Masala *et al.,* 2007) and lower risk of mortality in general (Trichopoulou *et al.,* 2005; Trichopoulou *et al.,* 2009).

While inadequate or bad nutrition is a risk factor in the development and progression of many chronic diseases, good nutrition is not a guarantee of prevention or cure, but can significantly reduce the likelihood of developing a number of common chronic diseases and/or slow down their progression (WHO, 2003).

CHAPTER THREE

METHODOLOGY

3.1 Overview

This section discusses the various methods and procedures that were employed in gathering data for the study. The following were discussed; research design, population, sample and sampling techniques, instrumentation, validity and reliability of instruments, data collection procedures, data analysis, and ethical considerations.

3.2 Research design

This study, which is descriptive in nature, used the quantitative paradigm. The study employed the descriptive cross-sectional survey design. This enabled the researcher gather quantitative data during a particular period for data collection (Fraenkel, Wallen & Hyun, 2012). The study was underpinned by the positivist worldview. Positivism contends that only through the objective interpretation of and intervention in reality can that reality be fully understood. Positivists believe that reality is stable and can be observed and described from an objective viewpoint. This viewpoint is usually linked to the notion of science as the objective truth or fact. Here, numerical estimation and statistical inferences are made from a generalized sample in relation to a larger _true' population of interests. The positivist paradigm emphasizes on the objective measurements and numerical analysis of data collected through polls, questionnaires or surveys (Saunders, Lewis & Thornhill, 2009). The positivist philosophical approach, which is often linked to quantitative research, uses critical approaches such as the generation of models, theories and hypotheses; the development of instruments and measurement; experimental control and manipulation of variables; collection of

empirical data; modeling and analysis of data; and evaluation of results (Gall, Gall & Borg, 2003).

A cross-sectional study is one that produces a _snapshot' of a population at a particular point in time. The epitome of the cross-sectional study is a national census in which a representative sample of the population consisting of individuals of different ages, different occupations, different educational and income levels, and residing in different parts of the country, is interviewed on the same day (Creswell, 2012). The single _snapshot' of the cross-sectional study provides researchers with data for either a retrospective or a prospective enquiry (Cohen, Manion, & Morrison, 2007).

The descriptive cross-sectional survey was therefore employed to help produce a good amount of responses from a wide range of elderly people since it was associated with large-scale research, covering many people or events. It enabled the researcher to collect enough data to determine the nature of the group studied as it existed at the time of the study. The strategy allowed the use of questionnaires to large volumes of data that were analyzed statistically. The wide and suitable coverage gave credibility to generalized statements made on the basis of the research. The design permitted the generalization of research findings about the population studied. Best and Khan (1995) postulate that descriptive statistical analysis limits generalization to the particular group of individuals observed and that no conclusions are extended beyond this group. Further, the researcher employed descriptive statistical tools such as percentages and frequencies in analyzing the data collected. McMillan (1996) agrees that descriptive study simply describes and provides an understanding of a phenomenon usually with simple descriptive statistics and it is particularly valuable when an area is first investigated.

However, Fraenkel and Wallen (2000) indicate that the descriptive cross-sectional design have some weaknesses which include the difficulty of ensuring that a sufficient number of questionnaires are administered for meaningful analysis to be made. In order to mitigate the effects of the weaknesses associated with the use of descriptive survey for the study, the questionnaire was pilot tested. This offers the researcher the opportunity to reframe and sharpen ambiguous items. Further, respondents were assured of their anonymity and the confidentiality of responses provided to enable them to respond candidly and dispassionately. Also, in some instances after administering the instrument, the researcher waited for respondents to fill in their responses and collected them. As a result, the descriptive cross-sectional survey design was considered most appropriate for the study.

3.3 Area of study

The Jasikan District is located in the northern part of the Volta Region. It shares boundary with the Kadjebi District to the north, the Biakoye District in the west, the Hohoe Municipality in the south and to the east with the Republic of Togo. The District covers a total land area of 555.8 square kilometers representing 6.6 percent of the entire land area of the Volta Region. Jasikan, the District capital, lies 110 kilometres north-east of Ho, the regional capital. The population of Jasikan District, according to the 2010 Population and Housing Census, is 59,181. Males constitute 49.2 percent and females represent 50.8 percent. About 72.4 percent of the population in the district live in rural areas. The urban settlements include Jasikan, Okadjakrom and Bodada. In terms of health infrastructure, the district has a hospital, six health centres, three community health planning services (CHPS compound) and a private clinic. There is a smaller

proportion of elderly persons (65 years and older) who constitute 6.7 percent of the population.

Table 1 shows the population of the aged/elderly by age, sex and type of locality in the district. Figure 1 also shows the map of the Jasikan district.

Table 1: Population of the elderly or aged by age, sex and type of locality in the Jasikan District

		Sex			Type of locality	
Age group	**Both sexes**	**Male**	**Female**	**Sex ratio**	**Urban**	**Rural**
65 - 69	1,023	461	562	82	260	763
70 - 74	1,182	508	674	75.4	290	892
75 - 79	789	342	447	76.5	201	588
80 - 84	494	174	320	54.4	130	364
85 +	472	172	300	187	105	367
65+	**3,960**	**1,657**	**2,303**	**71.9**	**986**	**2,974**

Source: Ghana Statistical Service, 2010 Population and Housing Census

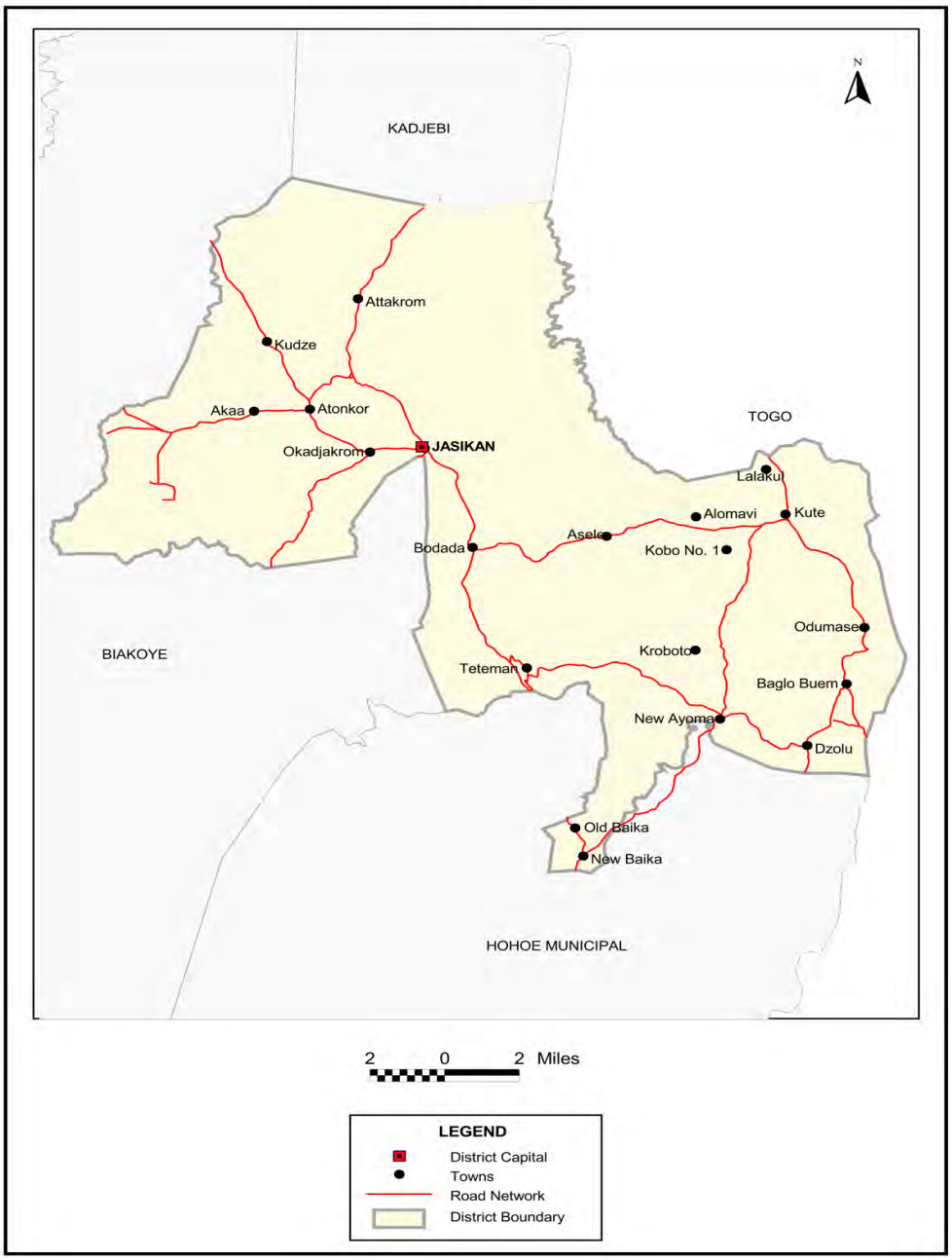

Figure 1. Map of Jasikan District

Source: Ghana Statistical Service, GIS (2014).

3.4 Population

A research population is described as a group of people to whom the researcher is interested in gaining information to be able to draw conclusion. It is defined as a group of individuals or people with the same characteristics and in whom the researcher is interested (Kusi, 2012). The target population for this study consisted of three thousand, nine hundred and sixty (3,960) aged or elderly persons in the Jasikan District. This comprised 986 aged persons who are farmers and 2,974 elderly who are retired civil servants. In addition, the population included ten (10) caretakers of the aged persons who were selected because they mainly cared for the diets of the elderly. In all the population of the study was one hundred and eight (108) respondents.

Only aged persons who were relatively healthy were recruited for this study. All the aged persons who experienced or suffered from diseases such as type 2 diabetes, hypertension and other heart diseases, HIV/AIDS, some kinds of cancers, and adult bone loss (oesteomalcacia and oesteoporosis) were excluded from the study. This was because elderly with any of the above illness might be on one medication or another that might restrict the quality and quantity of nutrients they consume and this could affect the nutrition information the researcher wanted to solicit.

3.5 Sample, sampling techniques and procedures

The Jasikan District was conveniently selected for the study to ensure easy accessibility with respect to information, reduce time and to get as many respondents (elderly and their caretakers) as required.

A multi-stage sampling technique was used to sample the ninety-eight (98) elderly persons from Jasikan town. The sample size used for this study represents 2.5% of the

target population of the elderly in urban settings. The choice of 2.5% of the target population is based on Dornyei's (2007) assertion that between 1% and 10% of a study population gives an adequate sampling fraction. Multistage sampling procedure combines both probability and non-probability sampling techniques. This sampling procedure relies on sampling at different stages in the process (Maduekwe, 2011).

Stage one

The elders were categorised into two clusters based on the type of locality. This was done in order to sample respondents fairly across the towns. The clusters were elders in urban areas or settings such as Jasikan, Okadjakrom and Bodada were sampled for the study. A maximum of thirty-three (33) and minimum of thirty-two (32) elderly people were randomly sampled from each cluster: cluster A (Jasikan) = 33; cluster B (Okadjakrom) = 33; and cluster C (Bodada) = 32.

Stage two

The elderly were then regrouped into five (5) age strata. Stratified sampling is a probability sampling technique in which each stratum is properly represented so that the sample drawn from it is proportionate to the stratum's share of the population; it ensures higher statistical efficiency than a simple random sample. The population strata by age group for this study is as follows: elderly persons aged between 65-69 years; 70-74 years; 75-79 years; 80-84 years; and 85 years and above.

The Kish (1965) equation was used to determine the sample size for the population of the elderly or aged persons. Assaf, *et al* (1999, 2001) and Abdul-Hadi (1999), among others, used this equation:

$n = n'/ [1 + (n'/N)]$

where, n′ is the sample size from infinite population, which can be calculated from this formula: [$n' = S^2/V^2$]

The definitions of all variable are as follows;

n = sample size from finite population.

N = total population (aged/elderly persons).

V = standard error of sample population equal to 0.05 for the confidence level 95 per cent, t = 1.96.

S2 = standard error variance of population elements, S2 = P (1- P); maximum at P = 0.5.

The sample size for the population of aged or elderly persons can be calculated from the previous equations as follows:

$n' = S^2V^2 = (0.5)^2 / (0.05)^2 = 100$

$$n \text{ (elderly persons)} = \frac{[\ 100\ ]}{1 + \frac{(100)}{3{,}960}} = 97.53 = 98 \text{ elderly persons.}$$

The stratified random sampling technique was utilised in selecting the elderly from various zones or urban settings in the Jasikan District: Jasikan, Okadjakrom and Bodada, and by gender as well as age stratification. In using stratified sampling technique, it is ―advisable to subdivide the population into smaller homogeneous groups" to ―get more accurate representation" (Best & Kahn, 1995). Based on this, each urban community, gender and age stratification was taken as a stratum from which some respondents were selected based on proportional representation. The proportional (proportionate) quota sampling technique was further used to select study participants from each age stratification and urban community by gender.

Stage three

Simple random sampling via the manual lottery method was also used to select between 18 and 19 elderly from each age stratification: 65-69 years; 70-74 years; 75-79 years; 80-84 years; and 85 years and above by gender and community or area of residence. The manual lottery method was used to determine who took part in the study from the strata. Ease of using simple random sampling represents the biggest advantage of opting for such a procedure. Also, simple random sampling is meant to be an unbiased representation of a large group, since every member of the population has an equal chance of getting selected (Crossman, 2017).

Stage four

Convenience sampling was also used to select ten (10) caretakers of the sampled elderly for observation. Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenience, accessibility and proximity to the researcher (Saunders, Lewis & Thornhill, 2012). This procedure relies on data collection from the characters that are conveniently available to participate in the study. Convenience sampling was considered because only the elderly and their caretakers who were available and willing to provide information about their diet quality were accessed. It was also convenient to reach the elderly because of proximity of Jasikan to the researcher. Though convenience sampling is considered a weak form of sampling because of the inability to generalize findings to a larger population, data collection can be facilitated in short duration of time (Gravetter & Forzano, 2006).

3.6 Data collection instruments

Two techniques used during data collection were administration of questionnaire and observation. Therefore, multiple instruments: questionnaire and observation checklist were used for data collection. This was done to ensure triangulation of data as noted by (Punch, 2003) and cross-checking data from multiple sources to search for regularities in the research data (Berg, 2007). When data are triangulated, that is, more than one data collection method is used, gaps in collected data are filled and false or misleading information can be detected (Greeff, 2002).

3.6.1 Questionnaire

A structured questionnaire was used to assess the nutritional knowledge, diet quality as well as feeding practices for the elderly as practiced by the caretakers. A meal pattern and/or dietary/feeding practice questionnaire (food frequency questionnaire) containing close-ended questions were administered to the elderly or caretakers. This was based on the Diet Quality Index (DQI) and the 2010 U.S. Dietary Guidelines as measured by their 2010 Healthy Eating Index.

The question items were structured in a way to gather information from respondents on their dietary habits, social and economic factors that affect the nutrient intake of the elderly. The questions in the questionnaire are in four (4) sections comprising a Likert scale and open- ended questions were used to find out about the demographic characteristics of the elderly. Open-ended questions. This was used to solicit response on the diet quality, factors that influence the feeding practices of the elderly, nutritional and health challenges of the elderly and measures to improve the diet quality of the elderly.

The questionnaire contained close ended and a few open ended items. The close ended items mainly contained a Likert-scale type questions/statements which will be built on a five-point scale rating: Very Great Extent (**VGE)** = 4; Great Extent **(GE)** =3; Some Extent **(SE)**=2; Very Little Extent (V**LE)** =1; Not at all **(N)** = 0. The questionnaire will be designed for the respondents to reflect on the key themes raised in the research questions.

The questionnaire were designed into five main sections labelled as A,B, C, D and E. Section ‗A' had 4 items on the demographic data of the respondents. Section ‗B' contained 8 items on nutritional quality of the diet consumed by the elderly, and section ‗C' was on factors affecting choice of quality diet by the elderly. Section ‗D' was on nutritional related health challenges of the elderly, while section ‗E' was on measures to improve diet quality of the elderly.

Koul (2002) explained questionnaire as a device which consists of series of questions which deal with some psychological, social and educational topics with the objective of obtaining data with regards to some problems under investigation. A structured questionnaire contains a series of questions and statements or items that are presented and the respondent is asked to answer, respond to or comment on them in a way she or he thinks best. There is a clear structure, sequence and focus, but the format is open-ended, enabling the respondent to respond in her or his own terms (Cohen, *et al* (2012).

3.6.2 Observation checklist

A checklist using the 24 hour dietary recall was used as dietary indicator to describe intake of foods by the aged persons. A semi-structured observation guide was designed to collect data on the kinds of food eaten by the elderly, portion size and their dietary

pattern. The observation involved physical examination of the food quantity in terms of portion size, quality, and how those foods are prepared and served.

3.7 Validity and reliability of the instruments

Yin (2003) discussed the test involved in validating any data in any social science research. He groups them under construct validity, internal validity, external validity and reliability. He explains these tests in the following ways:

Face validity of the questionnaire was carried out by giving it to colleague MPhil students in the Department of Home Economics of the University of Education, Winneba as well as colleague Home Economics tutors for peer review. Their comments and suggestions were considered for review of the questions. The content validity of the questionnaire was ensured by experts in the area of nutrition, health, aged care (gerontology) as well as the research supervisor who scrutinized the items for their suitability before pre-test. All the necessary corrections in the items were made and declared valid by the supervisor. Construct validity was ensured by critically developing the items or questions within established theoretical framework by employing accepted definitions and constructions of concepts and terms; operationalizing the research and its measures.

The current researcher also adopted the internal validity check. This was done through ensuring agreements between different parts of the data, matching patterns of results. Ensuring that findings and interpretations derived from the data are transparent and that causal explanations are supported by the evidence (alone), and that trivial explanations and inferences have been weighed and found to be less acceptable than the explanation of inference made, again based on evidence. The current researcher also ensured the

concurrent validity through the use of multiple sources and kinds of evidence to address research questions and to yield convergent validity.

Joppe (2000) defines reliability as the degree to which outcomes are reliable in a period of time and if the outcomes in a research can be replicated using the same method, then the research instrument is reliable. To ensure reliability of the questionnaire, it was pre-tested on ten (ten) elderly persons and two (2) of their caretakers at Kajebi. The result was subjected to Cronbach's alpha reliability analysis using Statistical Package for Social Sciences (SPSS) version 22.0 to determine the reliability coefficient (r) in order to establish the reliability of the instrument. A reliability coefficient (r) of 0.775 was obtained and this was deemed as an acceptable measure of reliability because more than 0.70 the threshold value of acceptability is achieved as a measure of reliability (Dörnyei & Taguchi, 2010).

3.8 Data collection procedures

In conducting a study, Creswell (2005) advises researchers to seek and obtain permission from the authorities in charge of the site of the study because it involves a prolonged and extensive data collection. For ethical reasons, a letter of introduction from the Head of Department of Home Economics of the University of Education, Winneba, was obtained to introduce the researcher during the data collection, after establishing the necessary contacts with the respondents. This was meant to formalise the research as pointed out by Ball (1993) and cited by Seidu (2006) that the negotiation of entry to an educational setting usually is conducted through formal channels. The purpose of the study was explained to sampled respondents. This letter was used to obtain permission from the elderly and their caretakers. Participants were assured of the necessary confidentiality. The administration of the questionnaire and the observation

were done after consent was sought from the elderly and their caretakers. All information were kept confidential and utilised for research purposes only. The principal investigator kept all data.

The meal pattern and/or dietary practice questionnaire (food frequency questionnaire) were personally administered to the elderly and caretakers. This was done on Sunday after church service when the elderly met for their weekly meeting at Chapel Square at Jasikan. Similarly, the researcher personally observed selected caretakers of the elderly. For respondents who could not read and write the English language, the researcher read and interpreted the questions to them using "Ewe and Twi" as medium, and their responses were recorded on the questionnaire by the researcher. Each questionnaire was completed within 30 minutes. Completed questionnaires were collected on the same day to be coded for analysis. This was done to ensure high coverage, completion, and return rate.

3.9 Data analysis

Yin (2003) stated that before interpretation takes place, data should be displayed and presented. Responses by the respondents to each set of items in the questionnaire were tallied to get the number of respondents who answered each set of items. The collected questionnaire data were fed into the SPSS version 22 software and this was analysed. Frequency, percentage, mean and standard deviation distributions of responses were generated according to each research question raised, and this was presented in tables and figures or charts. The observation (qualitative) data were used to support the responses in the questionnaire.

3.10 Ethical considerations

The researcher executed all ethical procedures and practices by researchers in conducting research. The researcher avoided plagiarism by ensuring that works of people which were used to buttress analysis of and in the literature review, were be duly acknowledged in-text and listed in the reference section.

In order not to violate the principle of informed consent as recommendation in the social research, letters of introduction were sent to the study participants to seek their permission before the conduct of the study. In these letters the purpose of the study were clearly stated to both the elderly people. Hence, consent of the elderly people were sought to participate in the study.

Again, the elderly people were assured that their identities would be concealed. In achieving this purpose, elderly people were given numbers which written on their questionnaire sheets instead of their names which made it difficult for people to identify their identities. Individual elderly people were assured of voluntary withdrawal from the study.

CHAPTER FOUR

RESULTS

4.1 Overview

This chapter presents the results of the data collected from the respondents. The quantitative data is presented in tables as frequency counts and frequencies, mean and standard deviation. On the other hand, the qualitative data gathered from the sample was analyzed using thematic content analysis method — responses from respondents were categorized into themes. Data have been organised, presented and discussed under the following themes:

i. Socio-demographic information on the elderly in Jasikan.
ii. Types of diet eaten by the elderly in Jasikan.
iii. Factors affecting the choice of diet quality of the elderly in Jasikan.
iv. Nutritional related health challenges of the elderly in in Jasikan.
v. Ways of improving diet quality of the elderly in Jasikan.

4.2 Socio-demographic information on the elderly in Jasikan community

The demographic data of the respondents cover the following attributes: gender, age, marital status, level of education, post-retirement employment status, and source of income.

Table 2: Socio-demographic information on the respondents

(n = 98)

Variable	Variable category	F	%
1. Gender	Male	40	41
	Female	58	59
2. Age (in yrs.)	60-69	56	57
	70-79	32	33
	80-89	8	8
	90 and above	2	2
3. Marital status	Single	0	0
	Married (intact family)	86	88
	Divorced/Separated	10	10
	Widowed	2	2
4. Level of education	Basic education	43	44
	Secondary education	49	50
	Tertiary education	5	5
	No formal education	1	1

Source: Fieldwork data (2019)

Key: F = Frequency; **%** = Percentage; **n** – sample

The gender distribution of the elderly is skewed towards respondents who were females (n= 58, 59%), and followed by males (n= 40, 41%). Similarly, the age distribution of the elderly is skewed towards respondents who were 60-69 years (n= 56, 57%), and followed by those who were 70-79 years (n= 32, 33%). The elderly who were between 80 and 89 years (n= 8, 8%) and 90 years and above (n= 2, 2%) constituted the least number.

As indicated in Table 2, majority of the elderly were married and intact families (n= 86, 88%). A few were divorced or separated (n= 10, 10%) and widowed (n= 2, 2%). The distribution of the respondents by their educational level revealed that elders who had basic education (n=43, 44%) and secondary education (n=49, 50%) were more than their counterparts who had tertiary education (n=5, 5%), and no formal education (n= 1, 1%).

4.3. Types of diet eaten by the elderly in Jasikan

The data presented and discussed, on the above comes under research questions 1, which states *"What types of food are eaten by the elderly in Jasikan community?"* To find answer to this research question, responses to items (questions) 5 - 12 in the questionnaire were analysed.

Table 3: Types of breakfast meals consumed by the elderly in Jasikan

(n=98)

Breakfast meal	**H**	**M**	**L**	**M**	**SD.**
Lipton tea and bread	12(12)	23(24)	63(64)	2.52	.706
Milo and bread	21(21)	17(17)	60(61)	2.39	.821
Coffee and bread	0(0)	18(18)	80(82)	2.81	.389
Hausa *koko* with *koose*	13(13)	24(24)	61(62)	2.48	.721
Hausa *koko* and *masa*	11(11)	20(20)	67(68)	2.57	.688
Hausa *koko* with bread	9(9)	13(13)	76(78)	2.68	.635
Oatmeal with bread	15(15)	23(23)	60(61)	2.45	.748
Corn dough (white) porridge with bread rolls	35(36)	40(41)	23(23)	1.87	.763
Rice porridge with bread rolls	22(22)	38(39)	38(39)	2.16	.769
Tom brown (roasted corn) porridge with bread rolls	36(37)	42(43)	20(20)	1.83	.741
Ekuegbemli with roasted groundnut	20(20)	37(38)	41(42)	2.21	.763
Korkli with roasted groundnut	20(20)	37(38)	41(42)	2.21	.763
Waakye and fish/boiled egg	35(36)	30(31)	33(34)	1.97	.837
Overall mean				**2.32**	**.633**

Key: F = Frequency; **%** = Percentage; **n** – sample; **H**. = High; **M** = Moderate; **L** = Low; **SD**. = Standard Deviation; **M** = Mean

In line with the average or cut-off mean (M) value of M ≥ 1.32, the results in Table 3 indicated that the breakfast meals which are mostly consumed by the elderly people in Jasikan community include coffee and bread, Hausa *koko* with bread (X = 2.68, SD = 0.635), Hausa *koko* and *masa* (X = 2.57, SD = 0.688), Lipton tea and bread (X = 2.52, SD = 0.706). These were followed by Hausa *koko* with *koose* (X = 2.48, SD = 0.721), Oatmeal with bread (X = 2.45, SD = 0.748), Milo and bread (X = 2.39, SD = 0.821).

Corn dough (white) porridge with bread rolls, rice porridge with bread rolls, *tom* brown (roasted corn) porridge with bread rolls, *ekuegbemli* with roasted groundnut, *korkli* with roasted groundnut, *waakye* and fish/boiled egg were less consumed (M ≤ 2.32) by the elderly people of Jasikan. It unfolds from this study that the breakfast meals which are mostly consumed by the elderly people in Jasikan community include coffee and bread; Hausa *koko* with bread; Hausa *koko* and *masa; and* lipton tea and bread.

Table 4: Types of snack meals consumed by the elderly in Jasikan

(n=98)

Snack meal	H	M	L	M	SD.
Roasted plantain with groundnut	10(10)	25(26)	63(64)	2.54	.676
Roasted maize with groundnut/coconut	31(32)	27(28)	40(41)	2.82	.610
Boiled maize with groundnut/coconut	11(11)	20(20)	67(68)	2.57	.688
Banana with groundnut	16(16)	25(26)	57(58)	2.58	.758
Meat pie, dough nut, bread with soft drink	8(8)	12(12)	78(80)	2.71	.609
Meat pie, dough nut, bread with milo drink	5(5)	11(11)	82(84)	2.78	.522
Meat pie, dough nut, bread with yoghurt, fan ice, fan choco	6(6)	22(22)	70(71)	2.65	.593
Fresh fruits	7(7)	20(20)	71(72)	2.09	.850
Fresh vegetables	3(3)	11(11)	84(86)	2.41	.584
Overall mean				**2.57**	**.584**

Key: F = Frequency; **%** = Percentage; **n** – sample; **H**. = High; **M** = Moderate; **L** = Low; **SD**. = Standard Deviation; **M** = Mean

With a cut-off mean (M) value of M ≥ 2.57 and a standard deviation (SD) of .584, the snack meals which are mostly consumed by the elderly people in Jasikan are: boiled maize with groundnut/coconut (X = 2.82, SD = 0.610), meat pie, dough nut, bread with milo drink (X = 2.78, SD = 0.522), meat pie, dough nut, bread with soft drink (X = 2.71, SD = 0.609). These are followed by meat pie, dough nut, bread with yoghurt, fan ice, fan choco (X = 2.65, SD = 0.593), banana with groundnut (X = 2.58, SD = 0.758), boiled maize with groundnut/coconut (X = 2.57, SD = 0.688), roasted plantain with groundnut (X = 2.54, SD = 0.676).

The result of this study revealed boiled maize with groundnut/coconut; meat pie, dough nut, bread with milo drink; and meat pie, doughnut, bread with soft drink as snack meals which are mostly consumed by the elderly people in Jasikan. On the other hand,

fresh fruits and vegetables are rarely consumed as snack meals ($M \leq 2.57$) by the elderly people of Jasikan.

Table 5: Types of lunch meals consumed by the elderly in Jasikan

(n=98)

Lunch meal	H	M	L	M	SD.
Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup	12(12)	23(24)	63(64)	2.52	.706
Plain rice with fish/egg/meat stew or *shito*	21(21)	17(17)	60(61)	2.39	.821
Plain rice with vegetable, palm, groundnut, light soup	0(0)	18(18)	80(82)	2.81	.389
Plain rice with beans stew	13(13)	24(24)	61(62)	2.48	.721
Waakye with fish/egg/meat stew or *shito*	11(11)	20(20)	67(68)	2.57	.688
Fufu with palm soup, groundnut soup, light soup with snails, bush meat, tilapia	9(9)	13(13)	76(78)	2.68	.635
Banku/akple with okro stew, pepper and fried fish, bush meat, tilapia	15(15)	23(23)	60(61)	2.54	.628
Kenkey with stew, pepper and fried fish, bush meat, tilapia	35(36)	40(41)	23(23)	1.84	.777
Ampesi (boiled yam, cocoyam, plantain) with palava sauce	22(22)	38(39)	38(39)	2.16	.769
Tuo zaafi (TZ) and green leaves soup	36(37)	42(43)	20(20)	1.84	.730
Beans and fried plantain *(red red)*	20(20)	37(38)	41(42)	2.22	.745
Kokonte with palm soup, groundnut soup, and meat/fish	20(20)	37(38)	41(42)	2.22	.745
Overall mean				**2.36**	**.633**

Key: F = Frequency; **%** = Percentage; **n** – sample; **H**. = High; **M** = Moderate; **L** = Low; **SD**. = Standard Deviation; **M** = Mean

The results in Table 5 is about the lunch meals consumed by the elderly people in Jasikan community. With a cut-off mean (M) value of M ≥ 2.36, the most widely consumed lunch meal were: plain rice with vegetable, palm, groundnut, light soup (X = 2.81, SD = 0.389), *fufu* with palm soup, groundnut soup, light soup with snails, bush

meat, tilapia (X = 2.68, SD = 0.635), *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia (X = 2.54, SD = 0.628).

Other lunch meals which are commonly eaten by the elderly include rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup (X = 2.52, SD = 0.706), plain rice with fish/egg/meat stew or *shito* (X = 2.39, SD = 0.821), plain rice with beans stew, *waakye* with fish/egg/meat stew or *shito* (X = 2.48, SD = 0.721).

A number of meals are less eaten during lunch (M ≤ 2.36) by the elderly of Jasikan. They are: *kenkey* with stew, pepper and fried fish, bush meat, tilapia, *ampesi* (boiled yam, cocoyam, plantain) with palava sauce, *tuo zaafi (TZ)* and green leaves soup, beans and fried plantain *(red red), kokonte* with palm soup, groundnut soup, and meat/fish.

It could be concluded from the results that plain rice with vegetable, palm, groundnut, light soup; *fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia; *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia are widely consumed by the elderly people of consumed.

Table 6: Types of supper meals consumed by the elderly in Jasikan

(n=98)

Supper meal	H	M	L	M	SD.
Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup	21(22)	18(18)	59(60)	2.52	.706
Plain rice with fish/egg/meat stew or *shito*	38(39)	19(19)	41(42)	2.39	.821
Plain rice with vegetable, palm, groundnut, light soup	32(33)	18(18)	48(49)	2.81	.389
Plain rice with beans stew	10(10)	21(22)	67(68)	2.48	.721
Waakye with fish/egg/meat stew or *shito*	8(8)	19(19)	71(73)	2.57	.688
Fufu with palm soup, groundnut soup, light soup with snails, bush meat, tilapia	13(13)	19(19)	66(67)	2.68	.635
Banku/akple with okro stew, pepper and fried fish, bush meat, tilapia	60(61)	38(39)	0(0)	2.54	.628
Kenkey with stew, pepper and fried fish, bush meat, tilapia	38(39)	43(44)	17(17)	1.84	.777
Ampesi (boiled yam, cocoyam, plantain) with palava sau	38(39)	38(39)	22(22)	2.16	.769
Tuo zaafi (TZ) and green leaves soup	6(6)	12(12)	80(82)	1.84	.730
Kokonte with palm soup, groundnut soup, and meat/fish	41(42)	57(58)	0(0)	2.22	.745
Overall mean				**2.36**	**.633**

Key: F = Frequency; **%** = Percentage; **n** – sample; **H**. = High; **M** = Moderate; **L** = Low; **SD**. = Standard Deviation; **M** = Mean

The results in Table 6 is about the supper meals consumed by the elderly people in Jasikan community. With a cut-off mean (M) value of M ≥ 2.36, the most widely consumed lunch meal were: plain rice with vegetable, palm, groundnut, light soup (X = 2.81, SD = 0.389), *fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia (X = 2.68, SD = 0.635), *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia (X = 2.54, SD = 0.628). Other lunch meals which are commonly eaten by the elderly include rice balls (*omo tuo*) with vegetable, palm, groundnut, light

soup (X = 2.52, SD = 0.706), plain rice with fish/egg/meat stew or *shito* (X = 2.39, SD = 0.821), plain rice with beans stew, *waakye* with fish/egg/meat stew or *shito* (X = 2.48, SD = 0.721).

The following meals were less eaten during lunch (M ≤ 2.36) by the elderly of Jasikan. They are: *kenkey* with stew, pepper and fried fish, bush meat, tilapia, *ampesi* (boiled yam, cocoyam, plantain) with palava sauce, *tuo zaafi (TZ)* and green leaves soup, beans and fried plantain *(red red), kokonte* with palm soup, groundnut soup, and meat/fish.

The results revealed that plain rice with vegetable, palm, groundnut, light soup; *fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia; *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia are widely consumed by the elderly people.

4.3 Quality of the diet eaten by the elderly in Jasikan

The data are presented and discussed on the theme based on the diet quality in terms quantity (portion size) and quality (nutrient composition) eaten by the elderly in the community.

Table 7: Quality and quantity of breakfast served to the elderly and eaten by them

(n=98)

Description	**Response**				**M**	**SD**
	Yes		**No**			
	Frequency	**%**	**Frequency**	**%**		
Quality	36	37	62	63	1.47	.502
Quantity	51	52	47	48	1.63	.484
Overall mean					**1.55**	**.459**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 7 is about the quality of the diet eaten by the elderly in Jasikan community. Out of the eighty-seven respondents sampled for the study, sixty-three (63%) of the respondents indicated that the food was of no quality. In terms of quantity, fifty-two percent (52%) revealed food was served in good quantity.

With a cut-off mean (M) value of M ≥ 1.55, it could be deduced from the findings of this study that breakfast meals eaten by the elderly of Jasikan was large in quantity or portion size (X = 1.63, SD = 0.484) but poor in quality.

Table 8: Whether breakfast meals served to the elderly and eaten by them contains the required food nutrients

(n=98)

Nutritional content	Yes		No		M	SD
	Frequency	%	Frequency	%		
Carbohydrate	73	74	25	26	1.64	.481
Protein	38	39	60	61	1.41	.495
Fats & oils	57	58	41	42	1.62	.487
Vitamins	35	36	63	64	1.23	.425
Minerals	37	38	61	62	1.25	.438
Water	76	78	22	22	1.61	.489
Overall mean					1.46	.397

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 4.8 seeks to find whether breakfast meals served to the elderly and eaten by them contains the required food nutrients. In Table 8, majority of the respondents indicated their breakfast meals contain carbohydrate (n = 74%, X = 1.64, SD = 0.481), followed by water (n = 78%, X = 1.62, SD = 0.487) and fats and oil (n= 58%, X = 1.61, SD = 0.489). It could be concluded from the result in Table 8 that the breakfast meals eaten by the elderly in Jasikan were poor or low in proteins, vitamins and minerals.

Table 9: Quality and quantity of snack served to the elderly and eaten by them

(n=98)

Description	Response					
	Frequency	%	Frequency	%	M	SD
Quality	28	29	70	71	1.36	.484
Quantity	62	63	36	37	1.71	.454
Overall mean					**1.54**	**.404**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 9 is about the quality of the snack served to the elderly in Jasikan community. Out of the eighty-seven respondents sampled for the study, only twenty-nine (29%) of the respondents indicated that the food was of quality. In terms of quantity, sixty- three percent (63%) revealed food was served in good quantity (X = 1.71, SD = 0.454). This implies that they consumed a large portion size of snack meals that were poor in quality.

Table 10: Whether snack meals served to the elderly and eaten by them contains the required food nutrients

(n=98)

Nutritional content	Yes		No		M	SD
	Frequency	%	Frequency	%		
Carbohydrate	75	77	23	23	1.75	.432
Protein	24	24	74	76	1.34	.478
Fats & oils	70	71	28	29	1.74	.438
Vitamins	25	26	73	74	1.23	.425
Minerals	50	51	48	49	1.28	.454
Water	64	65	34	35	1.48	.502
Overall mean					**1.47**	**.454**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 10 seeks to find whether snack meals served to the elderly and eaten by them contains the required food nutrients. Majority of the respondents revealed that their snack meals contain more carbohydrate (n = 77%, X = 1.75, SD = 0.432) followed by fats and oil (n = 71%, X = 1.74, SD = 0.438) and water (n = 65%, X = 1.48, SD = 0.502). It is clear from the results that the snack meals eaten by the elderly in Jasikan were poor or low in proteins, vitamins and minerals.

Table 11: Quality and quantity of lunch served to the elderly and eaten by them

(n=98)

Description	**Response**				**M**	**SD**
	Yes		**No**			
	Frequency	**%**	**Frequency**	**%**		
Quality	44	45	54	55	1.42	.497
Quantity	56	57	42	43	1.55	.499
Overall mean					**1.48**	**.470**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 11 is about the quality of the lunch served to the elderly in Jasikan community. Out of the eighty-seven respondents sampled for the study, forty-five (45%) of the respondents indicated that the food was of quality. In terms of quantity, sixty- three percent (57%) revealed food was served in good quantity (X = 1.55, SD = 0.499). This result is an indication that the elderly people of Jasikan normally consumed lunch meals which were low or poor in quality.

Table 12: Whether lunch meals served to the elderly and eaten by them contains the required food nutrients

(n=98)

Nutritional content	Yes		No		M	SD
	Frequency	%	Frequency	%		
Carbohydrate	72	73	26	27	1.69	.463
Protein	33	34	65	66	1.50	.502
Fats & oils	68	69	30	31	1.66	.475
Vitamins	30	31	68	69	1.26	.443
Minerals	49	50	49	50	1.30	.463
Water	57	58	41	42	1.41	.495
Overall mean					**1.47**	**.399**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 12 seeks to find whether lunch meals served to the elderly and eaten by them contains the required food nutrients. In Table 4.8, majority of the respondents indicated that their lunch meals contain carbohydrate (n = 73%, X = 1.69, SD = 0.463) followed by fats and oil (n = 69%, X = 1.66, SD = 0.475) and protein (n = 58%, X = 1.50, SD = 0.502). It is clear from the results that the snack meals eaten by the elderly in Jasikan were poor or low in vitamins and minerals.

Table 13: Quality and quantity of supper served to the elderly and eaten by them

(n=98)

Description	**Response**				**M**	**SD**
	Yes		**No**			
	Frequency	**%**	**Frequency**	**%**		
Quality	40	41	58	59	1.44	.499
Quantity	54	55	44	45	1.59	.491
Overall mean					**1.52**	**.464**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 13 is about the quality of the lunch served to the elderly in Jasikan community. Out of the eighty-seven respondents sampled for the study, forty- one (41%) of the respondents indicated that the food was of quality. In terms of quantity, fifty-five percent (55%) revealed food was served in good quantity (X = 1.59, SD = 0.491). This result signifies that the elderly people of Jasikan normally consumed poor quality lunch meals.

Table 14: Whether supper meals served to the elderly and eaten by them contains the required food nutrients

(n=98)

Nutritional content	Yes		No		M	SD
	Frequency	%	Frequency	%		
Carbohydrate	70	71	28	29	1.68	.467
Protein	31	32	67	68	1.54	.500
Fats & oils	65	66	33	34	1.68	.467
Vitamins	31	32	67	68	1.28	.454
Minerals	45	46	53	54	1.33	.475
Water	56	57	42	43	1.41	.495
Overall mean					**1.49**	**.476**

Key: F = Frequency; **%** = Percentage; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

Table 14 seeks to find whether supper meals served to the elderly and eaten by them contain the required food nutrients. Evidence gathered from the results show that majority of the respondents indicated that their supper meals contained carbohydrate (n = 71%, X = 1.68, SD = 0.467) followed by fats and oil (n = 66%, X = 1.68, SD = 0.467) and protein (n = 32%, X = 1.54, SD = 0.500). Obviously, the results revealed that the elderly in Jasikan consumed supper meals which were poor or low in vitamins and minerals.

4.4 Factors affecting the diet quality of the elderly in Jasikan

This theme emanates from research question two which states *"What factors affect the diet quality of the elderly in the community?"* Responses to question 13 provided data for this theme.

Table 15: Factors affecting the diet quality of the elderly in Jasikan community

(n=98)

Factors	H	M	L	M	SD.
Low income level	65(66)	30(31)	3(3)	1.94	.632
Weak social support system	60(61)	28(29)	10(10)	1.60	.742
Living alone/loneliness	52(53)	33(34)	13(13)	1.60	.742
Poor dental status	54(55)	29(30)	15(15)	1.48	.677
Poor health status	54(55)	29(30)	15(15)	1.36	.544
Food insecurity	22(22)	59(61)	17(17)	1.94	.634
Food unavailability	22(22)	59(61)	17(17)	1.60	.714
Overall mean				**1.65**	**.669**

Key: n – sample; **H**. = High; **M** = Moderate; **L** = Low; **SD**. = Standard Deviation; **M** = Mean

Table 15 indicates factors affecting the diet quality of the elderly in Jasikan community. With a cut-off mean (M) value of M ≥ 1.65 and a standard deviation (SD) of 0.0669, it could be deduced from the findings of this study that food insecurity (X=1.94, SD=.634) and low income levels (X=1.94, SD=.632) are the major factors affecting the diet quality of the elderly people in Jasikan community. Weak social support system, living alone/loneliness, poor health and dental status are not significant factors that affect diet quality of the elderly (M ≤ 1.35).

4.5 Nutritional related challenges of the elderly in Jasikan

This theme emanates from research question three which states –*What are the nutritional related health challenges of elderly in the community?"* Responses to question 13 provided data for this theme.

Table 16: Nutritional diseases, disorders or conditions among the elderly in Jasikan

(n=98)

Item	A	D	M	SD.
Type 2 diabetes	28(29)	70(71)	1.92	.258
Hypertension	20(20)	78(80)	1.94	.221
Stroke (mild)	7(7)	91(93)	1.32	.471
High cholesterol	5(5)	93(95)	1.70	.458
Constipation	66(67)	32(33)	1.79	.405
Pile	29(30)	69(70)	1.71	.454
Overall mean			**1.73**	**.295**

Key: A= Agree; **D** = Disagree; **n** – sample; **SD**. = Standard Deviation; **M** = Mean

The data (responses) were collapsed into two categories: agree and disagree. In line with the mean ranges above, the following cut-off mean (M) values were used as guideline for the interpretation of the levels of respondents' opinions: $M \leq 1.72$ — Low; $M \geq 1.73$ — High. This was done in order to facilitate the interpretation of the results.

The data in Table 16 shows the prevalence of nutritional diseases, disorders or conditions among the elderly in Jasikan. The most prevalent nutritional disorder among the elderly in Jasikan community was hypertension (X = 1.94, SD = 0.221). This was closely followed by type 2 diabetes (X = 1.92, SD = 0.258) and constipation (X = 1.79, SD = 0.405). The mean ratings for pile, high cholesterol and stroke were below the mean cut-off point. Hence, they were not common among the elderly ($M \geq 1.73$).

4.6 Measures to improve the diet quality of the elderly in Jasikan community

This theme on research question four: *"How can the diet quality of the elderly be improved in the community?"* Responses to question 15 provided data for this theme.

Table 17: Measures to improve the diet quality of the elderly in Jasikan

(n=98)

Item	A	U	D	M	SD.
Dietary/nutrition counselling	22(22)	30(0)	46(4)	1.00	.000
Vitamin and mineral supplementation	98(100)	0(0)	0(25)	2.24	.800
Increased fish intake	62(51)	8(4)	28(45)	1.31	.467
Increased fresh fruit intake	86(58)	12(15)	0(27)	1.65	.897
Increased fresh vegetable intake	67(58)	31(15)	0(27)	1.56	.788
Increased water intake	90(75)	0(0)	8(25)	1.27	.449
Moderate exercise	71(85)	28(0)	0(15)	1.12	.329
Reduced/no salt in diet	74(87)	0(0)	24(13)	1.19	.304
Avoidance of very high fat diets	88(87)	10(0)	0(13)	1.16	.550
Overall mean				**1.29**	**.453**

Key: M- Mean; **SD.** - Standard Deviation; **A –** Agree**; U –** Uncertain; **D –** Disagree

Note: The figures in parentheses are in percentage

Table 17 is about measures to improve the diet quality of the elderly in Jasikan. Majority of the respondents agreed to vitamin and mineral supplementation (X=2.24, SD=.800), increased fresh fruit intake (X=1.65, SD= 0.897), increased fresh vegetable intake (X=1.56, SD= 0.788), and increased fish intake (X=1.31, SD= 0.467).

Dietary/nutrition counselling, increased water intake, moderate exercise, reduced/no salt in diet and avoidance of very high fat diets are not recommended significant measures to improve the diet quality of the elderly ($M \leq 1.29$).

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Overview

The study investigated the diet quality of the elderly in Jasikan District. This chapter is devoted to the discussion of the findings of the study. It covers the following thematic areas: demographic data of the respondents, the types of food/meals eaten by the elderly, the quality of the diet eaten by the elderly, and ways for improving the nutrient quality of the diet for the elderly.

5.2 Demographic data of the respondents

The demographic attributes of the respondents included the following: gender, age, marital status, educational status and prevalent nutritional disorder. It emerged from the findings of this study that there were more elderly female respondents (59%), and most of the elderly people aged 60-69 years.. The finding that elderly female population outnumbered their male counterparts in Jasikan community validates the views of Mutharayappa and Bhatt (2008) who opined that the proportion of ageing female is relatively higher than males in both rural and urban areas. The disproportion in numbers between elderly females and males in Jasikan could be as a result of the assumption that females live longer than males as noted by Brown *et al.* (2008).

It also unfolds from this study that majority of the respondents were married and intact families (78%). Marital status of being married and an intact family is thought to have a justifying influence on healthy aging, especially in older men. Reasons attributable to this trend may involve decreased social isolation, spousal aid in procuring foods, cooking, and serving meals; or increased care giving in general (Schone & Weinick,

1998). It could also be deduced from the findings of this study that married elderly people who live as intact families are likely to experience food security. This is because being in an intact family could moderate the quality and quantity of social supports, or caregiving elderly persons receive with regard to the provision of meals by spouse or relations. In the opinion of Payette and Shatenstein (2005), management of an elder's diet may be more difficult if there are no other family members present.

More so, mealtime can provide a source of social interaction which improves food intake and quality of life because of the enjoyment factor associated with eating with others. Societal norms involve women cooking and preparing food for their families, while men are expected to consume the food that is prepared for them. These traditional gender roles influence cultural norms and eating behaviors at mealtimes (Vesnaver & Keller, 2011). Men who live alone tend to have a tougher time preparing meals, while women are less likely to cook and prepare food for themselves (Deirlein *et al.,* 2014). This is also an indication that living arrangements can also have an impact on nutritional status. The conjecture is that elderly people who live with a spouse are likely to consume a higher quality diet compared to elderly persons who live alone. This gives a good indication that the social support system has a positive effect on food security. This observation buttresses the views of Larrieu *et al.* (2004) who stated that unmarried or widowed men living alone are food insecure which may affect their nutritional status.

Conversely, Larrieu *et al.* (2004) pointed out that unmarried or widowed men living alone are more likely to have poorer intakes which affect their nutritional status. In the words of Lee and Frongillo (2001), living alone as unmarried person and/or without a

caretaker is a precursor to food insecurity and a poor nutritional status among the elderly.

The majority (94%) of the respondents had low level of education (basic and secondary). It is likely that they are food insecure because they might not possess the right knowledge of food preparation and appropriate diets to eat. In the opinion of Ross and Mirowsky (1999), educated people are more food secure and are well informed on nutrition. On the other hand, the less educated had increased risks for nutritional deficiency as well as poorer overall health (Ross & Mirowsky, 1999).

5.3 Types of diet eaten by the elderly in Jasikan community

The first research question sought to gather data on the types of breakfast, snack, lunch and supper meals regularly consumed by the elderly people in Jasikan. The findings of this study identified coffee and bread, Hausa *koko* with bread, Hausa *koko* and *masa* lipton tea and bread (breakfast meals), boiled maize with groundnut and coconut (snack meals) as mostly consumed by the elderly people. It is probable that the elderly preferred consuming these breakfast meals because it was convenient and affordable to purchase and eat them. The convenience and affordability of these breakfast meals might probably account for the low consumption of typical Ewe breakfast meals such as corn dough (white) porridge and *korkli* with roasted groundnut by the elderly people of Jasikan. This study revealed that boiled maize with groundnut and coconut is the most consumed snack meal by the elderly people in Jasikan. This finding is a justification that boiled maize with groundnut and coconut is a favorite snack meal among the Ewes. Evidence gathered from this study revealed plain rice with vegetable, palm, groundnut, light soup; *fufu* with palm soup, groundnut soup, light soup and snails, bush meat,

tilapia; *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia as meals often eaten for lunch and supper by elderly people in Jasikan.

The findings revealed that the elderly people consumed large portion size (quantity) of these meals with high carbohydrate, protein as well as fats and oil content. This means that they consumed more macronutrients and less of micronutrients even though older adults need a fewer amount of macro nutrients and a higher amounts micro nutrients. Micronutrients have been associated with healthy aging because antioxidants in them help maintain normal cellular function by preventing oxidative stress (Sharlin, 2010). This observation is also parallel to the views of Campbell, *et al* (2008) who stated that older adults need fewer calories due to reduced metabolic rate and lean body mass, but their requirements for protein must be slightly higher than in younger adults. In the opinion of Sharlin (2010), It is vital for older people to maintain sufficient protein intake to help prevent loss of muscle mass, pressure sores and maintain immune-competence. Since protein intake is directly related to calcium intake, poor bone health is also a consequence of inadequate protein intake (Devine *et al.,* 2005).

5.3.1 Quality of the diet eaten by the elderly in Jasikan community

This theme was intended to find out respondents‘ opinions on diet or meal (breakfast, snack, lunch and supper) quality with regard portion size or quantity, quality in terms of nutrient quality, food variety and diversity, dietary pattern and meal time. It emerged from this study that breakfast, snack, lunch and supper meals eaten by the elderly in Jasikan were relatively large in quantity or portion size. However, diet quality was poor in terms of nutrient content. For instance, the study found that breakfast and snack meals consumed by them were poor or low in proteins, vitamins and minerals.

Similarly, lunch and supper meals consumed by the elderly were poor in nutrient quality as regards low vitamin and mineral. Generally, the result signifies that the elderly people of Jasikan normally consumed poor quality diet. It unfolds from the study that the elderly people consumed large portion size (quantity) of these meals with high carbohydrate, protein as well as fats and oil content. This means that they consumed more macro nutrients and less of micro nutrients even though older adults need a fewer amount of macro nutrients and a higher amounts micro nutrients. Micronutrients have been associated with healthy aging because antioxidants in them help maintain normal cellular function by preventing oxidative stress (Sharlin, 2010). This observation is also parallel to the views of Campbell, Johnson, McCabe, and Carnell (2008) who stated that older adults need fewer calories due to reduced metabolic rate and lean body mass, but their requirements for protein must be slightly higher than in younger adults. In the opinion of Sharlin (2010), It is vital for older people to maintain sufficient protein intake to help prevent loss of muscle mass, pressure sores and maintain immune-competence. Since protein intake is directly related to calcium intake, poor bone health is also a consequence of inadequate protein intake (Devine et al., 2005).

5.4 Factors affecting the diet quality of the elderly in Jasikan community

The findings of this study indicate that food insecurity and low income levels are the major factors affecting the diet quality of the elderly people in Jasikan community. This result implies that low income is a co-factor for food insecurity. It becomes clear from the findings of this study that socio-economic factors such as low income and food insecurity can influence diet and nutritional intake of the elderly. This observation is consistent with that of Wilson (2009) who posited that adverse socio-economic factors

make it difficult for older people to access, prepare and eat a healthy diet. This result is also consistent with the claims by Wilson (2009) and Chernoff (2001) who indicated that low income in older age can result in older people having less money to spend on food. This observation further affirms the views of Krondl *et al.* (2008) and Eeuwijk (2003) who identified that the elderly are particularly vulnerable to food insecurity due to their reduced or low income. Other studies by Adler and Rehkopf (2008), and Bahr (2007) identified socioeconomic factors, particularly low income as key contributors to diet-related health problems of the elderly. In the opinions several scholars (Ledikwe, Blanck & Khan, 2006; Huot, Paradis & Ledoux, 2004; Adler *et al.,* 2002), higher incomes can provide better nutrition while low income may well be one of the main causes of inadequate and poor diets among the elderly. This observation also substantiates the views of Garcia and Grande (2010) that because the income of the majority of the elderly is a pension which in many cases is not sufficient for subsistence, their food intake decreases resulting in the decline of their nutritional needs.

The finding of this study about the link between low income and food insecurity corroborates the findings of Alaimo *et al.* (1998) and Nord *et al.* (1999) who claimed that food insecurity has been cited as sociodemographic and economic conditions that limit the household resources available for food acquisition.

Result gathered from this study indicate that some of the elderly people were unmarried, widowed, divorced or separated making them to live alone. Living alone has been linked to food insecurity. Those who are food insecure are prone to street food consumption. Heuberger (2009) and Waite (2004) put the situation into perspective by stating that the situation faced by the older men and women on the dimension of

companionship is substantially better than that faced by older women, because most men remain married until they die, while most women experience the death of their husbands and end their lives as widows.

5.5 Nutritional relate d health challenges of the elderly in Jasikan

Hypertension, type 2 diabetes and constipation were the most prevalent nutritional disorders among the elderly in Jasikan community. This observation gives credence to the findings of Moses (2012) and Roth (2012) who indicated that the aged are faced with numerous health related problems such as cardiovascular diseases and many more, including a chronic illnesses. Other studies by Minicuci *et al.* (2014), FIFARS (2012), Mutharayappa and Bhatt (2008), Ahn and Kim (2004) identified the prevalence of diet related health conditions such as hypertension and type 2 diabetes among the elderly. Also the finding that constipation is prevalent among the elderly in Jasikan could be as a result of the entero-muscular changes that occur with ageing, older people are especially prone to constipation (Sharlin, 2010; Marlett, McBurney, & Slavin, 2002).

5.6 Measures to improve the diet quality of the elderly in Jasikan community

The findings reveal that more than 50% of the respondents cited a plethora of dietary and lifestyle modifications strategies for improving their diet quality of the elderly. The measures include vitamin and mineral supplementation, increased fresh fruit intake, increased fresh vegetable intake, and increased fish intake. These findings are in line with the views of Reedy and Krebs-Smith (2008) who recommended the increased intake of fresh fruits and vegetables, and restriction of added sugar, salt and saturated fat to meals in order to control cardiovascular diseases. Other studies by John, *et al* (2002) have both shown that a diet rich in fresh fruit, vegetables and low-fat dairy

products and low in saturated fats can substantially lower both systolic and diastolic blood pressure. The recommendation that eating a lot of fresh fruits and vegetables is a way of improving on the diet and health of the elderly is in line with the World Health Organisation's (2003) report on the Joint FAO/WHO expert consultation on diet, nutrition and the prevention of chronic diseases, which recommends the intake of a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries.

The respondents also recommended nutrient supplement intake by the elderly. This recommendation is in line with other studies which have shown that micronutrient supplementation is desirable among the elderly because micronutrient status changes with age (Heuberger, 2009; Bueche, 2009; Brown *et al.,* 2008; Schwarzpaul *et al.,* 2006; Ahluwalia & Ahluwalia, 2005), hence the need for supplementation of macronutrients such as supplemented magnesium, calcium, iron, folate, Vitamins A, B, C and E, calcium. In their opinion, the elderly are likely not to consume enough nutrient dense foods to meet their requirements for beneficial nutrients like vitamin D, vitamin B12 and calcium (Wardlaw *et al.,* 2004), hence, the need for supplement intake.

CHAPTER SIX

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

6.1. Overview

This study investigated the diet quality of the elderly in Jasikan community. To arrive at this objective, ninety-eight (98) elderly respondents were sampled via the multi-stage sampling technique for the study. The study employed the cross-sectional design for the study. Questionnaire with Cronbach alpha 0.775 and observation checklist were used as research instruments to collect data. The quantitative data was analysed using Statistical Package for Social Sciences (SPSS) version 22 software. This chapter highlights the summary of the study, conclusions and recommendations drawn from the study. Suggestions for further studies are also put forward.

6.2. Summary of key findings

Among the findings of this study were the following:

The first research question sought to gather data on the types of breakfast, snack, lunch and supper meals regularly consumed by the elderly people in Jasikan. The findings revealed the consumption of coffee and bread, Hausa *koko* with bread, Hausa *koko* and *masa* lipton tea and bread (breakfast meals), boiled maize with groundnut and coconut (snack meals) by the elderly. Plain rice with vegetable, palm, groundnut, light soup; *fufu* with palm soup, groundnut soup, light soup and snails, bush meat, tilapia; *banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia were often eaten for lunch and supper by the elderly.

The first research question further looked at the diet quality with regard to portion size or quantity, quality in terms of nutrient content, dietary pattern and meal time. It emerged from this study that breakfast, snack, lunch and supper meals eaten by the elderly in Jasikan were relatively large in quantity or portion size but poor in protein, vitamin and mineral contents.

The second research question sought to find out the factors affecting diet quality of the elderly. The findings of this study reveal that food insecurity and low income levels are the major factors affecting the diet quality of the elderly people in Jasikan community.

The third research question sought to identify prevalent nutritional related health challenges of the elderly Jasikan. The findings of this study revealed the prevalence of hypertension, type 2 diabetes and constipation as self-reported and clinical diagnosed nutritional disorders among the elderly in Jasikan.

The last objective of this study sought to find out ways to improve the diet related health problems of the elderly. The study identified dietary and lifestyle modifications strategies for improving their diet and health. The measures include increased fish intake by the elderly, vitamin and mineral supplementation, increased fresh fruit and vegetable intake.

6.3. Conclusions

All indications from this study show that many elderly people in Jasikan often consumed poor quality diets which are low in protein and micronutrients. This situation has been linked to food insecurity as a result of low income level among the elderly.

This finding justifies the need to address the problem of food insecurity among the elderly in Jasikan, and other communities in societies across the world. The low consumption of protein and micronutrients by the elderly people is a justification that they should be served with high quality protein- and micronutrient-dense foods.

6.4. Recommendations

In the light of the findings of this study, the following recommendations are put forward:

i. This study found that the elderly in Jasikan often consumed breakfast meals such as coffee and bread, lipton tea and bread, Hausa *koko* with bread and *masa;* they did not even eat the typical Ewe breakfast meals which is the corn dough or white porridge (*korkli)* with roasted groundnut. These breakfast meals were eaten by the elderly because of convenience and ease to purchase (affordability) and eat them. In this regard, producers and sellers of these breakfast meals should fortify and enrich them by making them dense in protein and micronutrients.

ii. It emerged from this study that low income and food insecurity affect diet quality of the elderly in Jasikan. These factors contribute to low protein and micronutrient content of their meals. Therefore, elderly people should improve the nutrient content of their foods by feeding on the right amount of macronutrients (carbohydrate, protein, fats and oils) and micronutrients (vitamins, minerals and water). They can have beans and legumes which are cheaper protein foods.

iii. Similarly, elderly people should increase the intake of fish, fresh fruits and vegetables, and water in their diet as well as vitamin and mineral supplementation.

iv. The findings of this study indicate that some elderly people in Jasikan suffered nutritional and diet related health problems such as hypertension, type 2 diabetes and constipation. In this regard, health workers such as nurses, doctors, nutritionists in the district should organise outreach programmes where they can screen the elderly with the view to educating them on unhealthy nutritional or dietary lifestyle.

6.5. Suggestion for Further Studies

The study focused on the diet quality of the elderly in Jasikan. It is suggested that a large scale study is conducted on nutrition of the elderly in Volta Region and other regions in Ghana in order to expand coverage of the study to draw valid conclusions. This calls for the replication of the study in a larger geographical area with a larger sample.

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APPENDIX A

QUESTIONNAIRE FOR THE ELDERLY

INVESTIGATING THE NUTRITIONAL QUALITY OF THE DIET OF ELDERLY IN JASIKAN

INTRODUCTION

This questionnaire is designed to assess the diet quality of the elderly in the Jasikan community. The information is being sought for, through this medium is for research purpose only. You are kindly requested to read through the items and respond to them as honest and objective as possible. Every information provided shall be treated as confidential and private. Besides, your anonymity is assured.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Please answer the following questions by placing a tick (√) or filling in the blanks where necessary.

1. What is your gender? Male [ ] Female [ ]

2. What is your age group? 60-69 [ ] 70-79 [ ] 80- 89 [ ] above 90 [ ]

3. What is your marital status? Single [ ] Married [ ] Divorced [ ]Widowed [ ]

4. What is your highest level of education?

Basic level [ ] Secondary level [ ] Higher/Tertiary level [ ] None [ ]

SECTION B: NUTRITIONAL QUALITY OF THE DIET CONSUMED BY THE ELDERLY

Instruction: Please indicate with a tick (√) to rate the type and quality of meal/diet which you always consume/eat daily for breakfast, snack, lunch and supper. Use the Likert-scale below to answer questions 6- 13:

Key: 5 = Very high (**VH**); **4** = High (**H**); **3** = Moderate (**M**); **2** = Low (**L**); **1** = Very low (**VL**)

3. What kinds of breakfast meals do you normally take? (You may choose more than one item).

TYPE OF BREAKFAST MEAL	**VH**	**H**	**M**	**L**	**VL**
a. Tea (lipton) and bread					
b. Milo and bread					
c. Coffee and bread					
d. Hausa *koko* with *koose*					
e. Hausa *koko* and *masa*					
f. Hausa *koko* with bread					
g. Oatmeal with bread					
h. Corn dough (white) porridge with bread rolls					
i. Rice porridge with bread rolls					
j. *Tom* brown (roasted corn) porridge with bread rolls					
k. *Ekuegbemli* with roasted groundnut					
l. Korkli with roasted groundnut					
m. Waakye and fish					
n. Others, specify: ……					

4. What kinds of food nutrients do you suspect to be available in your breakfast meals? (Tick where appropriate. You may tick as many as you can)

a. Carbohydrate Yes [ ] No [ ]

b. Protein Yes [ ] No [ ]

c. Fats Yes [ ] No [ ]

d. Vitamins Yes [ ] No [ ]

e. Minerals Yes [ ] No [ ]

f. Water Yes [ ] No [ ]

5. What kinds of snack meals do you normally take? (You may choose more than one item).

SNACK	VH	H	M	L	VL
o. Roasted plantain with groundnut					
p. Roasted maize with groundnut/coconut					
q. Banana with groundnut					
r. Meat pie, dough nut, bread with soft drink					
s. Meat pie, dough nut, bread with milo drink					
t. Meat pie, dough nut, bread with yoghurt, fan ice, fan choco					
u. Fresh fruits					
v. Fresh vegetables					
w. Others, specify: ……					

6. What kinds of food nutrients do you suspect to be available in your snack meals? (Tick where appropriate. You may tick as many as you can)

a. Carbohydrate Yes [ ] No [ ]

b. Protein Yes [ ] No [ ]

c. Fats Yes [ ] No [ ]

d. Vitamins Yes [ ] No [ ]

e. Minerals Yes [ ] No [ ]

e. Water Yes [ ] No [ ]

7. What kinds of lunch meals do you normally take? (You may choose more than one item).

LUNCH	VH	H	M	L	VL
x. Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup					
y. Plain rice with fish/egg/meat stew or *shito*					
z. Plain rice with vegetable, palm, groundnut, light soup					
aa. Plain rice with beans stew					
bb. Waakye with fish/egg/meat stew or *shito*					
cc. *Fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia					
dd. *Banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia					
ee. *Kenkey* with stew, pepper and fried fish, bush meat, tilapia					
ff. *Ampesi* (boiled yam, cocoyam, plantain) with palava sauce					
gg. *Tuo zaafi (TZ)* and green leaves soup					
hh. Beans and fried plantain *(red red)*					
ii. *Kokonte* with palm soup, groundnut soup, and meat/fish					
jj. Others, specify: ……					

8. What kinds of food nutrients do you suspect to be available in your lunch meals? (Tick where appropriate. You may tick as many as you can)

a. Carbohydrate Yes [ ] No [ ]

b. Protein Yes [ ] No [ ]

c. Fats Yes [ ] No [ ]

d. Vitamins Yes [ ] No [ ]

e. Minerals Yes [ ] No [ ]

e. Water Yes [ ] No [ ]

9. What kinds of supper meals do you normally take? (You may choose more than one item).

SUPPER	VH	H	M	L	VL
kk. Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup					
ll. Plain rice with fish/egg/meat stew or *shito*					
mm. Plain rice with vegetable, palm, groundnut, light soup					
nn. Plain rice with beans stew					
oo. Waakye with fish/egg/meat stew or *shito*					
pp. *Fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia					
qq. *Banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia					
rr. *Kenkey* with stew, pepper and fried fish, bush meat, tilapia					
ss. *Ampesi* (boiled yam, cocoyam, plantain) with palava sauce					
tt. *Tuo-zaafi (TZ)* and green leaves soup					
uu. *Kokonte* with palm soup, groundnut soup, and meat/fish					
vv. Others, specify: ……					

10. What kinds of food nutrients do you suspect to be available in your supper meals?

(Tick where appropriate. You may tick as many as you can)

a. Carbohydrate Yes [ ] No [ ]

b. Protein Yes [ ] No [ ]

c. Fats Yes [ ] No [ ]

d. Vitamins Yes [ ] No [ ]

e. Minerals Yes [ ] No [ ]

e. Water Yes [ ] No [ ]

SECTION C: FACTORS AFFECTING CHOICE OF QUALITY DIET BY THE ELDERLY

13. To what extent do the following factors affect your diet quality and nutrition?

Factor	High extent	Moderate Extent	Low Extent	No Extent
i. Low income level				
ii. Poor/weak social support				
iii. Social isolation				
iv. Living alone/loneliness				
v. Poor health status				
vi. Poor dental status (missing teeth and ill-fitting dentures)				
vii. Food insecurity				
viii. Food unavailability				
ix. Poor nutritional knowledge				
x. Others, specify: ……				

SECTION D: NUTRITIONAL RELATED HEALTH CHALLENGES OF THE ELDERLY

14. Have you ever been told by a doctor/nurse in the past 6 months that you have the following conditions?

Nutritional diseases, disorders or conditions	Strongly Agree	Agree	Disagree	Strongly Disagree
a. Type 2 diabetes				
b. Hypertension				
c. Stroke				
d. High cholesterol				
e. Constipation				
f. Others, specify: ……				

SECTION D: MEASURES TO IMPROVE THE DIET QUALITY OF THE ELDERLY IN THE DISTRICT

Instruction: Please indicate with a tick (√) ways of improving on your diet quality.

15. To what extent do the following factors affect your diet quality and nutrition?

Ways of improving on diet quality	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
i. Dietary/nutrition Counselling					
ii. Vitamin and mineral supplementation					
iii. Increased fish intake					
iv. Increased fresh fruit Intake					
v. Increased fresh vegetable intake					
vi. Increased water intake					
vii. Moderate/no added salt to diet					
viii. Avoidance of very high fat diets					

APPENDIX B

OBERVATION CHECKLIST

Instruction: Tick **(√)** or write the response that best suits your opinion.

SECTION A: BIOGRAPHIC INFORMATION

1. Community/Locality: ……

2. Community Type (rural, sub-urban, urban): ……

3. Sex of respondent? Female [ ] Male [ ]

4. Age of respondent (yrs): 60-69 [ ] 70-79 [ ] 80-89 [ ] 90-99 [ ] 100+ [ ]

5. Nutrition related and health challenges: Hypertension [ ] Type 2 Diabetes [ ]

Stroke [ ] Obesity/overweight [ ] Other [ ], specify: …….

Instruction: Please indicate with a tick (√) to rate the type and quality of meal/diet which you always consume/eat daily for breakfast, snack, lunch and supper. Use the Likert-scale below to answer questions 6- 54:

Key: 4 = Very often (**VO**); **3** = Often (**O**); **2** = Sometimes (**S**); **1** = Rarely (**R**);
0 = Never (**N**)

1. TYPES OF MEALS (BREAKFAST, SNACK, LUNCH, SUPPER) NORMALLY CONSUMED BY THE ELDERLY

TYPE OF BREAKFAST MEAL	VH	H	M	L	VL
a. Tea (lipton) and bread					
b. Milo and bread					
c. Coffee and bread					
d. Hausa *koko* with *koose*					
e. Hausa *koko* and *masa*					
f. Hausa *koko* with bread					
g. Oatmeal with bread					
h. Corn dough (white) porridge with bread rolls					
i. Rice porridge with bread rolls					
j. *Tom* brown (roasted corn) porridge with bread rolls					
k. *Ekuegbemli* with roasted groundnut					
l. Korkli with roasted groundnut					
m. Waakye and fish					
n. Others, specify: ……					

SNACK	VH	H	M	L	VL
o. Roasted plantain with groundnut					
p. Roasted maize with groundnut/coconut					
q. Banana with groundnut					
r. Meat pie, dough nut, bread with soft drink					
s. Meat pie, dough nut, bread with milo drink					
t. Meat pie, dough nut, bread with yoghurt, fan ice, fan choco					
u. Fresh fruits					
v. Fresh vegetables					
w. Others, specify: ……					

LUNCH	VH	H	M	L	VL
x. Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup					
y. Plain rice with fish/egg/meat stew or *shito*					
z. Plain rice with vegetable, palm, groundnut, light soup					
aa. Plain rice with beans stew					
bb. Waakye with fish/egg/meat stew or *shito*					
cc. *Fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia					
dd. *Banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia					
ee. *Kenkey* with stew, pepper and fried fish, bush meat, tilapia					
ff. *Ampesi* (boiled yam, cocoyam, plantain) with palava sauce					
gg. *Tuo zaafi (TZ)* and green leaves soup					
hh. Beans and fried plantain *(red red)*					
ii. *Kokonte* with palm soup, groundnut soup, and meat/fish					
jj. Others, specify: ……					

SUPPER	VH	H	M	L	VL
kk. Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup					
ll. Plain rice with fish/egg/meat stew or *shito*					
mm. Plain rice with vegetable, palm, groundnut, light soup					
nn. Plain rice with beans stew					
oo. Waakye with fish/egg/meat stew or *shito*					
pp. *Fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia					
qq. *Banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia					
rr. *Kenkey* with stew, pepper and fried fish, bush meat, tilapia					
ss. Ampesi (boiled yam, cocoyam, plantain) with palava sauce					
tt. Tuo-zaafi (TZ) and green leaves soup					
uu. Kokonte with palm soup, groundnut soup, and meat/fish					
vv. Others, specify: ……					

2. NUTRIENT QUALITY OF MEALS (BREAKFAST, SNACK, LUNCH, SUPPER) NORMALLY CONSUMED BY THE ELDERLY

SUPPER	VH	H	M	L	VL
a. Rice balls (*omo tuo*) with vegetable, palm, groundnut, light soup					
b. Plain rice with fish/egg/meat stew or *shito*					
c. Plain rice with vegetable, palm, groundnut, light soup					
d. Plain rice with beans stew					
e. Waakye with fish/egg/meat stew or *shito*					
f. *Fufu* with palm soup, groundnut soup, light soup with snails, bush meat, tilapia					
g. *Banku/akple* with okro stew, pepper and fried fish, bush meat, tilapia					
h. *Kenkey* with stew, pepper and fried fish, bush meat, tilapia					
i. *Ampesi* (boiled yam, cocoyam, plantain) with palava sauce					
j. *Tuo-zaafi (TZ)* and green leaves soup					
k. *Kokonte* with palm soup, groundnut soup, and meat/fish					
l. Others, specify: ……					