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NUTRITION & HEALTH STATUS, QUALITY OF LIFE, AND ASSOCIATED FACTORS AMONG NON-INSTITUTIONALIZED OLDER GHANAIANS

BY

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DECLARATION

I, Amatu-Quddus Osman hereby declare that this thesis titled: "*Nutrition & Health Status, Quality of Life and Associated Factors Among Non-Institutionalized Older Ghanaians*" is my own work based on principal data collected. To the best of my knowledge, this work does not contain material published previously by another person, nor material accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

The ageing process with its attendant physiologic changes increase the risk for a host of diseases and disabilities, such as hypertension, diabetes mellitus, oral conditions, arthritis, stroke, angina, and malnutrition. In Ghana, very little data upon which appropriate interventions can be implemented exists on the nutrition and quality of life of older people. The study aimed to assess nutrition, health status and quality of life (QOL) of older Ghanaians. A cross-sectional study was conducted on 400 older adults. Data was collected on QOL of the elderly population using the Older People Quality of Life (OPQOL) questionnaire which has been validated. Patterns of dietary intake were assessed with a food frequency questionnaire. A 3-day repeated 24-hour food recall was done to assess nutrients intake of the participants. Anthropometric data including weight, height, body mass index, body fat, visceral fat, blood pressure was measured and biochemical indices such as fasting blood glucose, lipids profile were determined using standard procedures. Majority of the participants (66.3%) were female. Total calorie, macronutrients and calcium intakes were inadequate compared with RDA. Males had 39.3% deficits while female participants had 29.6% deficit for total calorie intake. Carbohydrate, protein and fat were in deficit for both males (41%, 46.6%, and 35.6%) and females (26.6%, 73%, 27.5%) respectively. Vitamin A and Calcium intake were inadequate by 39.4% and 48.1% for males and 39.2% and 66.1% for females. However, intakes of vitamin A, folic acid and phosphorus were found to be in excess for male and female participants by between 15% to 40%. Prevalence of hyperglycaemia, overweight and obesity were 21.2%, 30.5% and 16.0% respectively. Among the three grades of high SBP and DBP, the number of participants with grade 1 systolic hypertension was higher (30.2%) than those with grade 2 (16%) and 3 (8%). Same was found for grade 1 diastolic hypertension (22.8%), grade 2 (11.2%) and grade 3(8.8%). Dyslipidaemias including high total cholesterol (TC), low high-density lipoprotein cholesterol (HDL-C) and high low-density lipoprotein cholesterol (LDL-C) was at a prevalence of 0.2%, 98.2% and 1.5% respectively. An increasing body mass index among the elderly population was strongly associated with increasing total energy (r=0.73, p=0.00), carbohydrate (r=0.62, p=0.00), protein (r=0.52, p=0.00), and fat (0.50, p=0.00) intakes. Most (79%) participants reported a good QOL. Among the parameters of QOL, 44.0%, 65.8%, 62.5%, 93.5% and 48.0% of the participants were rated to have good health-related QOL, social QOL, independence and control QOL,

home and neighbourhood QOL and financial QOL respectively. However, more than half (59.0%) of the participants reported poor psychological QOL. Quality of life had very weak, significant correlation with phosphorus intake (r= 0.11, p= 0.04). Other nutrients intake measures did not show significant correlation with QOL (p > 0.05). In conclusion, the elderly population had inadequate intakes for total calorie and macronutrients. Intake of calcium and vitamin A was found to be inadequate. The prevalence of non-communicable disease risk factors such as overweight (30.5%) and obesity (16.0%) were high among the elderly population. Among the dyslipidaemia parameters, low levels of high-density lipoprotein cholesterol (98.2%) was observed higher among the elderly population.

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LIST OF ABBREVIATIONS

ADL	=	Activities of Daily Living
ATP III	=	Adult Treatment Panel III
BIA	=	Bio-Electrical Impedance analysis
BMI	=	Body Mass Index
COPD	=	Chronic Obstructive Pulmonary Disease
CVD	=	Cardiovascular Disease
DBP	=	Diastolic Blood Pressure
ELSA	=	English Longitudinal Study of Ageing
FBG	=	Fasting Blood Glucose
HbA1c	=	Glycated Haemoglobin
HDL-C	=	High Density Lipoprotein Cholesterol
HPT	=	Hypertension
HRQOL	=	Health-related Quality of Life
ISH	=	International Society of Hypertension
LDL-C	=	Low Density Lipoprotein Cholesterol
LEAP	=	Livelihood Empowerment Against Poverty
MNA	=	Mini Nutritional Assessment
MNA-SF	=	Mini Nutritional Assessment Short Form
MIPAA	=	Madrid International Plan of Action
MUAC	=	Mid Upper Arm Circumference
NCD	=	Non-communicable Disease
OGTT	=	Oral Glucose Tolerance Test
OPQOL	=	Older People Quality of Life
QOL	=	Quality of Life
RBG	=	Random Blood Glucose
RDA	=	Recommended Daily Allowance
SAGE	=	Study on Global Ageing and Adult Health
SBP	=	Systolic Blood Pressure
SPSS	=	Statistical Package for the Social Sciences
SSNIT	=	Social Security and National Insurance Trust
TC	=	Total Cholesterol
WHO	=	World Health Organization
WHOQOL	=	World Health Organization Quality of Life

CHAPTER ONE

1.0 Introduction

The world's population is ageing with most countries showing an increase in the number of older people in their population. The number of people aged 60 years and over is projected to grow by 56% worldwide, from 901 million to 1.4 billion from 2015 to 2030 and nearly double to about 2.1 billion by 2050 (Biritwum, Mensah, Yawson, Minicuci, & Kowal, 2015). In Ghana, the number of people aged sixty years and above is expected to almost double from 6.0% in 2011 to 11.9% in 2050 (Biritwum et al., 2015). Two thirds of the world's older people reside in developing countries; with their numbers increasing faster than in the developed countries (Pillay & Maharaj, 2013). The absolute and relative growth of elderly persons around the world has been attributed to reductions in fertility, reductions in infant and maternal mortality, improved nutrition, reduction in infectious and parasitic diseases, as well as improvement in health care, education, and income (Mba, 2010).

In 2000, Ghana had a total population of about 18,912,079 with an elderly population of 5.3% forming a total of 1,002,340 people (Ghana Statistical Service, 2000). The 2010 population census by the Ghana Statistical Service shows that out of a total population of 24,658,823 people, about 4.7%, (1,158,965 people) were 65 years old and above. In the Ashanti Region, 204,461 people representing 4.3% of the region's total population of 4,780,380 people were 65years and above; contributing 17.6% to the total elderly population in Ghana (Ghana Statistical Service, 2012). Population ageing brings on several challenges; including security, health, social and economic consequences. Most developing countries are still combating long standing problems related to education, health, poverty and employment. Population ageing has been in the limelight recently because developing countries do not have an all-inclusive formal social

security system nor a well-functioning traditional care system in place for elderly people (Tawiah, 2013).

An increase in the elderly population means an increase in age-related health conditions and disabilities, shortage of gerontologists, inadequate care facilities and increased cost of geriatric care which will in turn place a lot of pressure on governments (Ayernor, 2012).

The ageing process with its attendant physiologic changes increase the risk for a host of diseases and disabilities. Some of the most reported health conditions among the elderly in Ghana include hypertension, oral conditions, arthritis, stroke, angina, and malnutrition. Diabetes mellitus, hypertension and oral health issues were the most reported (Ayernor, 2012). Apart from dealing with diseases and malnutrition, many older people are faced with inadequate healthcare, poor shelter, isolation and inadequate and insecure source of income (Khan & Tahir, 2014). These challenges gravely affect their quality of life (QOL).

The impact of nutrition on health and functional status of the elderly is well-known. In a community based study on older people, health-related quality of life (HRQOL) was considerably reduced in the individuals with impaired nutritional status (Keshavarzi, Ahmadi, & Lankarani, 2015).

A shift towards a nuclear family system among the working Ghanaian population disputes the common thinking that the children and grandchildren of the elderly stay at home to cater for them. This leaves most elderly people unattended, especially those incapacitated. Due to the previously youthful nature of the African population, the elderly was not often included in national policies. However, with the recent population ageing trend and the consequent alterations in the age structure of Africa, more

attention is needed for the situation of the elderly (Grad, 2002). Good physical health is only a component of health, as reflected in the World Health Organization's definition of health which states that "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Grad, 2002).

1.1 Problem Statement

Most African communities celebrate the death of elders for the sole reason that they lived long on earth (Selvam & Collicutt, 2013). This is however fallacious since for most people, the sense of satisfaction that comes with longevity is not just about remaining in existence but actually living a good quality life. The question of whether the growing numbers of older persons are living their later years in good health is only timely and appropriate. Currently, in Sub-Saharan Africa, Ghana has one of the highest percentage of individuals aged 60 years and above and yet, little is known about the situation of older people (Mba, 2010). Resources are not specially apportioned to cater for the needs of the older population.

As the human body gets older, nutritional and health requirements change due to an increased susceptibility to diseases (Aganiba, Owusu, Steiner-Asiedu, & Dittoh, 2015). Diseases in the elderly may exist subtly and exacerbate if no appropriate interventions are adopted. Factors such as ignorance, poverty, self-care deficits, and unavailable support readily come to mind. Although population ageing is viewed as a desirable trend, low income countries are unprepared for the public health challenges it comes with.

1.2 Justification

In recent years, Ghanaian researchers have done a lot of studies with various age groups in the younger category but little has been done in the area of geriatrics. Most of the evidence of trends in the nutrition and health status of older persons is confined to high-income countries (United Nations, 2015). This makes it almost impossible to draw comparisons and accurate conclusions about the situation in Ghana. The need for further research to examine their health, nutrition and QOL in order to enlighten the public about the plight of the elderly in Ghana is essential. This study would also help bridge the knowledge gap and inform decision making with regards to planning, implementation and evaluation of interventions on policies involving the elderly in Ghana. In addition to this, baseline data upon which further research can be done will be obtained from the study. Study findings will also be shared with the scientific community.

1.3 Research Questions

1. What are the dietary patterns, quality and adequacy (nutrients intake) of the elderly?
2. What is the prevalence of Non-Communicable Diseases (obesity, diabetes, hypertension and dyslipidaemia) and other morbidities among the elderly?
3. What are the social/living circumstances (financial freedom, health-related QOL, safety and psychological health) of the elderly?
4. Are there any links between QOL, morbidities and nutritional status among the elderly?

1.4 Main Objective of the Study

To assess nutrition, health status and QOL of older Ghanaians and determine if there is a link between all three parameters.

1.5 Specific Objectives of the Study

1. To assess dietary patterns, quality and adequacy (nutrients intake) of the elderly.
2. To evaluate the prevalence of Non-Communicable Diseases (obesity, diabetes, hypertension and dyslipidaemia) and other morbidities among the elderly.
3. To evaluate the social/living circumstances (financial freedom, health-related QOL, safety and psychological health) of the elderly.
4. To determine the interrelationships between QOL, morbidities and nutritional status among the elderly.

1.6 Scope and Limitation of the Study

Misreporting of information and a greater probability of recall bias is associated with old age and is likely to occur in this study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Ageing is a normal, progressive and irreversible universal phenomenon affecting every individual, family, community and society. It is a process of deterioration in the functional abilities of an individual due to structural changes associated with ageing (Qadri et al., 2013).

The absolute and relative growth of elderly persons around the world has been attributed to reductions in fertility, reductions in infant and maternal mortality, improved nutrition, reduction in infectious and parasitic diseases, as well as improvement in health care, education, and income (Mba, 2010).

Persons aged 65 years and over make-up about 5 per cent of the Ghanaian population which is among the highest elderly population in Africa (United Nations, 2007). Population ageing in Ghana has been credited to rapid fertility decline and improved public health systems, enhanced sanitation and nutrition as well as the impact of rural-to-urban migration (Mba, 2010). It is important for policymakers to promote health and QOL of the elderly so as to curtail the costs of healthcare and sustain economic efficiency (Kalfoss, Low, & Molzahn, 2010). The increase in the number of older people in the country has necessitated the need for further information on age-related alterations pertinent to the field of nutrition, to help with promotion of health and good QOL in the aged (Gariballa & Sinclair, 1998).

Recent research on ageing has sought to understand and improve the ageing process in order to promote active ageing (Tesch-Roemer, 2012). To do this, it is important to

understand all the factors that influence active ageing in order to successfully promote it.

The WHO defines active ageing as "the process of optimizing opportunities for health, participation and security in order to enhance QOL as people age" (World Health Organization, 2002a). It gives people the chance to appreciate their potential for physical, social, and mental well-being all throughout life and to contribute to society. It also helps individuals to participate in socio-economic, cultural, spiritual and public affairs. This keeps them relevant in old age while promoting good QOL (World Health Organization, 2002a).

Active ageing strategies yield best results when instituted early in life in childhood and adolescence even though interventions in middle to late adulthood are still quite effective. However, efficiency reduces as age increases. The goal of all the interventions is to enhance QOL in ageing. No matter the approach used, health, integration and participation cannot be excluded since health is a complete physical, mental and social wellbeing helps older people maintain autonomy and independence (World Health Organization, 2002a). Integration and participation are used in relation to social, economic and political participation, social inclusion and integration and intergenerational relationships (Tesch-Roemer, 2012).

2.1 Effects of Ageing on Nutrition

An individual's needs for nutrients and energy change over their life span. As people age, their nutritional intake reduces even though nutritional requirements do not in any way decrease in old age (Kromhout et al., 1990; Russell, 1992; Russell & Suter, 1993; Tur et al., 2003). Nutritional problems alter body composition, increase disease burden,

reduce functional status and negatively impact social functioning. Poor nutritional status in older people is associated with higher morbidity and mortality (Kritika et al., 2014). It is therefore necessary for nutrition-focused policies to be instituted by public health stakeholders in order to tackle chronic disease and support well-being through old age (Conklin, Maguire, & Monsivais, 2013).

Physiological changes such as deterioration in physical and cognitive function increases risk for malnutrition and consequently higher morbidity and mortality in the elderly population. Factors implicated in the cause of malnutrition in the elderly include poor food intake due to loss of appetite, loss of dentition, swallowing difficulties, digestive disorders, chronic diseases and depression (Hickson, 2006). Nutritional problems in the elderly are not recognised as grave problems by policymakers and health professionals. Hence, nutritional assessments and interventions necessary in the elderly population are overlooked. (Chen et al., 2001).

A study conducted in the Northern Region of Ghana revealed relatively high levels of malnutrition (under- and over-nutrition) among the elderly in the region, thus, making malnutrition an issue of public health concern (Aganiba et al., 2015). Nutritional deficiencies in the geriatric age group are common and often subclinical (Semwal et al., 2014). Nutrition-related conditions are best prevented when lifestyle and dietary changes are instituted in early years. Positive effects can still be achieved during old age, thus, health promotion activities to insist on the importance of lifestyle and dietary changes can go a long way to ensure better health for older people (Appling, 1997; Bidlack, 1996; Chernoff, 2001; Fishman, 1996).

In the elderly, nutrition, health and QOL are intertwined. Certain consequences of aging such as the changes in sense of smell and taste, ability to chew and swallow, and

altered gastrointestinal and bowel function can inadvertently negatively affect nutritional status and consequently influence QOL. Poor nutrition can also bring about lack of appetite, inability to accomplish activities of daily living (ADL) as well as variations in QOL and health status (Amarantos et al.,2001).

Good nutrition is an indispensable marker of good living. Mealtimes can add psychological pleasure, a sense of security, meaning, and structure to an elderly person's daily life; fill that person with feelings of independence and a sense of command over his surroundings. Eating with others may increase social relations. Good nutrition promotes health, prevents dietary deficiency diseases, helps reduce risk of communicable diseases and promotes social relations and thus improves QOL (Amarantos et al., 2001).

2.2 Assessment of Nutritional Status in Older People

Nutritional status can be assessed by using several parameters like anthropometric measures biochemical indices, clinical indicators and dietary components or through validation methods or tools like the Mini Nutritional Assessment (MNA), Mini Nutritional Assessment-Short Form (MNA-SF) or Elderly Nutrition Screening tool (Moreira et al., 2016).

2.2.1 Anthropometry

Anthropometric measurements are essential parameters in assessing nutritional status (Frisancho, 1984). Anthropometric measurements such as body weight, bio-electrical impedance analysis (BIA), body mass index (BMI), mid upper arm circumference (MUAC), waist circumference, hand grip strength and many others are affected by changes in body fat distribution and lean body mass (Gariballa & Sinclair, 1998). Most

nutrition-based guidelines were derived from anthropometry values from younger population or included few subjects above the age of 65 years. These measurements are usually not corrected or adjusted for age, sex etc.

Using BIA in the elderly even though it is said to have low reliability is quite ideal for measuring body composition since it is less demanding on them (Chumlea & Baumgartner, 1989). The WHO classifies BMI below 18.5 Kg/m^2 and 25-29.9Kg/m^2 as underweight and pre-obesity respectively. The higher the BMI, the higher the possibility of a person acquiring a non-communicable disease (NCD). Though BMI does not consider changes in adiposity due to age, it is still reliable for determining the risk for overweight and obesity related diseases (World Health Organization, 2017b). It is also very easy to determine since it uses only height and weight measurements.

2.2.2 Biochemical Indices

Biochemical tests tell a clear picture of what cannot be assessed physically. Nevertheless, biochemical measures may be biased by client's overall state of health and medical history, previous lifestyle, and even past and present medication usage (Sahyoun et al., 1988). These tests are mainly laboratory tests performed on blood or urine. They include blood glucose tests like the fasting blood glucose (FBG), random blood glucose (RBG), oral glucose tolerance test (OGTT), glycated haemoglobin (HbA1C) or urine tests such as blood urea nitrogen and creatinine clearance.

A blood glucose test measures the amount glucose in a blood sample. It is considered "fasting" after at least 8 hours of not eating or drinking anything but water. Tests like the FBG and OGTT are usually done to screen for diabetes. FBG is also used to monitor the effectiveness of different medication or dietary changes on people already diagnosed with diabetes (Australia, 2016)

The fasting lipid profile test which is routinely used to assess cardiovascular risk includes four basic parameters: total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides. This test is performed on plasma. A fasting period of 12–14 hours overnight dietary restriction excluding water and medication is required (Nigam, 2011). It is an important test in the diagnosis of dyslipidaemias.

2.2.3 Clinical Indicators

Past and present medical history is vital to a proper nutritional assessment since nutritional irregularities may be associated with certain diseases and/or its treatment. Information collected here include the duration of the current illness, signs and symptoms, diagnostic tests and therapies such as chemotherapy and medications (Maqbool, Olsen, & Stallings, 2008). Information to look out for when doing a clinical assessment includes a detailed physical examination of a person's general condition, vomiting, gastro-oesophageal reflux, diarrhoea, constipation, appearance of skin, hair, teeth, eyes, nails etc.

2.2.4 Dietary Intake

A comprehensive dietary history provides the exact details of an individual's eating habits and makes way for the nutrition professional to give recommendations that inspire compliance (Chernoff, 2001; Contento et al., 1995). Forms of diet history include diet interview, food frequency questionnaire, food record/diaries, and 24-hour dietary recall. A food frequency questionnaire collects data on the frequency and amount consumed of specific foods. It helps to detect usual eating patterns even though the quantity of foods consumed is often over-reported (Maqbool et al., 2008).

Food records are prospective in nature. The records are collected for three to seven days with a combination of weekend and weekdays to provide the best data on a person's nutritional intake. Food records provide data which can be analysed and compared to the recommended daily allowance (RDA) for nutrients. However, food records are very time consuming, labour intensive, and participants can forget to record all foods consumed.

The twenty-four-hour dietary recall is used to assess diet and also to authenticate other diet assessment tools. It adopts a retrospective approach. It can be used either as a self-report tool or an interview-assisted tool. Energy and nutrient intake varies daily, this makes a single 24-hour dietary recall unreliable in the estimation of a person's usual energy and nutrient intake. A three-day 24-hour dietary recall is found to be ideal. The mean energy and nutrient intake from the three days is calculated and used as an individual's energy and nutrient intake (Ma et al., 2009). The participant is required to recollect food and drink and their quantities consumed within a 24-hour period. It is a quick way to assess dietary intake but it is highly dependent on the participant's memory and ability to estimate quantities (Maqbool et al., 2008).

2.2.5 Other Screening Tools

The Mini nutritional assessment (MNA) tool, a simple and rapid malnutrition screening tool explicitly intended for elderly people is widely used with high sensitivity (96%) and specificity (98%) rate. It is made up of 18 items based on anthropometric measurements, dietary questionnaire, global health and social assessment and also a subjective assessment of health and nutrition (Guigoz, Vellas, & Garry, 1996; Kabir et al., 2006; Vellas et al., 2001). It is widely used in adults who are 65 years old and above and are malnourished or at risk for malnutrition.

The Nutrition Screening Initiative was introduced in 1989 by the American Dietetic Association, American Academy of Family Physicians, and National Council on Aging as a long-term plan to expose the healthcare community to potential nutritional problems (Posner, Jette, Smith, & Miller, 1993). Its goal amongst others was to identify risk factors for malnutrition in free living older people by using programmes like The Determine Your Nutritional Health checklist Level I and Level II which has been used as a nutrition screening tool in many screening programs for vulnerable older people (Chernoff, 2001; Posner et al., 1993; Spangler & Eigenbrod, 1995). Regardless of afore mentioned nutrition screening tools, nothing compares to a detailed diet history.

2.3 Nutritional Requirements of Older People

The nutritional requirements of elderly people are quite similar to those of younger adults (World Health Organization, 2017a). Recent studies have shown that although older adults need fewer calories due to reduced metabolic rate and lean body mass, the requirements for protein is slightly higher in older adults than in younger adults (Campbell, Johnson, McCabe, & Carnell, 2008). 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, Dick et al., 2005; Sharlin, 2010).

As a result of the entero-muscular changes that occur with ageing, older people are especially prone to constipation and as such fibre cannot be excluded from their dietary needs. Soluble and insoluble fibre are needed to eliminate abnormal cells from the gastrointestinal tract, increase stool quality and frequency, trap bilious cholesterol,

carcinogens as well as and improve blood glucose control (Marlett, McBurney, & Slavin, 2002; Sharlin, 2010).

Although micronutrient needs of healthy older adults appear to be similar to those of younger adults (Kromhout et al., 1990), further studies are needed to provide specific guidelines on micronutrient requirements for older persons. Micronutrients have been associated with healthy aging. Micronutrients in the form of antioxidants help maintain normal cellular function by preventing oxidative stress (Sharlin, 2010). Vitamin C and E have been implicated in lowering the incidence of senile cataracts (World Health Organization, 2002b) due to the protective antioxidant abilities. Older people are prone to Vitamin B insufficiency due to poor dietary choices and medication usage (Lichtenstein & Russell, 2005). Also, certain drugs interfere with bioavailability of the B Vitamins. Uptake and transformation of folate and cyanocobalamin may also decrease in old age as receptor function and transporter abilities decline naturally (Lichtenstein & Russell, 2005; Sharlin, 2010). Calcium abortion from foods would not be possible without Vitamin D. Older people who are institutionalized or confined to their homes are particularly at risk for Vitamin deficiency and consequently poor bone health (World Health Organization, 2002b).

The risk for dehydration in older people is quite high due to a diminished ability to sense thirst especially for those very advanced in age or very ill (World Health Organization, 2002b). Therefore, adequate fluid intake is important.

2.4 Effects of Ageing on Health Status

Age is used in population health studies to predict the state of a person's health and the risks of morbidity and mortality (United Nations, 2015). Ageing results in altered body

composition such as, reduced lean body mass and increased body fat, and also decreased bone density as a result of bone demineralisation (Durnin & Womersley, 1974). These changes affect metabolism, nutrient consumption, physical activity and increases an elderly person's risk for chronic disease (Chumlea & Baumgartner, 1989; Forbes & Reina, 1970). Ageing is biologically linked to cell damage that has accumulated over years. This cell damage reduces the body's self-repair abilities by weakening the immune system and escalating the risk of acquiring and developing various diseases (Morley, Silver, Fiatarone, & Mooradian, 1986).

In addition to this, modern social structure and changes in social roles further diminishes an older person's health and well-being. Cardiovascular diseases, cancer, chronic respiratory disease and diabetes caused 29 million deaths worldwide in 2002 (Ayernor, 2012). It is projected that chronic non-communicable diseases are going to be the major cause of death in the world by 2025 (Ayernor, 2012).

Older people 65years and above have a 90% chance of developing hypertension by age 80 (Boateng, Luginaah, & Taabazuing, 2015). About three-quarters (639 million people) of people living with hypertension reside in developing countries (Boateng et al., 2015). This only adds to the double burden of disease which most developing countries are not well equipped to handle. Some of the known risk factors associated with cardiovascular diseases include dietary factors (excessive salt, saturated fat intake), obesity and overweight, lack of exercise, alcohol consumption, cigarette smoking, and diabetes mellitus (Boateng et al., 2015; Cappuccio et al., 2004).

In Ghana, life expectancy increased from 48.6 in 1970 to 58.1 in the year 2000 (United Nations, 2007). The ageing Ghanaian population means an increase in the need for

health care with its associated high cost of care. The situation is exacerbated by limited number of geriatric health service providers in the country (United Nations, 2007).

The results from Wave 1 of the Ghana Study on Global Ageing and Adult Health (SAGE) which was carried out from January 2007 to December 2008 by the WHO showed that 45% of respondents had oral health problems, 33% were hypertensive, 14% had arthritis, 7% had been diagnosed with diabetes, 6% had a cardiovascular condition (angina) and 4.9% were either being treated for stroke or had been diagnosed with stroke. The SAGE is a nationally representative study by the WHO to monitor the health and well-being of adult populations aged 50 years and above in six countries; China, Ghana, India, Mexico, Russian Federation, and South Africa. The SAGE also included a smaller sample of younger adults aged 18 to 49 years. In Ghana, 5,573 (males = 2,799 and females = 2,764) respondents were sampled (Biritwum et al., 2015; Boateng et al., 2015). Unfortunately, current health systems in Ghana are not well equipped to deal with the increasing number of older people and its resultant burden on the health system (United Nations, 2015).

In 2011, the US National Centre for Chronic Disease Prevention and Health Promotion recognized that good health is possible in old age; poor health is not a direct result of ageing (Bazaadut, 2014).

2.5 Assessment of Health Status in older people

Many of the factors such as hypertension, cholesterol levels, hearing, vision, diabetes and cancer. that can affect health status in the elderly can be easily determined with simple screening tools which are integrated into routine health promotion programmes (Chernoff, 2001). Assessment of risk for NCD's is vital to their prevention. The four commonest NCD's; CVD's, cancer, COPD and Type 2 diabetes share common

preventable risk factors. These risk factors include high blood pressure, high blood cholesterol, high blood glucose, overweight and obesity which are usually triggered by unhealthy diet, physical inactivity and tobacco use (Bhattacherjee, Datta, Roy, & Chakraborty, 2015).

2.6 Ageing and Quality of Life (QOL)

The concept of QOL is multifaceted. The World Health Organization defines QOL as "an individual's perception of life in the context of culture and value system in which he or she lives and in relation to his or her goals, expectations, standards and concerns" (Qadri et al., 2013). The concept of QOL is broad and encompasses the individual's physical and mental health, level of independence, social liaisons, personal beliefs, spiritual beliefs, coping skills and connection to their environment (Devi & Roopa, 2013; Qadri et al., 2013). Quality of life goes beyond morbidity and mortality. Generally, researchers tend to view QOL as life satisfaction on the whole. In public health and medicine, QOL is viewed as a person's discernment of happiness and life satisfaction as well as position in life in their cultural and value systems in relation to their expectations, values, and concerns (Keshavarzi et al., 2015).

The first wave of the English Longitudinal Study of Ageing (ELSA) found that QOL in older adults increased from age fifty and peaked at sixty-eight years and declines gradually to the same level as age fifty, at age eighty-six. This is thought to be as a result of maintained functional ability around age fifty as most would have still been in active labour force; or enjoying their retirement bonuses at around retirement age 60-65 years, and as a result still maintain a decent level of independence. Individuals adapt to old age and accept its consequent challenges; explaining why their QOL is at the same level as those in the fifty years age group (Netuveli, Wiggins, Hildon, Montgomery, &

Blane, 2006). Several other studies reported similar findings with more than 80% of the population 65 years and above reporting good QOL. Several studies concluded that older people reported better QOL than younger folks. This was thought to be because they accepted physiological changes as challenges that came with ageing and maintained good social and religious relationships (Bazaadut, 2014; Cavrini, Broccoli, Puccini, & Zoli, 2012; Gabriel & Bowling, 2004). Reduced QOL therefore does not correlate directly to increase in age.

2.7 Factors Affecting QOL in Older People

As mentioned earlier, the concept of QOL encompasses several components. Some of the known causes of declining QOL in older people include risk or existence of chronic illness, decline in functional ability, reduced financial independence, inadequate healthcare, poor shelter and social isolation (Bazaadut, 2014; Khan & Tahir, 2014). These challenges gravely affect their QOL. Maintaining good QOL and increasing number of healthy years lived is currently of great public health concern and is one of the principal goals of the Healthy People 2010 initiative (Acree et al., 2006; Phelan, Anderson, LaCroix, & Larson, 2004). The following subsections detail the components of QOL as are relevant to this study.

2.7.1 Health-Related Quality of Life (HRQOL)

A more definite and bounded use of the term QOL is HRQOL. Health-related quality of life is a subjective evaluation of an individual's health. It focuses on the changes in physiological and mental health components that may occur as a result of disease, aging, or changes in functional status (Amarantos et al., 2001). The scope of HRQOL is smaller and focuses less on the social aspects of QOL. It involves more of biomedical

factors, focused on physical and mental health components that change with disease, altered functional status, or management/treatment of these changes (Amarantos et al., 2001). Older people associate good health to good QOL and as such reported lower QOL in the absence of good health; signifying that QOL is negatively affected in situations of deteriorating health (Gabriel & Bowling, 2004). However, some other studies reported that older people regarded reduced health as a normal part of ageing and as such poor health had no effect on their satisfaction with life (Bazaadut, 2014; Gabriel & Bowling, 2004).

The prevalence of non-communicable diseases in the elderly affects several aspects of their lives. Impaired physical health leads to loss of social identity and relationships, as well as decline in economic and nutritional state thus affecting their QOL (Ayernor, 2012; Bazaadut, 2014). The Ghana National Ageing Bill which was approved by parliament in 2010 and finalised in July, 2016 has been strategized to help promote issues affecting the elderly as well as promote and protect their rights. It will also serve as a framework to provide long term care for the elderly who are likely to be living with a number of disabilities (Ayernor, 2012; Biritwum et al., 2015; Government of Ghana, 2015)

2.7.2 Psychological Health

Psychological problems like depression, anxiety, addictions, excessive stress and worry have an impact on an individual's QOL. A healthy psychological state improves interpersonal relationships, enables us make good life choices, maintain physical health and tolerate ups and downs of life (World Health Organization, 2001). Mental health affects people's lives and actions and the way they view their life circumstances. It

dictates whether a person will be optimistic or pessimistic about a situation (Gabriel & Bowling, 2004).

2.7.3 Level of Independence

For most older people, being self-reliant is important and they enjoy life better when they do not have to depend on others for simple things like shopping and household tasks (Gabriel & Bowling, 2004). Being independent allows them to enjoy life, see their family and friends, and take up hobbies as well as get involved with social activities. Independence is threatened by poor health and morbidity, and even lack of access to transport. However independence is boosted by financial security and other factors like reduction in work constraints (Gabriel & Bowling, 2004).

2.7.4 Living arrangements/environment

The quality of an elderly person's living situation has a direct effect on their QOL since it affects physical health status, social interaction, access to services, independence and mobility (Devos & Palloni, 2002; Wong, 2003). Elderly persons living alone are more likely to need outside support in the case of illness or disability and are at greater risk of social segregation (Tawiah, 2013). In Ghana, research shows that while older women mostly live in extended family households, elderly men usually live nuclear households (Tawiah, 2013). A study in China found that the most vulnerable group of older people are those who live entirely by themselves as this situation negatively affects their HRQOL (Sun, Lucas, Meng, & Zhang, 2011). In the U.S, adult males 75 years and above who lived alone were found to have poorer diets than those living with a spouse. This outcome was higher in women and was found in those women between 55-64

years. Generally, adults living alone consumed fewer calories than those living with spouses (Davis, Murphy, & Neuhaus, 1990).

2.7.5 Financial Stability

Older people also tend to associate a good QOL with being financially comfortable (Gabriel & Bowling, 2004). It is important to them to have enough money to pay bills and cater for unexpected expenses (Gabriel & Bowling, 2004). In Ghana, at age 60, elderly people retire from active service. Most retire into poverty, isolation and abandonment (Bazaadut, 2014). Few Sub-Saharan African countries provide a social security system for the aged. Out of this few, most do not have healthcare packages for older persons (Aboderin & Ferreira, 2009; McIntyre, 2004; Susan, 2008).

The African Union adopted and implemented the African Policy Framework and Plan of Action on Ageing in July 2002 and December 2004 respectively to raise awareness about the special situation, needs and welfare of elderly people in the region. The Policy Framework and Plan of Action serves as a guide for African Union Member States to design, implement, monitor and evaluate national policies and programmes to satisfy the needs of the elderly (Tawiah, 2013).

With the implementation of the National Health Insurance Scheme in 2003, individuals aged 60 years and older were only required to register once to benefit from healthcare cost following hospital visits. Except for hypertension and diabetes, no other chronic non-communicable disease has been explicitly addressed in the National Health Insurance policy. It is necessary for the scope of the National Health Insurance policy to be expanded to include other chronic non-communicable diseases which affect the elderly (Ayernor, 2012).

In the year 2000, under the Madrid International Plan of Action (MIPAA), the Government of Ghana in conjunction with the private sector instituted strategies such as soap and pomade making, "batik tie and dye", bakery, aquaculture, snail and bee-keeping. to address the economic challenges facing the elderly. Active retirees were called upon to work on contract or volunteer basis for allowances at the end of each month to help reduce their dependence on family and also improve their QOL (United Nations, 2007).

As part of the Government of Ghana's social responsibility, the Growth and Poverty Reduction Strategy has a Livelihood Empowerment Against Poverty (LEAP) component that provides the poor and vulnerable as well as the aged with basic monetary support (Biritwum et al., 2015). Pension scheme coverage by the Government is quite low; worsening the plight of the elderly retiring in a country with high poverty rates like Ghana. The Social Security and National Insurance Trust (SSNIT) mans the leading formal social protection scheme in Ghana; the SSNIT social insurance pension scheme. It pays registered retirees allowances out of contributions from current employees registered with the scheme. Membership by law does not include officers Ghana Armed Forces and Self-employed individuals are not obliged to enrol on the scheme (Tawiah, 2013).

2.7.6 Social Relationships

Social relations in the elderly consist of social networks (connections among group of known people) and social support from family, friends and neighbours result in improved health outcome and well-being. In developing countries, social connections (family and kinship) and activities are important elements of QOL and promote high self-esteem in the elderly. Lack of social connections result in isolation and

consequently, poor QOL since the sense of belongingness and emotional, physical and psychological support become absent (Bond, 2004; Mollenkopf & Walker, 2007). Poor social relations lead to increased disease susceptibility and increased mortality resulting in reduced QOL among the elderly (Cavallero, Morino-Abbele, & Bertocci, 2007; Zhang, Norris, Gregg, & Beckles, 2007).

In traditional African societies, cultural transmission is mainly done by the elderly thus they are revered and catered for by the youth in relation to performance of house chores, financial assistance, self-care and others (Fajemilehin, Ayandiran, & Salami, 2007). Previously, the extended family system practiced by most African countries including Ghana, guaranteed that the elderly were well cared for by the younger generations in relation to financial, social and health care support (Tawiah, 2013). However, this does not occur in situations of urbanization and modernization (Tang, 2009) causing most elderly folks to be abandoned; consequently negatively impacting their QOL (Bowling et al., 2003). Loneliness increases with advancing age; and is compounded by the onset of disease and disability, loss of partners, seclusion from children and reduced social participation (Tesch-Roemer, 2012).

2.8 Assessment of QOL in Older People

While population ageing is celebrated worldwide, the WHO has called for ‘’adding life to years and active ageing policy’’ to aid older people to remain active, valued and engaged for as long as possible during the last years of their life (Bazaadut, 2014; World Health Organization, 1985, 2000). Assessment of QOL in older people population surveys are becoming popular in advanced countries. It serves as a tool to measure successful ageing, and also provides a means of monitoring the value of social-economic policies, welfare programmes, and health care (Bazaadut, 2014).

Most researchers agree that QOL consists of both objectively measurable conditions and subjective aspects of good life. Objective indicators of QOL are those that exist outside the body of the person, such as economic resources, health functioning, and social contact; while subjective indicators of QOL are those that are observed, experienced, and apprised by the individual; such as life satisfaction, happiness, morale, and positive outlook (Lu, 2012).

The tools/models used in assessing QOL are dependent on the field of research such as health sciences, social sciences, gerontology among others. Some tools limit assessment of QOL in the elderly to sick and fragile older people and not healthy free-living elderly (Fry, 2000). In Ghana, social connections form a basic part of an individual's life. Assessing HRQOL and not QOL as a whole will not be prudent in a community based research. Traditional models of QOL based mainly on Maslow's hierarchy of human needs and classic QOL models based on emotional wellbeing, morale and life satisfaction do not consider factors that back the individual's perceived comfort which contributes to their QOL (Andrews & Withey, 1976; Bowling et al., 2013; Larson, 1978; O'boyle, 1997). Since cultural and social norms play a major influence on the lives of the elderly and their families in Ghana, these models of QOL may not completely define the QOL of a Ghanaian elderly person. Evolving models of QOL do take into consideration synergies of domains of the current models so as to reflect the growing interest and multidimensionality of the concept (Gabriel & Bowling, 2004).

The WHO's model of QOL is a typical example of such combined efforts (Group, 1998). It measures critical aspects of life such as the health status, psychological, economic and emotional state of the individual. It has good internal consistency,

discriminate validity, criterion validity, concurrent validity, and test-retest reliability. The WHOQOL-BREF contains 26 items while the original WHOQOL-100 contains 100 items. Each is made up of four domains: physical, psychological, social relationships and environment. Each domain represents an aspect of the person's life and is made up of questions which are scored between one and five. Higher scores mean better QOL (Silva et al., 2014).

Bowling (Bowling, 2009) identified eight dimensions of QOL as overall QOL, health, social relationships, independence, control over life and freedom, home and neighbourhood, psychological and emotional well-being, leisure and activities; and financial circumstances in the thirty-five item OPQOL questionnaire. A short version, the thirteen item OPQOL-brief was developed in 2013. The OPQOL was derived entirely from the views of older people in Britain and cross-checked against theoretical models for comprehensiveness. The OPQOL-brief assesses QOL on seven domains. It consists of 13 items. The participant is required to indicate the extent to which he/she agrees with each item by selecting one out of five options ("strongly disagree", "disagree", "neither agree nor disagree", "agree" and "strongly agree") scored from 1-5. The responses for the 13 statements are summed to give a final score ranging from 13 to 65, with higher scores indicating a better rating of QOL (Bowling, 2009).

2.9 Conclusion of Chapter

Projected population ageing trends in Ghana suggest a huge rise in the population of the elderly. Looking at the paucity of data on the situation of the elderly, further research is needed to throw light on the nutritional status, health status and QOL as well as the factors that influence QOL among the elderly.

CHAPTER THREE

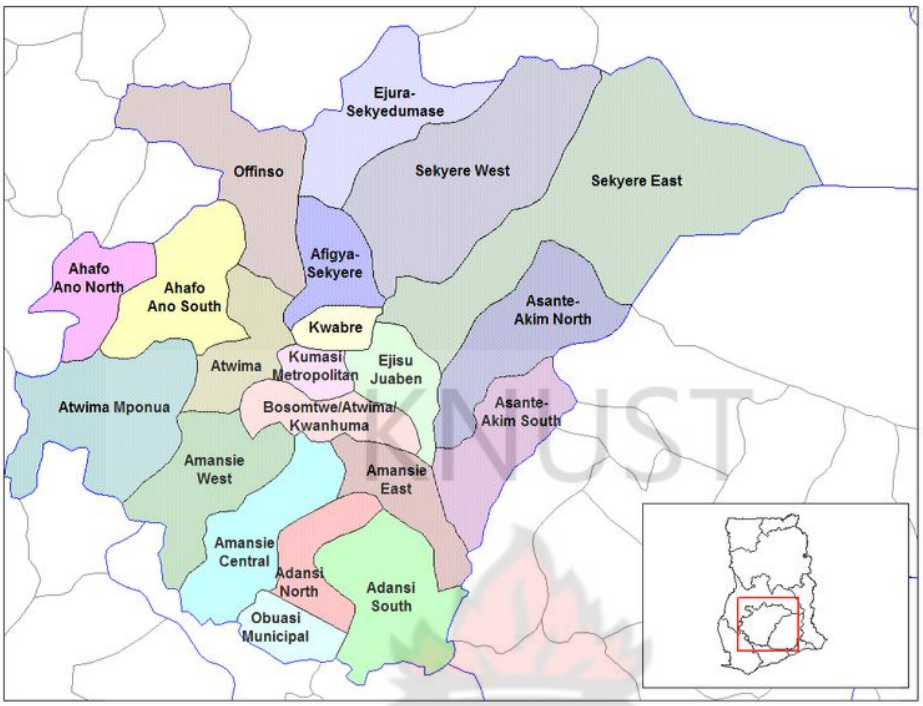
METHODOLOGY

3.0 Study Area

The districts used for the study were selected from the Ashanti Region of Ghana. The region lies in the southern part of Ghana and occupies 24,389 sq. km. or 10.2 percent of the total land area of the country. It is the third largest in size after the Northern and Brong Ahafo regions, respectively. It shares boundaries with the Western, Central, Eastern and Brong Ahafo regions. The region whose capital is the Kumasi Metropolis has 27 districts. It has a total population of about 4,780,380; 19.4% of the country's population. The female population is 2,464,328, and the remaining 2,316,052 people make up the male population. The older population of the ages 65 years and above is 204,461 people. Almost 61 percent of the region's population reside in urban areas (Ghana Statistical Service, 2012).

The districts included in the study are Kumasi Metropolis, Atwima Nwabiagya district, Ejisu- Juaben Municipality and Asante Akim Central Municipality. Even though these districts were conveniently sampled, their demographics ensured a fair representation of various ethnicities and social classes. This was necessary to guarantee a diverse data pool. A total of thirteen communities were used for the study.

Figure 3.1: Base map of Ashanti Region ('File', 2006).



3.2 Study design

A community based cross-sectional study of four districts in the Ashanti region was done. The four district assemblies that gave earliest approval for the study were chosen. Each district was given a quota (number of participants) based on the population size. Communities were selected systematically by choosing every fourth community on a list provided by the district assembly. Participants who fell within the target age group were conveniently chosen based on availability at the time of the study.

3.3 Population of the study

The study population consisted of free-living males and females aged 65 years and above.

3.4 Sample size determination

The study's sample size was determined by using Yamane's formula (Yamane, 1967) for calculating sample sizes with the assumption that the population size is infinite.

$n = N/ (1+N (e^2))$

Where, n = the sample size, N = the size of population, e = the error of 5 percentage points

$n = 204461 / (1 + 204461 (0.05^2))$

$n = 399.2$

Approximate sample size of 400 people was used for the study.

3.5 Sample techniques

The study data was collected from November to December 2016. Four districts were conveniently selected for the study. Thirteen communities were selected systematically, from which participants were recruited. Study participants were recruited through house-to-house visits in the study areas. In each house entered, at most two people, 65 years and above people were selected, ideally a man and a woman. If a house had more than two people in this age group, simple balloting was used to select the two. If a house had just one person in the desired age group, he/she was automatically recruited. The details of the study were explained to the study recruits. Informed consent (signed or thumb-printed) was obtained from participants before they were enrolled on the study.

3.6 Ethical Approval

The research was approved by the Committee on Human Research, Publication and Ethics of the Kwame Nkrumah University of Science and Technology School of

Medical Sciences in collaboration with Komfo Anokye Teaching Hospital (CHRPE, 2016). In addition to this, approval was also sought and received from the Ghana Health Service and the Kumasi Metropolitan Assembly before subject recruitment was initiated.

3.7 Data collection tools/instruments

a. Questionnaire

The questionnaire was made up of five parts. Part 1 collected data on participant demographics, education, income source, anthropometry, systolic and diastolic blood pressures and fasting blood sugar. Part 2 was used to assess participant's health status. Part 3 adopted the OPQOL-brief to assess the QOL of participants. Part 4 consisted of a modified food frequency questionnaire which was used to assess their dietary intake over the past three months. Lastly, Part 5 was a 3-day twenty-four-hour dietary recall sheet to document participant's food intake over the course of three days.

b. Blood pressure measurements

3-day systolic and diastolic blood pressures were taken with the digital OMRON M6 sphygmomanometer.

c. Anthropometric measurements

Weight, Body Mass Index, Body Fat Percentage, Skeletal Muscle Mass and Visceral Fat Percentage measurements were obtained with an OMRON Body Composition Monitor BF511.

Height was measured with the SECA 213 stadiometer.

d. Fasting blood glucose

OneTouch select blood glucose monitoring system was used to analyse fasting blood glucose.

e. Food and nutrient intake

A 3-day twenty-four-hour dietary record and a food frequency questionnaire were used to assess food and nutrient intake.

3.8 Data collection procedure

All subjects were oriented to the research protocol during the recruitment stages. They were informed of the purpose of the study and the need for them to fast overnight or at least eight hours for the purposes of the fasting blood glucose and the fasting lipid profile. They were informed of all the other procedures they will undertake as part of the three-day study. Three research assistants and a phlebotomist were trained on the research protocol to help collect the research data.

3.8.1 Inclusion Criteria

1. Free living elderly individuals.
2. Subjects aged sixty-five and above.

3.8.2 Exclusion Criteria

1. Elderly below age 65.
2. Institutionalised elderly.
3. Elderly people who are bedridden.
4. Elderly people who could not stand unsupported.

5. Elderly people who could stand unsupported but for some reason could not extend their arms straight at a 90° angle to their body.

3.8.3 Data collection day one

1. Personal Data

Some personal data such as Age, Sex, Level of Education, Ethnicity among others were collected as part of the study.

2. First Blood Pressure measurement

Systolic and Diastolic Blood Pressure were taken with the OMRON M6 digital sphygmomanometer on left arm with participants seated.

3. Anthropometric Measurements

All anthropometric measurements (Height, Weight, Body Mass Index, Body Fat Percentage, Skeletal Muscle Mass and Visceral Fat Percentage) were taken using standardized procedures and equipment. Participants wore minimum clothing; all extra clothing and accessories such as headgears, shoes, metallic bracelets, wrist watches, mobile phones and others were removed in order to get the definite weight of participants. Weight, Body Mass Index, Body Fat Percentage, Skeletal Muscle Mass and Visceral Fat Percentage measurements were obtained with an OMRON Body Composition Monitor BF511 which is based on bioelectrical impedance technology. Participants were asked to step on the main unit bare-footed, standing with your knees and back straight and looking straight ahead for weight measurements which were displayed in kilograms. After weight measurements were recorded, participants were asked to raise their arms horizontally with elbows extended for body mass index, body fat percentage, skeletal muscle mass and visceral fat percentage measurements to be taken. Arms were kept straight at a 90°angle to body and participants allowed to hold

the display unit with middle fingers in the dent at the back of the grip electrodes and the thumb and middle finger holding on firmly to the inner grip electrodes. The outer grip electrodes were clutched with the ring and small fingers.

Height was measured with the SECA 213 stadiometer set up against a vertical wall. Each participant stood upright with their heels, buttocks, shoulders and the back of their head against the stadiometer. With each participant looking straight ahead along the Frankfort horizontal plane, the headpiece was lowered to touch the top of their head gently but firmly and the readings recorded to the nearest 0.1 cm.

4. Fasting Blood Sugar

Capillary blood was drawn from fingertip and instilled on a Glucostrip inserted into a OneTouch Select Blood Glucose Monitoring System after an eight to twelve hour overnight fast.

5. Fasting Lipid profile

Venous blood samples were taken from all four hundred participants and sent to the KNUST Clinical Analysis Laboratory for lipid profile analysis.

6. Health Status Questionnaire

Assessment of activity level, risk for or presence of NCDs, etc. was done using a semi-structured interview and a checklist designed for the study.

7. First Twenty-Four-hour dietary recall

A 24-hour dietary recall was performed to determine nutrient intake for the previous day. Detailed information about all foods and beverages consumed on a particular day is collected during a structured interview.

3.8.4 Data Collection Day Two

1. Second Blood Pressure Measurement

Systolic and Diastolic Blood Pressure were taken with the OMRON M6 digital sphygmomanometer on left arm with participants seated.

2. QOL Questionnaire

The thirteen-item OPQOL-brief questionnaire was used to assess the QOL of the participants. Direct interviews were used to help complete the questionnaire given that difficulty reading, problems with vision and low levels of schooling are common in older adults.

3. Second Twenty-Four-hour dietary recall

A 24-hour dietary recall was performed to determine nutrient intake for the previous day.

3.8.5 Data collection day three

1. Third Blood Pressure Measurement

Systolic and Diastolic Blood Pressure were taken with the OMRON M6 digital sphygmomanometer on left arm with participants seated.

2.Three-month food frequency record

A Food Frequency Questionnaire was administered to assess habitual dietary intake and quality of participants' diet.

3.Third Twenty-Four-hour dietary recall

A 24-hour dietary recall was performed to determine nutrient intake for the previous day.

3.9 Data analysis

Statistical analysis was performed using SPSS software (version 20.0). Means, standard deviations and frequency tables were used as descriptive statistics. Independent variables used in this study included age, gender, marital status, ethnicity, level of education, religion, previous and current income sources.

To assess nutritional status, dietary patterns were extracted from the food frequency questionnaire. Food intake from the three-day 24hr dietary recall was quantified and transformed into energy (calories) and nutrients with the aid of a food composition table from the nutrient analysis template. Macronutrient and micronutrient intake was compared to the RDAs and also compared among various income and QOL groups. For health status, means, minimums and maximums of the BMI, total cholesterol, TG's, HDL, LDL, FBG, SBP, DBP were run and compared to standard measurements to assess hypertension, diabetes, dyslipidaemias, obesity and overweight. The FBG results were categorised according to the ADA diabetes guidelines. The ATP III classification was used to categorize participants into various levels of dyslipidaemia and the WHO/ISH hypertension classification was used to classify participants into various grades of hypertension.

Mean scores from the OPQOL-brief was analysed. The scores were also analysed for the number and percentage of participants in the "very good", "good", "average" and "poor" QOL groups. Same was done for all the parameters of QOL.

The relationship between nutrition, health and QOL was analysed by performing partial correlation among the three parameters.

CHAPTER FOUR

RESULTS

4.0 Demographics

The background characteristics of the participants are presented in Table 4.1. A total of 400 participants were recruited for the study. There were 135(33.7%) males and 265(66.3%) females with a mean age of 74.4 years. Majority (72.8%) of the participants were insured with the NHIS; the remaining 27.3% were not. Slightly more than half (204 participants) of the participants had never received any form of formal education and only 21 participants (5.3%) were educated to tertiary level. Less than half (46%) of the participants were married, 77 (19.3%) divorced/separated and 139 (34.8%) were widowed. Previous source of income for 10 (2.5%) of the participants was family, 152 (38%) previously farmed, 74 (18.5%) were formally employed, 9 (2.3%) were dependent on good samaritans while 155 (38.8%) were self-employed. Current sources of income were as follows; 47% family, 9.8% farming, 14.5% pension, 5.3% good samaritans and 23.5% self-employment.

Table 4.1 Participant Demographics

Variables	Frequency	Percentages
Age Category (years)		
65-74	225	56.3
75-84	123	30.8
85-94	48	12.0
95-100	4	1.0
Gender		
Male	135	33.7
Female	265	66.3
Level of Education		
None	204	51.0
Primary	32	8.0
Middle School/JSS	90	22.5
Secondary School	53	13.3
Tertiary	21	5.3
Marital Status		
Married	184	46.0
Divorced/Separated	77	19.3
Widowed	139	34.8
Religion		
Christian	309	77.3
Muslim	74	18.5
Traditionalist	2	0.5
Others	15	3.8
Ethnicity		
Akan	310	77.5
Ewe	15	3.8
Krobo	3	0.8
Northern	66	16.5
Others	6	1.5
Previous Income		
Family	10	2.5
Farming	152	38.0
Formal Employment	74	18.5
Good Samaritan	9	2.3
Self-Employment	155	38.8
Current Income		
Family	188	47
Farming	39	9.8
Pension	58	14.5
Good Samaritan	21	5.3
Self-Employment	94	23.5
NHIS		
Yes	291	72.8
No	109	27.3

4.2 Dietary Intake Patterns

Table 4.2 shows the dietary patterns of the participants. More than half (60.7%) of the male participants did not consume any type of milk at all as compared to 104 (39.2%) who did (p= 0.000). Full cream and semi-skimmed milk intake is significantly higher (p= 0.000) in the females 23.4% and 21.1% than the males 8.9% and 5.2% respectively. A lot more females consumed milk daily; up to 21.5% of the female participants compared to 9.6% male participants. Fats and oil intake was higher among the male participants; more than half of them 51.9% ate fried food daily compared to 35.1% of the females (p= 0.000). The number of male participants who never cooked with or used extra salt at the table 14(10.4%) and 72(27.2%) respectively is higher than the female participants; 72 (27.2%) and 28 (10.6%) respectively. Fruits and vegetables intake is higher among the male population; 46 (34.1%) of them consume fruits and vegetables daily compared to 77(29.1%) of the females. Also, consumption of animal protein in the form of fish and meat is higher in the male population; 41 (30.4%) males and 72 (27.2%) females consume fish and fish products daily while, 38(28.1%) of the males and 66 (24.9%) females consume meat and meat products daily (p= 0.009).

Table 4.2 Dietary Patterns among the Elderly

Variable	N (%)		P value
	Male	Female N (%)	
Type of Milk			
None	82 (60.7)	104 (39.2)	
Full Cream	12 (8.9)	62 (23.4)	
Semi-skimmed	7 (5.2)	56 (21.1)	0.000
Milk Powder	30 (22.2)	34 (12.8)	
Soy Milk	4 (3.0)	9 (3.4)	
Frequency of Milk Usage			
Never	82 (60.7)	104 (39.2)	
Daily	13 (9.6)	57 (21.5)	0.000
1-3 times a week	17 (12.6)	63 (23.8)	
4-6 times a week	23 (17.0)	41 (15.5)	
Type of Cooking Fat			
None	21 (15.6)	96 (36.2)	
Butter	8 (5.9)	4 (1.5)	0.000
Vegetable Oil	90 (66.7)	136 (51.3)	
Margarine	16 (11.9)	29 (10.9)	
Consumption of Fried Food			
Never	14 (10.4)	72 (27.2)	
Daily	70 (51.9)	93 (35.1)	0.000
1-3 times a week	45 (33.3)	69 (26.0)	
4-6 times a week	6 (4.4)	31 (11.7)	
Cooking with Salt			
Never	21 (15.6)	28 (10.6)	
Always	49 (36.3)	98 (37.0)	
Rarely	13 (9.6)	38 (14.3)	0.472
Usually	29 (21.5)	53 (20.0)	
Sometimes	23 (17.0)	48 (18.1)	
Use of Table Salt			
Never	78 (57.8)	144 (54.3)	
Always	4 (3.0)	8 (3.0)	0.180
Rarely	11 (8.1)	33 (12.5)	
Usually	5 (3.7)	2 (0.8)	
Sometimes	37 (27.4)	78 (29.4)	
Consumption of Fruits and Vegetables			
Never	26 (19.3)	69 (26.0)	
Daily	46 (34.1)	77 (29.1)	
1-3 times a week	51 (37.8)	97 (36.6)	0.470
4-6 times a week	12 (8.9)	22 (8.3)	

Consumption of Fish and Fish Products			
Never	9 (6.7)	6 (2.3)	0.124
Daily	41 (30.4)	72 (27.2)	
1-3 times a week	45 (33.3)	102 (38.5)	
4-6 times a week	40 (29.6)	85 (32.1)	
Consumption of Meat and Meat Products			
Never	23 (17.0)	83 (31.3)	
Daily	38 (28.1)	66 (24.9)	
1-3 times a week	49 (36.3)	65 (24.5)	0.009
4-6 times a week	25 (18.5)	51 (19.2)	

4.3 Nutrient Intake

Nutrient intake in the male population compared to the RDA is displayed in Table 4.3. Male participants consumed less daily calories than their RDA by 39.3%. Carbohydrate, protein and fat intake was inadequate by 41%, 46.6% and 35.6%. Vitamin A and Calcium intake were inadequate by 39.4% and 48.1% correspondingly. However, Vitamin B12, Vitamin C, Folic acid and Phosphorus intake was in excess by 150%, 203.8%, 15% and 37.9% respectively.

Table 4.3 Nutrients Intake among the Male Elderly In Relation To the RDA

Variable (nutrient)	Minimum	Maximum	Mean	SD	RDA	Inadequate(I) Adequate(A) Excess(E)	%Inadequate %Adequate %Excess
Energy (kcal)	971	2667	1423.7	475.3	2342	I	39.3
Carbohydrate (g)	112	357	173	65.1	293	I	41
Protein (g)	41	79	62.5	17.2	117	I	46.6
Fat (g)	35	77	50.2	16.4	78	I	35.6
Vitamin A (µg)	52.8	320.1	193.8	104	320	I	39.4
Vitamin B12 (µg)	0.0	7.8	5	2	2	E	150
Vitamin C (mg)	22	184.8	91.7	54.5	45	E	203.8
Calcium (mg)	222.4	688.8	363.5	144.7	700	I	48.1
Folic acid (µg)	154	1033	368.2	212.2	320	E	15
Phosphorus (mg)	770.3	1428.6	965.3	183.4	700	E	37.9

Nutrient intake in the female population compared to the RDA is displayed in Table 4.4. Female participants consumed less daily calories than their RDA by 29.6%. Carbohydrate, protein and fat intake was inadequate by 26.6%, 73% and 27.5%. Vitamin A and Calcium intake were inadequate by 39.2% and 66.1% correspondingly. However, Vitamin B12, Vitamin C, Folic acid and Phosphorus intake was in excess by 295%, 123.8%, 6% and 40.8% respectively.

Table 4.4 Nutrients Intake among the Female Elderly In Relation to the RDA

Variable (nutrient)	Minimum	Maximum	Mean	SD	RDA	Inadequate(I) Adequate(A) Excess(E)	%Inadequate %Adequate %Excess
Energy (kcal)	971	2667	1346	394	1912	I	29.6
Carbohydrate (g)	112	251	175.5	53	239	I	26.6
Protein (g)	41	107	59.9	24.2	95.5	I	37.3
Fat (g)	22	77	46.2	19.1	63.7	I	27.5
Vitamin A (µg)	52.8	273.3	194.4	76.7	320	I	39.2
Vitamin B12 (µg)	0.0	12.5	7.9	2.7	2	E	295
Vitamin C (mg)	50	184.8	100.7	45.4	45	E	123.8
Calcium (mg)	169.1	357.1	237.1	50	700	I	66.1
Folic acid (µg)	151.3	1033.0	339.3	156.1	320	E	6
Phosphorus (mg)	683.7	1753.9	985.8	364.2	700	E	40.8

4.3.1 Nutrients Intake by Gender

A comparison of nutrient intake between the male and female participants is shown in Table 4.5. Differences in the intake of energy, carbohydrates and protein are not statistically significant. Fat intake is higher (p=0.04) in the male population. The mean daily fat intake is 50.2g (±16.4) for the males and 46.2g (±19.1) for the females. There is also no statistical difference in the intake of Vitamin A, Vitamin C, Folic acid and Phosphorus between the sexes. However, Vitamin B12 intake is higher (p=0.00) in the females (7.9µg) than the males (5.0µg). Daily Calcium intake is higher (p=0.00) among the male participants (363.5mg) daily than the females (237.08mg).

Table 4.5 Daily Nutrients Intake by Gender

Variable (nutrient)	Male Mean (SD)	Female Mean (SD)	F (P-Value)
Energy (kcal)	1423.7 (±475.3)	1346.9 (±394.1)	2.95 (0.09)
Carbohydrate (g)	173.0 (±65.1)	175.5 (±53.1)	0.18 (0.67)
Protein (g)	62.5 (±17.2)	59.85 (±24.2)	1.29 (0.26)
Fat (g)	50.2 (±16.4)	46.2 (±19.1)	4.38 (0.04)
Vitamin A (µg)	193.8 (±104.0)	194.4 (±76.7)	0.00 (0.95)
Vitamin B12 (µg)	5.0 (±2.1)	7.9(±2.7)	126.6(0.00)
Vitamin C (mg)	91.7 (±54.5)	100.7 (±45.4)	3.06 (0.08)
Calcium (mg)	363.5 (±144.8)	237.08 (±50.0)	164.07(0.00)
Folic acid (µg)	368.2 (±212.2)	339.2 (±156.1)	2.40(0.12)
Phosphorus (mg)	965.3 (±183.4)	985.76 (±364.2)	0.38(0.54)

4.3.2 Nutrient Intake by Age

Nutrient intake comparisons among different age groups are displayed in Table 4.6. Energy intake declined significantly (p=0.01) with increasing age. This trend is consistent with carbohydrate (p=0.00) and protein (p=0.01) intake but not with fat (p=0.78) intake. Intake of Vitamin A, Vitamin B12 and Phosphorus also declined as age advanced significantly at p=0.02, 0.02 and 0.01 respectively. Vitamin C, Calcium and Folic acid intake did not vary considerably with age.

Table 4.6 Macronutrient and Micronutrient Intake by Age

Variable (nutrient)	65-74 Years Mean (SD)	75-84 Years Mean (SD)	85-94 Years Mean (SD)	95-100Years Mean (SD)	F (Sig)
Energy (kcal)	1433.2 (±438.2)	1304.3 (±386.0)	1293.6 (±422.6)	1029.8 (±117.5)	4.11(0.01)
Carbohydrate (g)	184.2 (±57.5)	166.6 (±57.7)	154.9 (±47.3)	119.5 (±15.0)	6.28(0.00)
Protein (g)	63.9 (±23.6)	56.6 (±19.3)	57.4 (±20.0)	50.5 (±19.0)	3.73(0.01)
Fat (g)	48.1 (±19.2)	47.1 (±17.8)	47.1 (±16.3)	39.5 (±3.0)	0.36(0.78)
Vitamin A (µg)	182.0 (±83.9)	211.4 (±86.6)	205.2 (±92.0)	218.2 (±110.3)	3.51(0.02)
Vitamin B12 (µg)	7.25 (±3.0)	6.8 (±2.7)	5.9 (±2.5)	5.5 (±1.1)	3.49(0.02)
Vitamin C (mg)	98.8 (±48.6)	98.0 (±49.8)	94.2 (±48.6)	64.5 (±9.7)	0.74(0.53)
Calcium (mg)	271.4 (±94.9)	291.4 (±133.2)	290.8 (±118.5)	256.1 (±67.4)	1.10(0.35)
Folic acid (µg)	342.6 (±190.4)	353.1 (±147.8)	369.1 (±189.1)	344.6 (±127.1)	0.32(0.81)
Phosphorus (mg)	1023.4 (±353.3)	925.9 (±255.5)	920.7 (±233.0)	803.1 (±65.5)	3.69(0.01)

4.3.3 Nutrient Intake by Income

Table 4.7 is showing the nutrient intake among different income sources. There is a significant (p=0.00) difference in the energy, carbohydrates and protein intake among different income groups. Carbohydrate intake is rather high (205.2g) in the Good Samaritan group and lowest (159.6g) in the farming group. Though protein intake was highest (69g) in the self-employed and lowest (53.2g) in the farmers, at p=0.07, fat intake among incomes did not differ significantly. Difference in Vitamin A, Vitamin C and Folic acid intake was not significant (p>0.05) among income groups. Vitamin B12, Calcium and phosphorus intake varied considerably among the various income groups (p=0.00). Participants who depend on Good Samaritans have the highest (9.3µg) Vitamin B12 intake while those on pension pay had the lowest (5µg). Calcium intake

was rather highest (391.1mg) in the Pension pay group and lowest (239mg) in the farming group. The self-employed had the highest (1115.4mg) phosphorus intake and those on pension pay had the lowest (892.2mg).

Table 4.7 Macronutrient and Micronutrient Intake among Different Income Sources

Variable (Nutrient)	Family Mean(SD)	Farming Mean(SD)	Pension Pay Mean(SD)	Good Samaritan Mean(SD)	Self-Employment Mean (SD)	F (Sig)
Energy (kcal)	1308.3 (±373.5)	1324.6 (±516.0)	**1289.4 (±338.7)**	1408.8 (±471.8)	**1565.2** (±461.7)	7.05 (0.00)
Carbohydrate (g)	163.2 (±49.7)	**159.6 (±55.6)**	163.6 (±41.5)	**205.2 (±75.2)**	203.8 (±64.1)	11.78 (0.00)
Protein (g)	60.5 (±22.3)	**53.2 (±20.6)**	55.7 (±16.7)	53.8 (±15.8)	**69.0 (±24.0)**	5.98 (0.00)
Fat (g)	46.8 (±17.8)	47.2 (±17.3)	44.3 (±13.8)	44.1 (±23.6)	52.1 (±20.5)	2.20 (0.07)
Vitamin A (µg)	195.0 (±86.8)	218.4 (±72.0)	202.9 (±110.7)	188.1 (±78.0)	178.5 (±75.4)	1.72 (0.15)
Vitamin B12 (µg)	7.0 (±2.6)	6.7 (±3.0)	**5.0 (±2.9)**	**9.3 (±2.9)**	7.6 (±2.8)	12.68 (0.00)
Vitamin C (mg)	94.6 (±48.7)	93.5 (±41.8)	100.7 (±49.9)	97.6 (±46.8)	103.6 (±51.5)	0.66 (0.62)
Calcium (mg)	258.9 (±66.0)	**239.0 (±44.4)**	**391.1 (±194.9)**	255.5 (±117.0)	275.2 (±86.0)	21.65 (0.00)
Folic acid (µg)	347.3 (±158.0)	414.7 (±213.9)	309.6 (±180.4)	328.1 (±193.9)	349.0 (±177.3)	2.17 (0.07)
Phosphorus (mg)	957.9 (±307.3)	921.0 (±292.5)	**892.2 (±125.6)**	901.9 (±284.5)	**1115.4 (±382.4)**	6.73 (0.00)

4.3.4 Nutrient intake by Quality of Life

Table 4.8 shows correlation between QOL parameters and some nutrients intake adjusting for age and gender. Bivariate correlation between QOL parameters such as home and neighbourhood (r= 0.18, p= 0.00) and energy intake were very weak, significant and positively associated. Same can be said for correlation between home and neighbourhood and fat intake. There was very weak, inverse relationship between independence and control and vitamin B12 intake (r= -0.14, p= 0.01). Also, there was very weak, direct relationship between independence and control (r=0.12, p=0.02), home and neighbourhood (r=0.15, p=0.00) and phosphorus intake.

Table 4.8 Bivariate Correlation between Energy, Some Nutrients and QOL Parameters Adjusting For Age and Gender

Nutrients	Energy (kcal)		Carbohydrates		Protein		Fat		Vitamin B12		Phosphorus	
QOL Para-meters	r	p	r	p	r	p	r	p	r	p	r	p
Over-all	0.06	0.20	0.07	0.15	0.01	0.81	0.00	0.96	0.01	0.93	0.04	0.40
Health	-0.00	0.97	-0.02	0.72	0.06	0.22	0.02	0.64	-0.07	0.19	0.03	0.54
Social	0.04	0.38	0.02	0.75	0.01	0.80	0.03	0.61	-0.08	0.12	0.01	0.85
Independence and Control	0.14	0.01	0.09	0.09	0.13	0.01	0.11	0.04	-0.14	0.01	0.12	0.02
Home and Neighbourhood	0.18	0.00	0.12	0.02	0.11	0.03	0.16	0.00	-0.09	0.09	0.15	0.00
Psychological	0.06	0.27	0.08	0.10	0.04	0.45	-0.00	0.96	0.03	0.54	0.07	0.16
Financial	0.10	0.04	0.04	0.48	0.03	0.60	0.07	0.14	-0.12	0.02	0.04	0.47

4.4 Morbidity

Table 4.9 compares values for the health parameters between sexes. Mean FBG values between sexes show no significant difference (p=0.08). Male population have a mean of 6.3(±2.5) mmol/L and the female 6.3(±2.3) mmol/L. Also, there was no difference in the means of the SBP (p=0.60) and DBP (p=0.33) for both sexes. The female participants have a higher mean BMI of 25.7(±5.1) compared to 23.9(±4.1) for the males (p=0.00). Body fat percentage is also higher (p=0.00) in the females than the males at 34.3% (±10.2) for females and 20.5% (±9.4) for males. However, Skeletal muscle mass is higher (p=0.00) in the male population than the female with 35.2(±5.1) for males and 27.6(±5.1) for the females. As with the visceral fat, there is no significant difference between the total cholesterol, HDL and LDL values. Triglycerides are higher (p=0.03) in the female population. Females have a mean value of 1.5(±0.6) compared to 1.3(±0.6) for the males.

Table 4.9 Average Values for Health Parameters between Sexes

Variable		Mean (SD)		P-value
		Male	Female	
Fasting Blood Glucose		6.3(±2.5)	6.3(±2.3)	0.98
Blood Pressure	**SBP**	144(±21.9)	144(±23.5)	0.60
	DBP	90(±16.4)	88(±15.1)	0.33
Body Mass Index		23.9(±4.1)	25.7(±5.1)	0.00
Body Fat Percentage		20.5(±9.4)	34.3(±10.2)	0.00
Skeletal Muscle Mass		35.2(±5.1)	27.6(±5.1)	0.00
Visceral Fat		8.5(±4.9)	9.1(±3.5)	0.20
Total Cholesterol		4.9(±1.5)	5.0(±1.3)	0.56
HDL		1.6(±0.3)	1.6(±0.3)	0.88
LDL		2.7(±1.0)	2.8(±1.0)	0.39
TG's		1.3(±0.6)	1.5(±0.6)	0.03

4.4.1 Metabolic Risk

Table 4.10 compares values for the health parameters among various age groups. Mean FBG values does not vary significantly (p=0.26) with advancing age. SBP increases only marginally (p=0.05) with advancing age. For instance, SBP for the 65-74-year group is 142(±22.2) mmHg compared to 144(±21.6) mmHg in the 75-84-year group. Changes in DBP is not significant (p=0.16) across age groups. BMI decreased (p=0.00) with increasing age; the 65-74-year group have a mean BMI of 25.9(±4.9) compared to 21.7(±5.2) for the 95-100-year group. Total cholesterol, HDL, LDL and triglycerides do not differ significantly with increasing age.

Table 4.10 Average Values for Health Parameters among Various Ages

Variable		Mean (SD)				P-value
		65-74 Years	75-84 Years	85-94 Years	95-100 Years	
Fasting Blood Glucose		6.1 (±2.3)	6.6 (±2.6)	6.4 (±2.4)	5.4 (±0.7)	0.26
Blood Pressure	SBP	142 (±22.2)	144 (±21.6)	151 (±28.3)	160 (±24.2)	0.05
	DPB	88 (±13.2)	89 (±18.7)	93 (±16.3)	98 (±21.2)	0.16
Body Mass Index		25.9 (±4.9)	24.2 (±4.5)	23.6 (±4.8)	21.7 (±5.2)	0.00
Total Cholesterol		5.0 (±1.5)	5.0 (±1.3)	4.7 (±1.1)	5.5 (±0.6)	0.43
HDL		1.6 (±0.3)	1.565 (±0.3)	1.5 (±0.3)	1.7 (±0.1)	0.72
LDL		2.7 (±1.1)	2.8 (±1.0)	2.5 (±0.8)	3.1 (±0.4)	0.32
TG's		1.4 (±0.7)	1.4 (±0.6)	1.4 (±0.5)	1.6 (±0.5)	0.90

4.4.2 Hypertension, DM and Dyslipidaemia

Table 4.11 shows the prevalence of NCDs between males and females. A total of 197 (49.6%) of the participants have normal FBG results. With regards to the females, 34.5% and 18.9% are pre-diabetic and diabetic respectively, while for the males, 18.8% and 25.6% are pre-diabetic and diabetic respectively. There was no difference (p=0.56) in the systolic hypertension classification for both sexes; 229 (57.2%) participants had normal diastolic blood pressure. Though the number of females with Grade 1 diastolic hypertension was higher than the males; 65(24.5%) females versus 26(19.3%) males, the reverse was true for the sexes with Grade 2 and 3 hypertension. This difference in all grades of diastolic hypertension between the sexes was marginally statistically

significant (p=0.05). Together, the number of elderly people with Grade 1 hypertension was higher than those with Grade 2 hypertension which was also higher than those with Grade 3 hypertension (p=0.05).

Using the WHO BMI classification, 31(7.8%) participants were classified as underweight with 25 of them been females. More 78(57.8%) males were of normal weight compared to 105(39.6%) females. The prevalence of overweight and obesity was higher in the female population. 183(45.8%) of all participants were of normal weight. Overall, there were lot more overweight participants than obese participants.

There was no statistical difference between the total cholesterol, HDL, LDL and triglycerides values between both sexes.

Table 4.11 Prevalence of diabetes, hypertension, dyslipidaemias and obesity between sexes

Variable			N (%)		Total (%)	P-value
			Male	Female		
FBG						
Normal			74(55.6)	123(46.6)	197(49.6)	0.01
Pre-diabetes			25(18.8)	91(34.5)	116(29.2)	
Diabetes			34(25.6)	50(18.9)	84(21.2)	
Blood Pressure	**SBP**	Normal	57(42.2)	126(47.5)	183(45.8)	0.56
		Grade 1 HPT	47(34.8)	74(27.9)	121(30.2)	
		Grade 2 HPT	21(15.6)	43(16.2)	64(16.0)	
		Grade 3 HPT	10(7.4)	22(8.3)	32(8.0)	
	DBP	Normal	73(54.1)	156(58.9)	229(57.2)	0.05
		Grade 1 HPT	26(19.3)	65(24.5)	91(22.8)	
		Grade 2 HPT	23(17.0)	22(8.3)	45(11.2)	
		Grade 3 HPT	13(9.6)	22(8.3)	35(8.8)	
BMI						
Underweight			6(4.4)	25(9.4)	31(7.8)	0.00
Normal			78(57.8)	105(39.6)	183(45.8)	
Overweight			40(29.6)	82(30.9)	122(30.5)	
Obesity			11(8.1)	53(20.0)	64(16.0)	
Total Cholesterol						
Desirable			134(99.3)	265(100.0)	399(99.8)	0.34
Borderline High			0(0.0)	0(0)	0(0)	
High			1(0.7)	0(0)	9(0.2)	
HDL						0.18
Low			131(97.0)	262(98.9)	393(98.2)	
Normal/ High			4(3.0)	3(1.1)	7(1.8)	
LDL						
Normal			134(99.3)	260(98.1)	394(98.5)	0.34
High			1(0.7)	5(1.9)	6(1.5)	
TG's						
Normal			135(100.0)	265(100.0)	400(100.0)	0.13
High			0(0.0)	0(0.0)	0(0.0)	

Table 4.12 shows the prevalence of NCDs among various age groups. There is no significant difference (p=0.27) between the FBG groupings across various ages. A higher proportion of the elderly in various age groups have normal DBP at a significance of p=0.00). The prevalence of GRADE 1 HPT reduces as age advances while GRADE 3 HPT increases with age. BMI ranges vary (p=0.02) with age. The prevalence of underweight increases with age.

Table 4.12 Prevalence of Diabetes, Hypertension, Dyslipidaemias and Obesity among Various Ages

Variable			N (%)				P-value
			65-74Years	75-84Years	85-94Years	95-100Years	
FBG							
Normal			113(50.7)	60(49.2)	22(45.8)	2(50.0)	0.27
Pre-diabetes			72(32.3)	29(23.8)	13(27.1)	2(50.0)	
Diabetes			38(17.0)	33(27.0)	13(27.1)	0(0.0)	
Blood Pressure	**SBP**	Normal	108(48.0)	56(45.5)	18(37.5)	1(25.5)	0.12
		Grade 1 HPT	70(31.1)	40(32.5)	11(22.9)	0(0.0)	
		Grade 2 HPT	31(13.8)	18(14.6)	13(27.1)	2(50.0)	
		Grade 3 HPT	16(7.1)	9(7.3)	6(12.5)	1(25.5)	
	DBP	Normal	132(58.7)	76(61.8)	20(41.7)	2(50)	0.00
		Grade 1 HPT	54(24.0)	27(22.0)	8(16.7)	0 (0.0)	
		Grade 2 HPT	22(9.8)	8(6.5)	15(31.2)	1 (25.0)	
		Grade 3 HPT	17(7.6)	12(9.8)	5(10.4)	1 (25.0)	
BMI							
Underweight			14(6.2)	10(8.1)	6(12.5)	1(25.0)	0.02
Normal			90(40.0)	65(52.8)	26(54.2)	2(50.0)	
Overweight			75(33.3)	38(30.9)	8(16.7)	1(25)	
Obesity			46(20.4)	10(8.1)	8(16.7)	0(0.0)	
Total Cholesterol							
Desirable			224(99.6)	123(100.0)	48(100.0)	4(100.0)	0.85
High			1(0.4)	0(0.0)	0(0.0)	0(0.0)	
HDL							
Low			222(98.7)	120(97.6)	47(97.9)	4(100.0)	0.88
Normal/ High			3(1.3)	3(2.4)	1(2.1)	0(0)	
LDL			221(98.2)	121(98.4)	48(100.0)	4(100.0)	0.82
Normal			4(1.8)	2(1.6)	0(0.0)	0(0.0)	
High							
TG's							
Normal			225(100.0)	123(100.0)	48(100.0)	4(100.0)	-
High			0(0.0)	0(0.0)	0(0.0)	0(0.0)	

4.5 Comparing Nutrient Intake by FBG

Nutrient intake among the various diabetes categories is displayed in Table 4.13. Mean daily energy and carbohydrate intake increases with increasing FBG. Energy intake was highest (p=0.00) in the diabetic group followed by the pre-diabetic group and then the normal group. With a mean daily energy intake of 1524.0(±495.1) kcal, the diabetic group consumed a lot more calories than the pre-diabetic group who consumed 1358.5(±406.9) kcal daily. Similarly, fat intake also increases with FBG at a P-value of 0.04. The diabetic group consumed 51.7(±20.1)g of fat daily compared to the 47.6(±18.8)g for the pre-diabetic group. With p-values ≤0.05, vitamin B12 and folic acid intake varied among the groups. Vitamin B12 was higher in the pre-diabetic group while folic acid was higher in the Diabetic group. Intake of folic acid also increased marginally (p=0.05) with increasing FBG. Other micronutrients assessed did not vary significantly among the groups.

Table 4.13 Nutrient Intake among Various Diabetes Categories

Variable (nutrient)	Mean(SD)			P Value
	Normal	Pre-diabetes	Diabetes	
Energy (kcal)	1315.5(±389.1)	1358.5(±406.9)	1524.0(±495.1)	0.00
Carbohydrate (g)	168.3(±59.1)	174.1(±50.8)	190.2(±60.0)	0.01
Protein intake (g)	60.7(±22.3)	58.1(±22.2)	64.2(±21.4)	0.16
Fat (g)	45.7(±17.0)	47.6(±18.8)	51.7(±20.1)	0.04
Vitamin A (µg)	191.8(±90.5)	205.2(±80.8)	184.3(84.2)	0.21
Vitamin B12 (µg)	6.8(±2.7)	7.3(±3.0)	6.7(±3.2)	0.01
Vitamin C (mg)	90.2(±46.0)	104.8(±48.3)	104.0(±52.9)	0.26
Calcium (mg)	277.2(±103.6)	269.9(±118.3)	293.4(±108.9)	0.32
Folic acid (µg)	329.3(±147.5)	357.2(±174.8)	385.4(±233.0)	0.05
Phosphorus (mg)	964.4(±314.8)	966.3(±320.4)	1028.8(±311.0)	0.26

Table 4.14 presents nutrient intake among the various BMI classes. Intake of energy, carbohydrates and protein increased significantly (p=0.00) with weight. Participants in the underweight class consumed the least (1007.7 kcal) energy and those in the obesity class consumed the most (1892.8 kcal). Participants in the overweight and obesity classes consumed the most fat at 53.3g and 63.1g daily respectively (p=0.00). Between the underweight and normal BMI classes, the underweight category consumed more fat at 40.4g daily compared to the 39.5g intake for the normal category. With regards to the micronutrients, vitamin A intake significantly (p=0.00) reduced as weight increased. This was rather the opposite for Vitamin C and Phosphorus which increased significantly (p=0.00) with weight. Even though Vitamin B12, Folic acid and calcium intake varied significantly (p=0.00) among the various classes, there was no particular order in regards ascent or descent of intake.

Table 4.14 Nutrient Intake among Various BMI Classes

Variable (nutrient)	Mean(SD)				P-Value
	Underweight	Normal	Overweight	Obesity	
Energy (kcal)	1007.7 (±102.8)	1154.8 (±295.6)	1519.8 (±333.8)	1892.8 (±384.7)	0.00
Carbohydrate (g)	119.9 (±23.9)	150.4 (±55.8)	199.3 (±44.4)	223.5 (±31.3)	0.00
Protein intake (g)	43.7 (±9.5)	52.1 (±17.2)	67.7 (±20.1)	80.5 (±23.9)	0.00
Fat (g)	40.4 (±4.3)	39.5 (±11.9)	53.3 (±22.6)	63.1 (±14.5)	0.00
Vitamin A (µg)	255.0 (±62.7)	201.9 (±96.9)	178.2 (±10.0)	173.0 (±59.2)	0.00
Vitamin B12 (µg)	6.0 (±1.4)	6.7 (±2.8)	7.9 (±2.9)	6.3 (±3.0)	0.00
Vitamin C (mg)	71.8 (±17.7)	74.2 (±29.0)	124.9 (±55.1)	125.3 (±50.0)	0.00
Calcium (mg)	244.4 (±89.8)	267.7 (±109.6)	300.3 (±127.6)	292.3 (±77.0)	0.02
Folic acid (µg)	379.5 (±78.5)	320.7 (±133.6)	332.8 (±158.8)	446.2 (±288.6)	0.00
Phosphorus (mg)	782.5 (±51.2)	836.8 (±189.5)	1053.6 (±313.0)	1337.7 (±340.0)	0.00

4.6 Nutrient Intake and Dyslipidaemia

Table 4.15 presents nutrient intake among the various dyslipidaemia categories. At significant values of p=0.02 and p=0.00 respectively, energy and carbohydrate intake are higher in participants with high total cholesterol values. Protein and Fat intake do not significantly vary among the various total cholesterol categories. Calcium intake was higher (p=0.04) in the participants in the high category. They consumed 509,1mg of calcium daily compared to the 279.1mg intake of the desirable category. Intake of all other micronutrients assessed did not vary significantly (p>0.05) among the different groups.

Table 4.15 Nutrient intake among Various Dyslipidaemia Categories

Variable (nutrient)	Mean(SD)		P-Value
	Desirable	High	
Energy (kcal)	1370.3(±421.9)	2347.0	0.02
Carbohydrate (g)	174.2(±56.7)	357.0	0.00
Protein intake (g)	60.7(±22.1)	75.0	0.52
Fat (g)	47.5(±18.3)	72.0	0.18
Vitamin A (µg)	194.0(±86.8)	254.0	0.49
Vitamin B12 (µg)	6.9(±2.9)	7.2	0.93
Vitamin C (mg)	97.8(±48.7)	42.4	0.26
Calcium (mg)	279.1(±110.3)	509.1	0.04
Folic acid (µg)	348.6(±177.4)	502.4	0.39
Phosphorus (mg)	977.7(±314.5)	1428.6	0.15

4.7 Nutrient Intake and Hypertension

Table 4.16 shows nutrient intake among the various hypertension categories. Energy and fat intake varied ($p=0.01$) within various systolic hypertension groups. As with fat, Grade 2 and Grade 3 groups had the highest daily calorie intake; 1386.5kcal and 1614.7kcal respectively. Grade 2 and 3 participants consumed 48.8g and 57.2g of fat daily. Participants with normal systolic blood pressures took in more energy and fat than those with Grade 1 systolic hypertension. Carbohydrate and protein intake are not different ($p>0.05$) among the various groups. Intake of folic acid increased ($p=0.04$) with SBP but intakes of other micronutrients did not vary among the various systolic hypertension groups. Energy and Fat intake is significantly ($p<0.05$) different between the various diastolic hypertension grades. Participants with Grade 3 diastolic hypertension consumed the most energy and fat. Protein and carbohydrate intake did not differ ($p>0.05$) among the groups. Intake of all micronutrients except phosphorus varied ($p<0.05$) within the DBP groups. Vitamin A, Vitamin C and Folic acid intake

was higher in participants with Grade 3 Hypertension but Vitamin B12 intake was higher in Grade 1 and Calcium was higher in Grade 2.

Table 4.16 Nutrient Intake among Various Hypertension Categories

Variable (nutrient)	Mean(SD)								SBP P-Value	DBP P-Value
	SBP				DBP					
	Normal	Grade 1 HPT	Grade 2 HPT	Grade 3 HPT	Normal	Grade 1 HPT	Grade 2 HPT	Grade 3 HPT		
Energy (kcal)	1364.7 (±404.8)	1315.3 (±414.2)	1386.5 (±451.0)	1614.7 (±496.5)	1332.7 (±416.6)	1436.4 (±417.5)	1369.3 (±402.6)	1574.7 (±502.9)	0.01	0.01
Carbohydrate (g)	175.9 (±58.5)	167.8 (±52.9)	178.0 (±67.6)	188.5 (±46.4)	170.0 (±57.0)	187.6 (±60.8)	170.8 (±56.9)	186.9 (±48.3)	0.32	0.06
Protein intake (g)	61.7 (±22.9)	57.8 (±21.3)	60.3 (±21.5)	68.2 (±21.0)	59.1 (±22.6)	64.0 (±23.3)	64.2 (±17.3)	63.1 (±21.7)	0.14	0.23
Fat (g)	47.0 (±18.2)	44.4 (±17.5)	48.8 (±18.4)	57.2 (±19.8)	46.1 (±17.4)	49.0 (±19.1)	47.1 (±18.8)	57.1 (±19.6)	0.01	0.02
Vitamin A (µg)	191.7 (±87.1)	189.0 (±89.9)	203.6 (±85.2)	183.2 (±79.6)	197.6 (±86.0)	190.8 (±85.9)	166.4 (±101.6)	208.4 (±70.8)	0.68	0.14
Vitamin B12 (µg)	7.1 (±2.8)	7.0 (±3.2)	6.9 (±2.7)	6.3 (±3.1)	7.0 (±2.8)	7.3 (±2.9)	5.9 (±2.9)	6.7 (±3.1)	0.58	0.07
Vitamin C (mg)	96.4 (±48.1)	92.1 (±44.2)	96.5 (±49.8)	114.8 (±58.2)	94.1 (±45.4)	101.2 (±50.9)	93.5 (±54.5)	119.9 (±55.2)	0.18	0.04
Calcium (mg)	277.4 (±109.2)	267.5 (±102.4)	291.4 (±123.0)	282.1 (±50.9)	268.7 (±103.4)	291.1 (±124.9)	331.4 (±129.1)	279.0 (±90.9)	0.54	0.01
Folic acid (µg)	334.6 (±158.7)	340.6 (±189.8)	357.2 (±161.9)	439.7 (±262.8)	345.4 (±169.7)	336.6 (±163.9)	318.4 (±188.4)	452.3 (±239.2)	0.04	0.01
Phosphorus (mg)	991.1 (±334.3)	927.6 (±289.5)	986.2 (±311.5)	1073.3 (±298.0)	963.9 (±323.0)	1033.5 (±351.3)	940.4 (±187.6)	1046.9 (±302.0)	0.12	0.17

4.8 Quality of life by gender

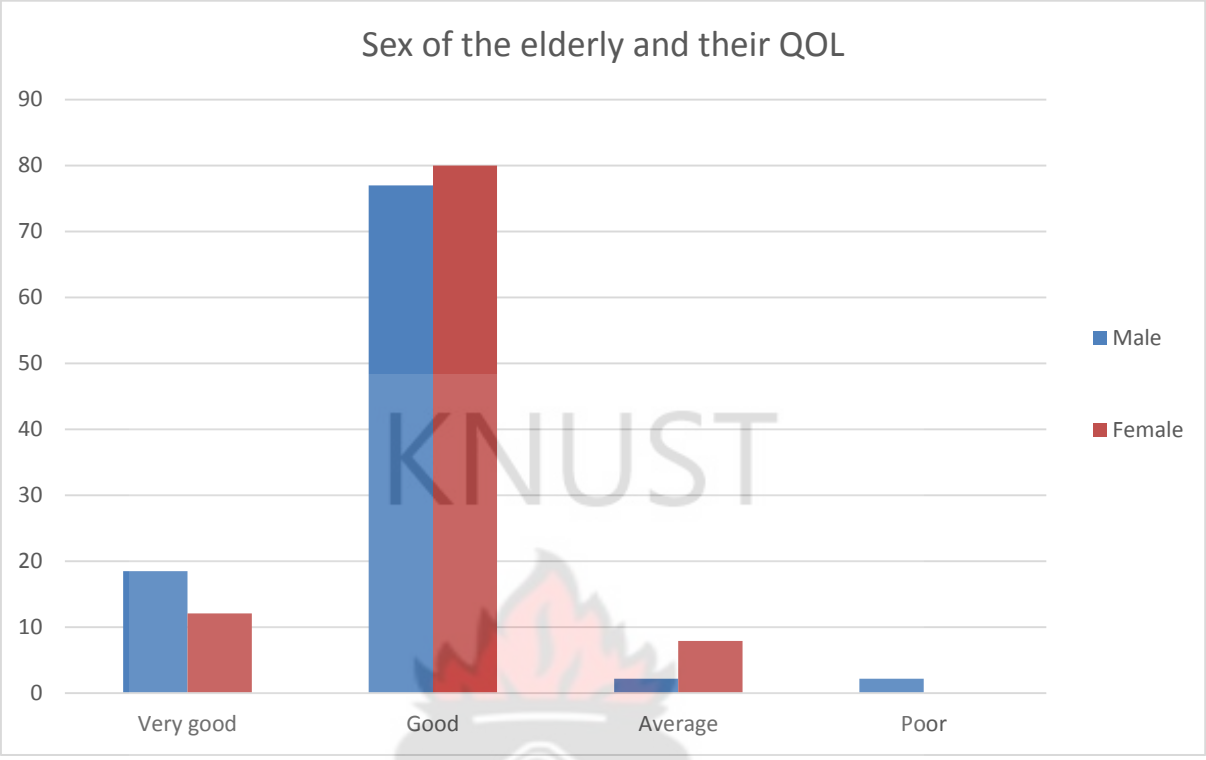
Scores obtained from QOL parameters between sexes are presented in Table 4.17. There was no significant difference (p=0.75) in the overall QOL scores in the male and female groups. Three hundred and seventy-one (92%) participants reported good overall QOL. With regards to the HRQOL, 176(44%) of the participants reported good HRQOL. However, there is a significant (p=0.00) difference in the scores for both sexes. More (41.9%) females reported to have poor HRQOL compared to the 35.6% male participants. The scores for social, independence and control, home and neighbourhood and psychological QOL scores did not vary between sexes. Financial scores differed significantly (p=0.03) between sexes; 110 (41.5%) female participants reported poor financial QOL compared to 39(28.9%) male participants. Majority of the male participants (76(56.3%)) had good financial QOL compared to 116 (43.8%) females.

Table 4.17 Scores of QOL Parameters between Both Sexes

Variable (QOL)	N (%)		chi square (p-value)
	Male	Female	
Overall			
Poor	9 (6.7)	15 (5.7)	0.6(0.75)
Average	1 (0.7)	4 (1.5)	
Good	125 (92.6)	246 (92.8)	
Health			
Poor	48 (35.6)	111 (41.9)	33.9(0.00)
Average	42 (31.1)	23 (8.7)	
Good	45 (33.3)	131 (49.4)	
Social			
Poor	26 (19.3)	53 (20.0)	0.0(0.98)
Average	20 (14.8)	38 (14.3)	
Good	89 (65.9)	174 (65.7)	
Independence and Control			
Poor	12 (8.9)	24 (9.1)	2.5(0.29)
Average	2 (1.5)	12 (4.5)	
Good	121 89.6)	229 (86.4)	
Home and Neighbourhood			
Poor	5 (3.7)	14 (5.3)	4.9(0.09)
Average	5 (3.7)	2 (0.8)	
Good	125 (92.9)	249 (94.0)	
Psychological			
Poor	74 (54.8)	162 (61.1)	1.6(0.45)
Average	37 (27.4)	65 (24.5)	
Good	24 (17.8)	38 (14.3)	
Financial			
Poor	39 (28.9)	110 (41.5)	6.8(0.03)
Average	20 (14.8)	39 (14.7)	
Good	76 (56.3)	116 (43.8)	

Figure 4.1 shows total QOL score categories between males and females. QOL was significantly different (p=0.00) between both sexes; 32 (12.0%) females scored very good QOL as compared to 25 (18.5%) males. Similarly, 212 (80.0%) females and 104 (77.0%) of males scored Good QOL.

Figure 4.1 Sex of the Elderly and Their QOL



4.9 Quality of Life by Marital Status

Scores obtained from QOL parameters among the various marital statuses are presented in Table 4.18. A lot more ($p>0.05$) divorced/separated participants reported to have poor overall QOL than married and widowed. Good independence and control scores was also highest in married and widowed participants. Poor HRQOL was highest in the divorced/separated and widowed groups. Social, home and neighbourhood and psychological QOL scores did not vary ($p>0.05$) across different marital statuses. Financial QOL was poorer in divorced/separated participants; more than half (111(60.3%) of the married participants reported good financial QOL compared to less than a fourth in the divorced/separated and widowed groups.

Table 4.18 Scores of QOL Parameters between Marital Statuses

Variable (QOL)	N (%)			chi square (p-value)
	Married	Divorced/Separated	Widowed	
Overall				
Poor	6 (3.3)	10 (13.0)	8 (5.8)	11.7
Average	4 (2.2)	0 (0)	1 (0.7)	(0.02)
Good	174 (94.6)	67 (87)	130 (93.6)	
Health				
Poor	66 (35.9)	33 (42.9)	60 (43.2)	9.7
Average	33 (17.9)	18 (23.4)	14 (10.1)	(0.04)
Good	85 (46.2)	26 (33.8)	65 (46.8)	
Social				
Poor	33 (17.9)	22 (28.6)	24 (17.3)	5.2
Average	25 (13.6)	11 (14.3)	22 (15.8)	(0.27)
Good	126 (68.5)	44 (57.1)	93 (66.9)	
Independence and Control				
Poor	6 (3.3)	12 (15.6)	18 (12.9)	19.0
Average	3 (1.6)	3 (3.9)	8 (5.8)	(0.00)
Good	175 (95.1)	62 (80.5)	113 (81.3)	
Home and Neighbourhood				
Poor	6 (3.3)	6 (7.8)	7 (5.0)	5.3
Average	2 (1.1)	3 (3.9)	2 (1.4)	(0.26)
Good	176 (95.7)	68 (88.3)	130 (93.5)	
Psychological				
Poor	111 (60.3)	44 (57.1)	81 (58.3)	0.7
Average	44 (23.9)	22 (28.6)	36 (25.9)	(0.95)
Good	29 (15.8)	11 (14.3)	22 (15.8)	
Financial				
Poor	48 (26.1)	38 (49.4)	63 (45.3)	22.9
Average	25 (13.6)	11 (14.3)	23 (16.5)	(0.00)
Good	111 (60.3)	28 (36.4)	53 (38.1)	

4.10 Quality Of Life by Income Source

Scores obtained from QOL parameters among the various current income sources are presented in Table 4.19. The overall, social, home and neighbourhood, psychological and financial QOL scores did not vary significantly ($p>0.05$) across various income sources. There was a higher percentage of poor HRQOL scores in the group who relied

on good samaritans for income. A higher number of participants (19 (48.7%)) who had their income from farming reported to have good HRQOL; followed by those who were self-employed with 44 (46.8%) participants. This was also the case for independence and control QOL. A higher number of participants who relied on good samaritans had poor independence and control while 39 (100%) and 84 (93.6%) of those who were into farming or self-employment respectively had good independence and control.

Table 4.19 Scores Of QOL Parameters among Various Current Income Sources

Variable (QOL)	N (%)					chi square (p-value)
	Family	Farming	Pension Pay	Good Samaritan	Self-Employment	
Overall						
Poor	11 (5.9)	0 (0.0)	5 (8.6)	2 (9.5)	6 (6.4)	7.4
Average	4 (2.1)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	(0.49)
Good	173(92.0)	38 (97.4)	53(91.4)	19 (90.5)	88 (93.6)	
Health						
Poor	80 (42.6)	15 (38.5)	12(20.7)	13 (61.9)	39 (41.5)	34.0
Average	26 (13.8)	5 (12.8)	23(39.7)	0 (0.0)	11 (11.7)	(0.00)
Good	82 (43.6)	19 (48.7)	23(39.7)	8 (38.1)	44 (46.8)	
Social						
Poor	27 (14.4)	6 (15.4)	14(24.1)	5 (23.8)	27 (28.7)	11.6
Average	29 (15.4)	6 (15.4)	5 (8.6)	3 (14.3)	15 (16.0)	(0.17)
Good	132(70.2)	27 (69.2)	39(67.2)	13 (61.9)	52 (55.3)	
Independence and Control						
Poor						
Average	19 (10.1)	0 (0.0)	5 (8.6)	7 (33.3)	5 (5.3)	26.9
Good	9 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)	5 (5.3)	(0.00)
	160(85.1)	39(100.0)	53(91.4)	14 (66.7)	84 (93.6)	
Home and Neighbourhood						
Poor						
Average	11 (5.9)	0 (0.0)	2 (3.4)	1 (4.8)	5 (5.3)	7.7
Good	2 (1.1)	1 (2.6)	3 (5.2)	0 (0.0)	1 (1.1)	(0.45)
	175(93.1)	38 (97.4)	53(91.4)	20 (95.2)	88 (93.6)	
Psychological						
Poor	113(60.1)	19 (48.7)	41(70.7)	15 (71.4)	48 (51.1)	9.9
Average	48 (25.5)	12 (30.8)	12(20.7)	3 (14.3)	27 (28.7)	(0.27)
Good	27 (14.4)	8 (20.5)	5 (8.6)	3 (14.3)	19 (20.2)	
Financial						
Poor	72 (38.3)	13 (33.3)	23(39.7)	11 (52.4)	30 (31.9)	5.9
Average	26 (13.8)	9 (23.1)	7 (12.1)	2 (9.5)	15 (16.0)	(0.65)
Good	90 (47.9)	17 (43.6)	28(48.3)	8 (38.1)	49 (52.1)	

4.11 Association between Morbidity and Nutrient Intake

Table 4.20 shows relationship between health parameters and nutrients intakes among the study participants. The result showed strong, significant positive correlation between dietary energy intake, (r= 0.73, p= 0.00) carbohydrate (r= 0.62, p= 0.00), protein (r= 0.52, p= 0.00) and fat (r= 0.50, p= 0.00), and body mass index. Additionally, fat intake showed very weak, significant positive correlation with systolic blood pressure (r= 0.14, p= 0.01), diastolic blood pressure (r= 0.18, p= 0.00) and serum total cholesterol (r= 0.14, p= 0.01), whereas, carbohydrate intake had very weak, significant positive correlation with diastolic blood pressure (r= 0.12, p= 0.02) Also, dietary intakes of energy (r= 0.14, p= 0.01) and carbohydrate (r= 0.12, p= 0.02) had very weak, significant positive correlation with fasting blood glucose.

Table 4.20 Partial Correlation between Health Parameters and Nutrient Parameters Adjusting for Age and Gender

Variables	Correlation Coefficient (P-Value)				
	BMI	**SBP**	**DBP**	**TOTAL CHOLESTEROL**	**FBG**
Energy (kcal)	0.73(0.00)	0.14(0.01)	0.20(0.00)	0.15(0.00)	0.14(0.01)
Carbohydrate (g)	0.62(0.00)	0.07(0.17)	0.12(0.02)	0.12(0.01)	0.12(0.02)
Protein intake (g)	0.52(0.00)	0.06(0.23)	0.11(0.02)	-0.00(0.93)	0.05(0.35)
Fat (g)	0.50(0.00)	0.14(0.01)	0.18(0.00)	0.14(0.01)	0.08(0.10)
Vitamin A (µg)	-0.24(0.00)	-0.00(0.98)	-0.01(0.84)	0.03(0.51)	-0.02(0.68)
Vitamin B12 (µg)	0.02(0.72)	0.08(0.09)	0.13(0.01)	0.05(0.37)	-0.01(0.87)
Vitamin C (mg)	0.50(0.00)	-0.07(0.14)	-0.07(0.14)	0.11(0.03)	0.07(0.17)
Calcium (mg)	0.23(0.00)	0.05(0.30)	0.08(0.13)	-0.00(0.98)	0.06(0.28)
Folic acid (µg)	0.20(0.00)	0.14(0.01)	0.14(0.01)	0.16(0.00)	0.08(0.11)
Phosphorus (mg)	0.60(0.00)	0.06(0.24)	0.13(0.01)	0.03(0.61)	0.06(0.22)

4.12 Association between Morbidity and QOL

Table 4.21 shows relationship between health parameters and QOL among the study participants. There was no significant effect on QOL and health risk parameters (p values > 0.05).

Table 4.21 Partial Correlation between Health Risk Parameters and QOL

Adjusting for Age and Gender

Variables	Correlation Coefficient (P-Value)				
	BMI	**SBP**	**DBP**	**TOTAL CHOLESTEROL**	**FBG**
QOL	0.06(0.28)	-0.03(0.60)	-0.08(0.11)	-0.00(0.10)	0.02(0.7)

4.13 Association between nutrient intake and QOL

Table 4.22 shows relationship between nutrients intake and QOL assessment among the study participants. Quality of life had very weak, significant correlation with phosphorus intake (r= 0.11, p= 0.04). Other nutrients intake measures did not show significant correlation with QOL (p > 0.05).

Table 4.22 Partial Correlation between Nutrition Parameters and QOL Adjusting For Age and Gender

Variables	Correlation Coefficient (P-Value)									
	Energy (kcal)	**Carbohydrates (g)**	**Protein (g)**	**Fat (g)**	**Vitamin A (µg)**	**Vitamin B12 (µg)**	**Vitamin C (mg)**	**Calcium (mg)**	**Folic acid(µg)**	**Phosphorus (mg)**
QOL	0.13(0.06)	0.09(0.06)	0.08(0.11)	0.07(0.19)	-0.03(0.54)	-0.05(0.33)	-0.02(0.72)	0.00(0.10)	0.07(0.17)	0.11(0.04)

CHAPTER FIVE

DISCUSSION

5.0 Demographics of the Study Population

The study found more females (66.3%) than males (33.7) with ratio 1.6: 1.0 respectively, similar to another study among older Ghanaians (Ayernor, 2012). Majority (56.3%) of the older adults were also within the 65-74-year age range with a mean age of 74.4 years; higher than the life expectancy for Ghanaians. This suggests that many older people in Ghana are living way beyond 70years old, a trend that will lead to increased dependency on the already limited available resources. Majority of the older adults depended on income they obtained from self-employment (23.5%) and pension stipends (14.5%).

5.1 Dietary Patterns of the Elderly Population

Nutrition plays significant role in the overall wellbeing of older adults (Johnson, Park, & Penn, 2008). In this study, the dietary assessment focused on intake and frequency of 6 food groups namely: milk and milk products, fat foods, salt usage, fruit and vegetables, fish and fish products, and meat and meat products. The study found that almost two-thirds (60.7%) of males and a little over a third (39.2%) of females had poor intake of milk and milk products. This observation may be due to a misconception that milk is purposely for children. This might have contributed to poor milk intake in the elderly population. In terms of usage, 9.6%, 21.5% of the male and female older adults used any of the milk products daily. Vegetable oil was the preferred cooking oil by both male (66.7%) and female (51.3%) older adults (p= 0.000). There was significant higher consumption of fried foods among male older adults (51.9%) compared to female older adults (35.1%, p= 0.000). These fried foods are likely to

contain more saturated and trans fats as deep frying is the main cooking method; this method is known to increase the amount of saturated and trans fats in foods. An increased intake of fried food could have negative influence on their blood lipids and negatively affect their health status. There was no significant difference on cooking with salt, use of table salt, fruit and vegetable consumption and intake of fish and fish products among gender (p values > 0.05). Dietary consumption pattern of meat and meat products was significantly higher among male older adults (28.1%) compared to female older adults (24.9%, p= 0.009).

5.1.1 Nutrient Intakes Adequacy of Older Adults

As people age, their nutritional intake reduces even though nutritional requirements do not in any way decrease in old age (Kromhout et al., 1990; Russell, 1992; Russell & Suter, 1993; Tur et al., 2003). Nutritional problems alter body composition, increase disease burden, reduce functional status and negatively impact social functioning. Good nutrition is associated with improving QOL and promoting health by preventing nutrient deficiencies (Amarantos et al., 2001).

In this study, total calorie, macronutrients and calcium intakes were inadequate, with similar deficits of about a third for both males and females. Inadequate total energy intake in both elderly males and females was found in a study by (McGandy et al., 1986). Intakes of macronutrients including; carbohydrates, protein and fat were inadequate for both male (carbohydrate: 41%, protein: 46.6%, fat: 35.6%) and female (carbohydrate: 26.6%, protein: 37.3%, fat: 27.5%) participants. This is consistent with the findings of various other studies and predisposes older people to nutritional deficiencies. (Marshall et al., 2001) found in their study that eighty percent of the elderly had inadequate intakes of at least four nutrients. Deficit for calcium intake is

higher in females than males with over two-thirds of females having inadequate calcium intake when compared to the RDA. This is quite similar to another study which found higher dietary calcium intake deficits in elderly females than males (McGandy et al., 1986). Milk and dairy products, fish and meat bones are good sources of dietary calcium. Older adults may not be comfortable consuming bones of fish and meat, and thus, would have to rely on dairy products for their calcium. However, the study found poor intake of milk products among older adults. This may explain the inadequacy of calcium intake among the participants. This predisposes the elderly to faster bone demineralization.

Intakes of micronutrients such as vitamin B12, vitamin C, folic acid and phosphorus were found to be in excess for both male and female participants.

5.1.2 Relationship between Nutrients Intake and QOL among Older Adults

Mean vitamin A intake was higher (p= 0.00) in older adults with good QOL, followed by average QOL, very good QOL and poor quality of life. This implies having good QOL could have influenced dietary intake of vitamin A. Quality of life had no direct influence on dietary intake of calcium.

QOL parameters such as independence and control, financial and home and neighbourhood and energy intake were very weak, significant and positively associated. This means older adults who had good independence and control, secure home and neighbourhood and were financially capable had higher energy intake. Additionally, protein and fat intake of older adults with good independent and control was very weak, significant and positively associated. This means older adults who were independent and had full control could have increased intakes of protein and fat foods

too. This is expected since such older persons are in a good position to purchase or obtain nutrient-rich foods.

5.2 Prevalence of Non-Communicable Diseases and Other Co-Morbidities among Older Adults

The result showed prevalence of diabetes, overweight, obesity was 21.2%, 30.5% and 16.0% respectively. The prevalence of diabetes was higher than an earlier study done by Ayernor, (2012) in Accra, which found 7% of older adults were diabetic. This means that prevalence of diabetes may have increased over the past 5 years. This requires appropriate health education and intervention to help curb this menace. The prevalence of diabetes was significantly higher (p= 0.01) among male participants compared to female participants. This is in contrast to the results from the SAGE Wave 1 which reported a higher prevalence of diabetes in females than males (Biritwum et al., 2015). This may also be due to differences in the population used for both studies.

As with other studies, a small percentage (7.8%) of the participants were classified as underweight (Tur et al., 2003). Overweight and obesity was significantly higher (p= 0.00) in female older adults compared to male older adults; as similarly reported by other studies (Gherbon, 2014; Gutiérrez-Fisac, López, Banegas, Graciani, & Rodríguez-Artalejo, 2004). This is undesirable since a higher prevalence of obesity and overweight is directly linked to a higher prevalence of NCDs (Amarya, Singh, & Sabharwal, 2014).

Among the three grades of high SBP and DBP, the number of participants with grade 1 systolic hypertension was higher (30.2%) than those with grade 2 (16%) and 3 (8%). Same was found for grade 1 diastolic hypertension (22.8%), grade 2 (11.2%) and grade 3(8.8%). This makes hypertension the most prevalent NCD as compared to diabetes

and dyslipidaemia. This is consistent with the findings of other studies (Ayernor, 2012; Biritwum et al., 2015). As expected, the prevalence of hypertension; particularly grade 3 systolic and diastolic hypertension increased with age (Biritwum et al., 2015).

The prevalence of dyslipidaemia including high TC, low high density lipoprotein cholesterol (HDL-C) and high low density lipoprotein cholesterol (LDL-C) was 0.2%, 98.2% and 1.5% respectively. Although, high TC and LDL-C were low among older adults, prevalence of low HDL-C could put them at risk of CVDs due to its reduced ability to mop up LDL-C for destruction in the liver (Eren, Yilmaz, & Aydin, 2012). HDL-C levels are expected to fall with advancing age as was found in another study (Wilson, Anderson, Harri, Kannel, & Castelli, 1994).

5.2.1 Relationship between Nutrient Intakes and Prevalence of Non-Communicable Diseases

Total calorie, carbohydrate and fat intakes were significantly higher among participants with diabetes compared to those in the pre-diabetes and normal groups ($p<0.05$). This may mean that the 50.4% of participants in the pre-diabetic and diabetic groups could have been as a result of intakes of calories made up of high carbohydrate and fat. Older adults who were obese had significantly higher ($p=0.00$) intake of calories, carbohydrate and fat compared to underweight, normal and overweight participants. The result also showed older adults with grade 3 systolic blood pressure had significant higher carbohydrate and fat intake compared to normal, grade 1 and grade 2 systolic blood pressures ($p= 0.01$). The same result showed older adults with grade 3 diastolic blood pressure had significant higher carbohydrate and fat intake compared to normal, grade 1 and grade 2 diastolic blood pressures ($p= 0.01$).

Furthermore, the result showed strong, significant positive correlation between dietary energy intake, (r= 0.73, p= 0.00) carbohydrate (r= 0.62, p= 0.00), protein (r= 0.52, p= 0.00) and fat (r= 0.50, p= 0.00), and body mass index.

This means increasing energy, carbohydrate, protein and fat intake could be responsible for significant increase in body mass index among participants. Additionally, dietary fat intake showed very weak, significant positive correlation with systolic blood pressure, diastolic blood pressure and serum total cholesterol, whereas, carbohydrate intake had very weak, significant positive correlation with diastolic blood pressure. This implies increasing fat intake may have influenced increased systolic and diastolic blood pressure as well as total cholesterol of participants. Furthermore, increasing carbohydrate intake could also have influenced increase in diastolic blood pressure of older adults. Also, dietary intakes of energy and carbohydrate had very weak, significant positive correlation with fasting blood glucose. This also implies that increase in dietary calorie and carbohydrate intake may be associated with increase fasting blood glucose of older adults.

5.3 Assessment of Quality of Life among Older Adults

The concept of QOL is broad and encompasses the individual's physical and mental health, level of independence, social liaisons, personal beliefs, spiritual beliefs, coping skills and connection to their environment, which may go beyond presence of disease (Devi & Roopa, 2013; Qadri et al., 2013). Among the parameters of QOL, 44.0%, 65.8%, 62.5%, 93.5% and 48.0% of the participants were rated to have good HRQOL, social QOL, independence and control QOL, home and neighbourhood QOL and financial QOL. Ageing is associated with psychological distress, and the result confirmed high poor psychological status (59.0%) among the older adults. More

females (41.9%) reported to have poor HRQOL than males (35.6%). Similarly, more females (41.5%) reported poor financial QOL than males (28.9%). Majority of the males (56.3%) had good financial QOL compared to 43.8% of females. This may explain why more females than males reported poor HRQOL since availability of funds goes a long way to influence access to healthcare services.

The study also looked at relationship between QOL and marital status. It was found that participants who were still married had good overall QOL, health, independence and control, and better financially stability than those who were divorced/separated and widowed ($p<0.05$). Quality of life was not varied by age.

5.3.1 Relationship between Overall Quality Of Life and Non-Communicable Diseases Risk Factors

There was no significant difference in QOL and body mass index, systolic blood pressure, diastolic blood pressure, total cholesterol and fasting blood glucose. This means there was not much evidence to ascertain if QOL could influence risk factors of Non-Communicable Diseases.

Additionally, there was very weak, positive correlation between QOL and intake of phosphorus. This implies that having a good QOL could influence increase intake of phosphorus. Phosphorus is needed in the energy generation pathway (ATP), which helps in energy expenditure in living organisms, thus controls satiety and obesity. This means having good QOL, which could increase in intake of phosphorus, could also influence obesity control.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.0 Conclusion

The elderly population had inadequate intakes for total calories, macronutrients and calcium compared to the RDA. The prevalence of non-communicable disease risk factors such as overweight (30.5%) and obesity (16.0%) were high among the elderly population. Among the dyslipidaemia parameters, low high-density lipoprotein cholesterol (98.2%) was observed to be higher among the elderly population.

Most participants (79%) reported a good QOL. Among the parameters of QOL, 44.0%, 65.8%, 62.5%, 93.5% and 48.0% of the participants were rated to have good HRQOL, social QOL, independence and control QOL, home and neighbourhood QOL and financial QOL respectively. More than half (59.0%) of the participants however, reported poor psychological QOL.

An increasing body mass index among the elderly population was strongly associated with increasing total calorie, carbohydrate, protein, and fat intakes. However, correlation between QOL parameters such as financial status, independent and control, neighbourhood and home, and nutrients intake such as total calorie, fat and protein were very weak and significant.

6.1 Recommendations

1. There is a need to develop a nutritional requirements database for older people in developing countries.
2. Mass nutrition screening for older people to identify those with nutritional problems.

3. Mass nutrition education older people to reduce risk for malnutrition and its consequences.
4. Policymakers need to equip health facilities with gerontologists to ensure older people receive individualized specialized healthcare.
5. Further research to better understand the risk factors of NDCs in Ghana and how these may be addressed.

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APPENDICES

APPENDIX A: Macronutrient and Micronutrient Intake between Various QOL Scores

Variable	Very Good QOL Mean (SD)	Good QOL Mean (SD)	Average QOL Mean (SD)	Poor QOL Mean (SD)	F (Sig)
Energy (kcal)	1444.5 (±482.4)	1373.2 (±421.1)	1209.2 (±288.5)	1275.3 (±122.7)	1.80 (0.15)
Carbohydrate (g)	184.5 (±64.0)	174.3 (±56.8)	157.5 (±46.9)	161.3 (±33.5)	1.34 (0.26)
Protein (g)	66.0 (±22.6)	60.1 (±22.1)	55.3 (±19.8)	68.0 (±19.1)	1.77 (0.15)
Fat (g)	45.7 (±18.1)	48.4 (±18.5)	41.5 (±16.3)	40.7 (±9.8)	1.48 (0.22)
Vitamin A (µg)	157.4 (±89.8)	201.6 (±83.5)	190.2 (±95.3)	140.8 (±152.5)	4.71 (0.00)
Vitamin B12 (µg)	6.5 (±3.3)	7.0 (±2.8)	7.1 (±3.1)	3.5 (±0.5)	1.99 (0.12)
Vitamin C (mg)	85.5 (±43.4)	100.6 (±49.7)	89.6 (±43.2)	86.8 (±63.8)	1.84 (0.14)
Calcium (mg)	290.8 (±100.2)	277.1 (±110.7)	264.8 (±110.6)	467.7 (±191.5)	3.33 (0.02)
Folic acid (µg)	322.1 (±219.8)	358.3 (±171.0)	309.7 (±137.9)	197.7 (±75.6)	1.86 (0.14)
Phosphorus (mg)	1013.7 (±338.0)	981.2 (±316.1)	872.6 (±240.1)	925.4 (±41.8)	1.18 (0.31)

APPENDIX B: Bivariate correlation between energy, some nutrients and QOL parameters

Nutrients	Energy (kcal)		Carbohydrates		Protein		Fat		Vitamin C		Phosphorus	
QOL Parameters	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**P**
Overall	0.07	0.17	0.08	0.11	0.02	0.73	0.00	0.93	-0.03	0.57	0.05	0.35
Health	0.00	0.93	-0.01	0.85	0.07	0.19	0.03	0.61	-0.02	0.68	0.04	0.48
Social	0.04	0.43	0.01	0.85	0.01	0.86	0.02	0.63	-0.06	0.25	0.01	0.91
Independence and Control	0.15	0.00	0.10	0.04	0.13	0.01	0.11	0.03	0.02	0.71	0.13	0.01
Home and Neighbour-hood	0.17	0.00	0.11	0.03	0.11	0.03	0.16	0.00	0.06	0.22	0.15	0.00
Psychological	0.05	0.29	0.08	0.12	0.04	0.47	-0.00	0.95	-0.05	0.36	0.07	0.17
Financial	0.11	0.04	0.04	0.42	0.03	0.56	0.08	0.13	-0.03	0.63	0.04	0.43