DIETARY INTAKE, MORBIDITY AND NUTRITION STATUS AMONG INSTITUTIONALIZED OLDER PERSONS IN NAIROBI CITY COUNTY, KENYA

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DECLARATION

This thesis is my original work and has not been presented for a degree or an award in any other university.

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DEDICATION

To James, Zenani, Zhanna, Zion and my dad Ombogo for supporting me morally and financially and continuing to inspire my life.

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ABBREVIATION AND ACRONYMS

BMI	Body Mass Index
DDS	Diet Diversity Score
FFQ	Food frequency questionnaire
INDDEX	International Dietary Data Expansion
KCAL	Kilo Calories
KU ERC	Kenyatta University Ethical Review Commission
LMICs	Low- and Middle- Income Countries
MNA	Mini Nutritional Assessment for the Older persons
MUAC	Mid Upper Arm Circumference
NACOSTI	National Commission for Science, Technology and Innovation
NCOA	National Council of Aging
NCPD	National Council for Population and Development
NGEC	National Gender and Equality Commission
NGOs	Non-Governmental Organization
NSSF	National Social Security Fund
OECD	Organization for Economic Co-operation and Development
RDA	Recommended Dietary Allowance
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
UN	United Nations
UN DESA	UN Department of Economic and Social Affairs
UNHCR	United Nations High Commissioner for Refugees
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Aging: A progressive biological change that happens in an organism over time which leads to decreased function and increased vulnerability.

Diet diversity: A measure of the range of different food groups in an individual's or population's diet.

Dietary intake: Dietary practices of the older persons which was assessed by meal time observations, frequency of consumption of foods and beverages, diet diversity, nutrient intake, consumption of fluids, fruits and vegetables.

Institutionalized older persons: Older adults who live in long-term care facilities or institutions rather than in their own homes or with family members.

Malnutrition: Physiological condition caused by inadequate, unbalanced, or excessive consumption of nutrients.

Mini Nutritional Assessment Tool: A tool designed specifically to identify older adults who are malnourished or at risk of malnutrition.

Morbidity markers Measurable indicators that can indicate the presence, severity, or impact of disease and ill health in a population. May be self-reported illnesses, diagnosed medical conditions, functional impairments, symptoms, or clinical indicators that reflect the burden of disease.

Morbidity: Having a disease or a symptom of disease, or to the amount of disease within a population.

Nutrition Status: Condition of an individual's health as it relates to their intake and utilization of nutrients.

Older persons: Persons aged 60 years or above (Constitution of Kenya, 2010).

ABSTRACT

Aging is associated with physiological decline and vulnerability to nutrition-related illnesses. The global increase in the older population and the high prevalence of malnutrition, including institutional settings, underscore the need to understand factors influencing nutrition outcomes among older persons. This study therefore assessed dietary intake, morbidity, and nutrition status among institutionalized older persons in Nairobi City County, Kenya. A cross-sectional analytical design was used. Two homes were purposively selected, and a proportional sample of 141 older persons aged 60 years and above was drawn. Data were collected using the Mini Nutritional Assessment (MNA), 24-hour dietary recall, and Food Frequency Questionnaire (FFQ). Quantitative data were analyzed using SPSS version 22. Descriptive statistics summarized participant characteristics, while Chi-square and regression analyses examined associations among dietary intake, morbidity, and nutrition status. Most respondents (49%) were aged 60–70 years, with 73.9% residing in the privately owned home for older persons. The mean daily energy intake was 2663.5 Kcal, (SD 1490.53) and nearly half (46.4%) had high dietary diversity. 53.6% of the participants reported suffering from various chronic illnesses such as hypertension and diabetes, while 26.1% took three or more prescription drugs daily. Using BMI classification, the MNA tool showed that 97.8% had ≥23 kg/m², with 66.7% overweight and 26.1% obese using the WHO BMI categorization. Using the MNA tool scores, 81.2% were considered malnourished, and 18.8% were at risk. Chi-square tests showed weak associations between age, institution, and nutrition status but significant associations between gender, dietary intake, morbidity, and nutrition status ($p < 0.05$). Regression analysis indicated that dietary diversity, presence of illness, and sex were strong predictors of nutrition status, with males being 2.9 times more likely to be malnourished than females. The study concludes that nutrition status among institutionalized older persons is influenced by dietary intake, morbidity, and gender which further contributes to malnutrition risk. It recommends that homes for older persons integrate diversified dietary intake with physical activity considering the number of respondents reported with high BMI. Additionally, based on the outcome of the regression analysis which revealed a significant association between sex and nutritional status where males were more likely to be malnourished than females, the study recommends qualitative research to explore underlying factors explaining this difference.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Aging is a gradual process that affects all living things as they progress towards their inherent lifespan. It is accompanied by progressive structural and functional decline, with gradual deterioration of physiological functions, an increase in vulnerability, and significant risks of various aging-related diseases (Guo et al., 2022). In the developed world, old age may mean retirement time and exit from paid employment and receipt of a pension at 60 or 65 years whereas in developing countries, old age describes persons as being 50 years and (Government of Kenya, 2010; UNHCR, 2018; World Health Organization, 2015).

The global population of the older persons is growing fast than the number of people in any other age group. Projections indicate that their numbers will increase by 56% from 901 million to 1.4 billion between 2015 and 2030. In Africa, estimates show that over the next 15 years, the older persons population will grow by 64% (UNDESA, 2015, 2017; World Health Organization, 2015). In Kenya's 2019 census, the population aged 50 and over represented approximately 6.5% of the total population, with the older persons (60 years and above) making up 6% and those aged 65 years and older accounting for 3.9% of the population (KNBS, 2022).

Due to increased physiological changes which may predispose individuals to disability or sickness (Amarya et al., 2018; Geissler & Powers, 2017) family structures and relations play a role in the informal support of older persons, (Gaugler & Kane, 2015). This may be within a family set-up or in an older persons care institution. A review on Africa’s aging showed most older persons live in rural, multigenerational households

with limited mobility and traditional care. In 2019, 96% of older persons in the United States lived in their own homes or other community-based housing due to health, emotional and cost benefits (Saffel-Shrier et al., 2019). In Kenya, there's a cultural preference for family-based care although the government has recognized the need for institutionalized services which has seen a rise in the number of older person care institutions between 2014 and 2020 to around 137 both government-sponsored and privately owned, with some charging residential fees, some as outreach centers while others relying on donations (National Council for Population and Development (NCPD), 2021; National Gender and Equality Commission (NGEC), 2016; Wan et al., 2020).

Old age presents with unique nutritional needs distinct from that of a healthy adult population with changes having nutritional consequences in dietary intake, requirements, and status. Globally, malnutrition among the older persons is growing with undernutrition and overweight/obesity predisposing them to morbidity and mortality. Recent studies indicate a prevalence of (5- 30%) of malnutrition in older community residents, with a significantly higher prevalence in hospitalized older persons at 20–60% and up to 67% in nursing homes either malnourished or at risk of malnutrition (Norman et al., 2021; Wairimu Mugo, 2018). In Sub-Saharan Africa, in terms of nutrition status, 6–48% of older persons are underweight, and 2.5–21% are overweight (Obeng et al., 2022). In Kenya, the percentage of older persons at risk of malnutrition increased from 20.1% to 29.6% in 2015 in most counties and in other studies, 39.4% of older persons were undernourished in Meru County while in Uasin Gishu, the prevalence was estimated to be at 41% (Bore et al., 2019; Munoru, 2018). Despite appropriate food service standards, institutionalized older persons may face

poor nutrition status due to individual health factors and institutional issues such as nutrition care, food quality, mealtime experiences, financial and staffing constraints, and medical care (Keller et al., 2022; Kiesswetter et al., 2020).

In this cohort, the complex interaction between dietary intake, nutrition adequacy and illness as a result of physiological, pathological, sociological, and psychological factors may negatively impact nutrition status and increase the risk of death, illness or physical decline and affect daily functioning and overall well-being (Geissler & Powers, 2017; Norman et al., 2021). Dietary intake and food choices can lead to dietary deficiencies while illness can lead to increased nutrient requirements, loss or poor absorption (Mangels, 2018). Globally, it has also been estimated that between 55% and 98% of older persons aged 60 years and over have at least 2 chronic diseases (Marengoni et al., 2016; National Council on Aging, 2025). Another study examining the age and socioeconomic distribution of diseases in Low- and Middle- Income Countries (LMICs) also noted a prevalence of multimorbidity in older persons to be 7.8% (Afshar et al., 2015). Disorders of the gastrointestinal systems are associated with poor dietary intake and malabsorption while chronic illnesses such as thyroid disorders and cardiovascular diseases may lead to unplanned weight loss through altered metabolism, decreased appetite and low-calorie intake leading to a poor nutrition status (Derbie et al., 2022; Norman et al., 2021). In addition, some diseases are treated with dietary restrictions and with medication which may alter food intake and nutrient absorption (Derbie et al., 2022; Host et al., 2016; Leslie & Hankey, 2015; Norman et al., 2021; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020).

Despite the LMICs particularly Sub-Saharan Africa (SSA) older population growing at a faster rate than was the case for today's developed countries, the health of the older persons could significantly be worse. Most nutrition problems in this group stem from dietary inadequacies although overnutrition and undernutrition related to aging and morbidity are also increasingly being observed (Motadi et al., 2022; Norman et al., 2021). Moreover, little attention is given to issues affecting older persons, as many agendas are primarily centered on opportunities for the region's youth (Aboderin & Beard, 2015). Additionally, facilities for assisted living for older persons in Africa are still in their early stages of development, with some countries lacking public policies to ensure safe living arrangements (National Gender and Equality Commission (NGEC), 2016). Similarly, even when community-level interventions exist, older persons may not always benefit due to various constraints (Mussie et al., 2022). These challenges, combined with limited data and research highlighting the health, well-being, and nutrition status of older persons, including those in institutional settings, are reflected in the few policies and programs addressing their needs (Aboderin & Beard, 2015; Adisa, 2019; Shlisky et al., 2017). Therefore, given these gaps, it is important to generate evidence to inform targeted interventions including age-responsive policies to promote older persons quality of life and overall good health and nutrition status outcomes.

1.2 Statement of the problem

Worldwide, the age group of sixty years and above is growing faster which has come with unprecedented socio-economic challenges due to the psychological, health, economic, and social needs of this population (Nature Aging, 2021). This has seen the rise of older persons' residential care facilities although this population still prefer to

live in their own homes given the relatively high cost of institutional care (Bambeni, 2022; Lu et al., 2020).

Malnutrition in older persons is a major health concern and is associated with mortality, morbidity, and physical decline, with global prevalence ranging from 50.5% in rehabilitation settings and 38.7% in older person's residential facilities. In SSA, 6–48% of older persons are underweight and 2.5–21% are overweight (Alzahrani & Alamri, 2017; Norman et al., 2021; Obeng et al., 2022). In Kenya, limited studies also reported an increase in malnutrition risk among older persons from 20.1% to 29.6% in 2015 (Bore, 2019; Munoru, 2018). The etiology of malnutrition in older persons is also complex and multifactorial with both intrinsic and extrinsic factors including inadequate food intake, food choices, illness, or a combination of these factors (Norman et al., 2021). Malnutrition may also rise with increasing comorbidity, functional dependence and in institutionalized settings, it may be aggravated by institutional factors (Stahl et al., 2023).

Despite the population's growing numbers, there's limited evidence and research on the health and nutrition status of older persons, including those in institutional settings (Aboderin & Beard, 2015; Adisa, 2019). This study therefore sought to assess the dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County, Kenya.

1.3 Justification

Aging presents with a decline in physiological functions, an increase in the risk of age-related diseases, psychological and behavioral changes including those related to social and economic factors (Guo et al., 2022). The causes of malnutrition in the older persons are complex and may be as a result of one or more or a combination of factors whose

interactions negatively affect nutrition status and increase the risk of death, illness or physical decline (Alzahrani & Alamri, 2017; Geissler & Powers, 2017; Norman et al., 2021). Studies have also shown that physiological changes in this group may affect dietary intake (Motadi et al., 2022) while co-existing morbidity is equally critical to the development of undernourishment (Marengoni et al., 2016). Global evidence shows that 55- 98% of older persons have at least 2 chronic diseases (Le Reste et al., 2015) while malnutrition is estimated at 50.5% in rehabilitation settings, 38.7% in hospitals and 13.8% in nursing homes (Alzahrani & Alamri, 2017).

In Kenya, there's minimal documentation of nutrition research conducted among the older persons nationally, however, some studies report that the percentage of older people at risk of malnutrition increased from 20.1% to 29.6% in 2015 in most counties (Bore et al., 2019; Munoru, 2018). Therefore, considering the vulnerability of this group due to the effects of aging, it is important to review dietary intake, morbidity and risk factors for malnutrition especially in institutionalised older persons and come up with strategies that can be tailored to prevent poor health and nutrition status in this group.

1.4 Research Questions

1. What are the demographic characteristics of institutionalized older persons in Nairobi City County?
2. What is the dietary intake among institutionalized older persons in Nairobi City County?
3. What is the morbidity status among institutionalized older persons in Nairobi City County?

4. What is the nutritional status among institutionalized older persons in Nairobi City County?
5. What is the relationship between dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County?

1.5 Hypotheses

H_{o1}: There is no significant relationship between dietary intake, morbidity, nutrition status and demographic characteristics among institutionalized older persons in Nairobi City County.

H_{o2}: There is no significant relationship between dietary intake and nutrition status among institutionalized older persons in Nairobi City County.

H_{o3}: There is no significant relationship between morbidity and nutrition status among institutionalized older persons in Nairobi City County.

1.6 Objectives of the study

1.6.1 Main Objective

The main objective of the study was to assess the dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County, Kenya.

1.6.2 Specific Objectives

1. To determine the demographic characteristics of institutionalized older persons in Nairobi City County.
2. To assess the dietary intake among institutionalized older persons in Nairobi City County.
3. To assess the morbidity status among institutionalized older persons in Nairobi City County.

4. To determine the nutrition status among institutionalized older persons in Nairobi City County.
5. To establish the relationship between dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County.

1.7 Delimitation and Limitation

1.7.1 Delimitation of the study

The study was conducted among institutionalized older persons in Nairobi City County therefore, generalization of the findings can only be done to other populations under a similar situation and with similar characteristics.

1.7.2 Limitation of the study

The study used a cross-sectional design and thus did not reveal dietary intake, morbidity and nutrition status among institutionalized older persons in the different times of the year.

1.8 Conceptual framework

Good health and nutrition status among the older persons are an important aspect affecting their autonomy and quality of life. Malnutrition in this group has a complex and multifactorial origin with factors such as age-associated physiological changes that increase vulnerability, decreased dietary intake, underlying medical conditions, gender, economic vulnerability, lifestyle issues, and drugs among others. These can lead to a reduction or utilization in the intake of nutrients, a progressive decline of functional autonomy, and psychological problems related to economic or social isolation (Cristina & Lucia, 2021; Rashid et al., 2020). Risk factors may occur independently or

simultaneously, interacting and influencing each other. Morbidity and inadequate dietary intake have a bi-directional relationship which creates a synergy that causes the two to benefit from each other. Nutrition deficiency may increase the risk of disease and infections and vice versa. This has a profound impact on nutrition status including the financial burden that is often associated with long-term illness (Cruz-Jentoft & Volkert, 2025; Volkert et al., 2019). To lower the risk of morbidity, the recommendation is to have a healthy lifestyle, good eating habits, physical activity, reduce tobacco use, and consistent use of preventive services This is as illustrated below;

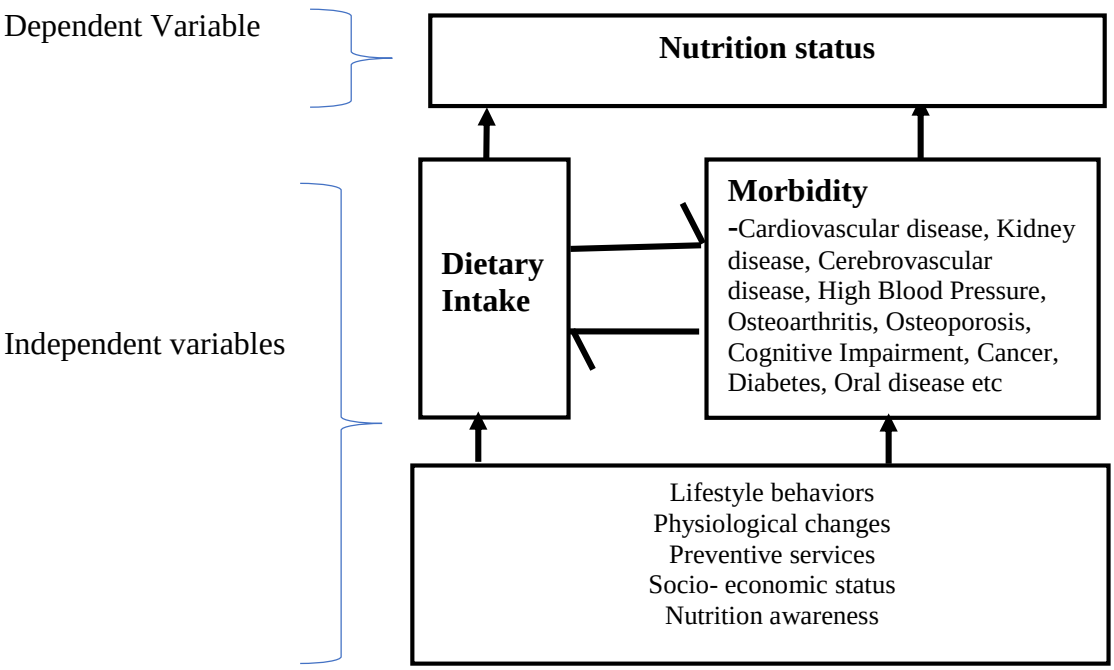

Figure 1. 1: Factors affecting the nutritional status of older persons (Adapted and modified from Determinants of Malnutrition in Aged Persons (DoMAP) model (Volkert et al., 2019).

1.9 Significance of study

The study findings will be valuable to the Government of Kenya, NGOs, donor agencies, and other stakeholders working with this group to plan and implement nutrition and health programs for the older persons. It may provide insights for further research, influence policy and practice on matters health and nutrition for older persons. The findings will also add to the body of knowledge on nutrition in the older persons.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews related literature on older person's demographic trends, dietary intake, morbidity, and nutrition status.

2.2 Aging and demographic trends among the older persons

The aging process is a progressive and irreversible series of physiological changes with time. It presents with declines in tissue and cell functions and significant increases in the risks of various aging-related diseases, psychological, behavioral, social and economic changes (Guo et al., 2022). The United Nations defines an older person as one who is 60 years and over. In most developing countries, an older person is considered as being 60 or 65 years of age and over while in developed countries, it is defined as being 50 years or over. This period is also sometimes characterized by an exit from formal employment and receipt of a pension. Additionally, different families and communities may use other socio-cultural referents to define age, including family status (grandparents) and physical appearance (Government of Kenya, 2010; *Policy on Age, Gender and Diversity Accountability 2018*, n.d.; World Health Organization, 2015).

The number of people aged 60 years and older was 1 billion and this was expected to rise to 1.4 billion by 2030 and 2.1 billion by 2050 (World Health Organization, 2019). In Africa, estimates show that over the next 15 years, older persons person's population will grow by 64% (UNDESA, 2015, 2017; World Health Organization, 2015). Kenya had an estimated total population of 53.7 million in 2020, of which approximately 2.2 million (4.2%) were people aged 60 years and older (UNDESA, 2019). The Kenyan census data however indicated that older persons represented 6% of its total population

with about 55% being females, 60% married, and over one-third widowed (KNBS, 2022). This population faces a myriad of challenges including poverty, abuse, discrimination, limited right to work among others which affect their quality of life and productivity (KNBS, 2022; National Council for Population and Development (NCPD), 2021).

The few studies conducted in Africa indicate that most older persons live in rural areas with a traditional way of families taking care of them (Gaugler & Kane, 2015) while in most developed countries, older persons live in their own homes or other community-based housing (Nature Aging, 2021; Saffel-Shrier et al., 2019). Despite the social challenges faced by older persons living in LMICs, the living arrangements within these family setups are usually helpful although they are under threat due to the impact of different social issues such as urbanization, migration, and work-related factors (Bambeni, 2022). This is similar to Kenya although the government has recognized the need for formal long-term residential care services (National Council for Population and Development (NCPD), 2021). This has seen an increase in the number of older person care institutions between 2014 and 2020 to approximately 137 although there's still a need for more to adequately serve the rising number of older persons.

2.3 Dietary intake among the older persons

Dietary intake refers to measuring and evaluating the quantity and quality of nutrients consumed by an individual or a group of people daily. It assesses food or nutrient intake and its adequacy, to establish exposure to food-borne contaminants in some cases, evaluate nutrition intervention programs, and develop nutrition guidelines for government health policy (Bailey, 2021). Aging is accompanied by many changes that

can affect dietary intake and overall, affect nutritional needs. In Africa, there's paucity in data and research studies that highlight the health and well-being of the older persons including their dietary intake (Motadi et al., 2022). Although there's a research gap, the few studies that have been done have demonstrated that dietary intake in older persons is influenced by several factors.

While there may be a reduction in energy requirements in this population, micronutrient demands remain mostly unchanged (Host et al., 2016; Leslie & Hankey, 2015) unless in the presence of chronic medical conditions that may require a modified diet (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). Dietary recommended allowances (RDA) are categorized by gender. For females, RDA for Calories is 1600 and for males is 2000 kilocalories (Kcal), percentage Kcal for protein and carbohydrates are similar across males and females at 10-35 and 45-65 respectively however there are variations in certain micronutrients such Calcium (Male: 1000mg Vs Females: 1200mg), Vitamin C ((Male: 90mg Vs Females: 75mg) among others.

Loss of appetite is a major cause of poor dietary intake in older persons and has several potential underlying causes like a decline in sensory perception, salivary dysfunction, poor oral health, various chronic conditions, psychological factors, and polypharmacy among others (Pilgrim et al., 2015). Poor oral health may also affect saliva production leading to chewing and swallowing difficulties while taste and smell that diminish with age may lead to subsequent avoidance of foods (Roy et al., 2016). Polypharmacy can cause loss of appetite, nausea, and diarrhea or reduced gastrointestinal motility, and dry mouth which negatively affects food intake (Rémond et al., 2015). Chronic diseases

that may come with aging such as respiratory disease, arthritis, stroke, depression, and dementia may also affect appetite, functional ability, or ability to swallow which may all lead to altered food intake and impairment of nutritional status (Cristina & Lucia, 2021). Reductions in energy requirements may impact the amount of food consumed which may contribute to naturally eating less and can lead to a reduction in food intake or the number of meals consumed in a day (Leslie & Hankey, 2015).

Decreased mobility, institutionalization (Schwartz et al., 2019), lack of social support (Pieroth et al., 2017), and social isolation (Boulos et al., 2017) due to the loss of close relationships may also make getting and preparing food for older adults challenging, encourage unhealthy eating behaviors and place them at risk for consuming poor diets and nutritional deficiencies. In addition, social and economic changes linked to aging may make healthy eating more difficult for older persons as they may have financial difficulties due to reduced income or increased medical expenditures (Pooler et al., 2019). Additional risk factors in an institution may include poor food service, limited choice, limited provision for cultural or religious dietary needs, limited meal times (duration), slow eating tendencies, poor presentation of food, need for supervision during feeding, unpleasant sights, sounds and smells (Stahl et al., 2023). These risk factors can lead reduced food intake and therefore calls for a critical analysis to understand how they influence dietary intake in this group.

2.4 Morbidity among the older persons

Available studies indicate that co-existing morbidity are important in the development of undernutrition. The limited studies conducted in SSA show that morbidity has increased among older adults with some having more than one condition particularly in

countries where the population is rapidly aging (Le Reste et al., 2015) and globally, it is estimated that between 55% and 98% of older persons have at least 2 chronic diseases (Marengoni et al., 2016). This has been linked to a decline in physical and mental functioning (Arokiasamy et al., 2015) and reduced quality of life (QoL). In addition, the prevalence and incidence of under nutrition among the older persons with chronic or acute illnesses is on the increase (Morley, 2014).

According to National Council on Aging (2022) research in the United States, percentage of older persons with Hypertension was (60%); Arthritis (35%); coronary heart disease (29%); Diabetes (27%); obesity at (42%); chronic kidney disease (25%) and Dementia (12%) among others. In another study examining the age and socioeconomic distribution of multimorbidity in LMICs, the prevalence of multimorbidity in older adults was noted to be fairly high at 7.8% (Afshar et al., 2015). These conditions may contribute to loss of appetite or reduce functional ability to swallow which leads to altered food intake. Mental ill health can also trigger a decrease in food intake and for the older persons already affected by moderate to severe Alzheimer disease, the tendency to forget to eat with a limited access to food could result to an impaired oral intake (Fostinelli et al., 2020).

The symptoms that may occur in high blood pressure such as confusion and nausea may affect dietary intake of the older persons (Benetos et al., 2019). Restrictions in blood sugar control among the older persons could also lead to the risk of low blood sugar which is correlated with the risk of seizures, heart attack and stroke. Manifestation of Type Two diabetes through excessive urination and thirst, unusual weight loss, extreme fatigue and hunger, nausea and vomiting may impact negatively on nutritional status.

In addition, surgery, trauma and drug therapy that trigger a variation in the digestive tract conditions and bodily nutrient requirements may have a detrimental effect on nutritional status through loss of appetite, nausea, diarrhea, reduced gastrointestinal motility and dry mouth (Leslie & Hankey, 2015). It is critical to review these factors to inform the development of strategies that aim at managing dietary adjustments in diseases but with a goal of good nutrition status among the older population.

2.5 Nutrition status among the older persons

Malnutrition in older adults has been recognized as an important health concern associated with not only increased mortality and morbidity, but also with physical decline, which has many implications for activities of daily living and quality of life (Norman et al., 2021). Although clinical malnutrition largely occurs in patients in hospitals, care situations or nursing homes, malnutrition, nutritional risk and other specific nutrient deficiencies are also a common occurrence although overlooked in community-dwelling old people (Eckert et al., 2021; van den Broeke et al., 2018).

Globally, malnutrition among older persons is increasing causing significant morbidity and mortality with recent studies showing a prevalence of 5- 30% in older community residents, with a significantly higher prevalence in hospitalized older people at 20–60% (Alzahrani & Alamri, 2017; Norman et al., 2021; Valentini et al., 2018). In SSA, 6–48% of older persons are underweight, and 2.5–21% are overweight (Obeng et al., 2022). In Kenya, there's minimal researches conducted on the nutrition status of older persons nationally. However, the few that exist report that the percentage of older people at risk of malnutrition increased from 20.1% to 29.6% in 2015 in most counties and that an estimated 39.4% and 41% of older persons were undernourished in Meru

and Uasin Gishu Counties respectively (Bore et al., 2019; Munoru, 2018).

The causes of malnutrition are multifactorial, and its development in older persons is likely facilitated by the aging process too. Age-associated physiological changes, decreased dietary intake, underlying medical conditions, economic vulnerability, lifestyle issues, and drugs among others can lead to a reduction or utilization of nutrients (Cristina & Lucia, 2021). These can lead to poor nutrition status and ultimately affect quality of life due to increased morbidity, mortality and functional impairment (Alzahrani & Alamri, 2017).

Prevention and treatment of malnutrition, nutrition assessment and screening among older persons is important. This groups presents diversity in terms of active and fit people, dependent people with chronic illnesses and age- related disabilities, and healthy golden agers among others. In nutrition assessments, the recommendation for this group is to use a combination of different methods if resources allow for purposes of validity (van den Broeke et al., 2018). Considering their vulnerability, it is therefore important to have a criterion for an early diagnosis of malnutrition, as well feasible nutritional interventions to help in delaying or preventing associated poor health and nutrition outcomes.

2.6 Summary of Literature Review

The number and proportion of people aged 60 years and older is increasing with an expectation that the number will increase to 1.4 billion by 2030 globally. Despite the social challenges faced by older persons, the Kenyan government has recognized the need for formal long-term care services which has seen an increase in the number of

older person care institutions. Aging is accompanied by many changes that can affect dietary intake. Diseases that may come with aging on the other end, may affect appetite, functional ability which may lead to reduced food intake and compromised nutrition status. Other socio- economic factors may also affect food preparation for the older persons and may encourage unhealthy eating patterns and predispose them to risk nutritional deficiencies. Studies show that morbidity has increased among older adults with global estimates between 55% and 98% of older adults having at least 2 chronic diseases which calls for the development of strategies that aim at managing dietary adjustments in diseases. Malnutrition among the older persons is growing and is predisposing them to morbidity and mortality with recent studies reporting a 23% prevalence of malnutrition. Due to the complex causes of malnutrition in this group, it is important to have an early diagnosis and come up with interventions to improve health and nutrition outcomes of this population.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Research Design

Cross-sectional analytical study design was used. This design was suitable since it describes the characteristics of the study population and the variables under the study in their normal setting at a particular point in time and therefore data was collected once (Setia, 2016).

3.2 Variables

The dependent variable was nutrition status while the independent variables were dietary intake and morbidity among the older persons.

3.3 Location of Study

The study was conducted in homes for older persons in Nairobi City County, Kenya.

3.4 Study Population

The study targeted institutionalized older persons 60 years or above in Nairobi City County. The age was purposively selected as it was consistent with the United Nations and the Constitution of Kenya's definition of an older person, (Government of Kenya, 2010; UNDESA, 2017), and because of their increased vulnerability to risk factors for under or over nutrition due to age. Age was verified by the use of national identity cards and from the institution's records if it was required.

3.4.1 Inclusion Criteria

Institutionalized older persons aged 60 years and above, male and female in Nairobi City County; institutionalized older persons aged 60 years and above who had lived in

the study area for a period not less than 6 months; and those who consented to participate in the study.

3.4.2 Exclusion Criteria

Older persons aged 60 years and above who were being supported through older persons outreach or daycare facilities; institutionalized older persons younger than 60 years; institutionalized older persons who were physically challenged as it was difficult to take accurate anthropometric measurements. This would mean using other required alternative measures that would not be consistent with the initial pre-determined anthropometric variables.

3.5 Sampling Techniques and Sample Size

3.5.1 Sample Size

Since the total population in the selected two homes was already established to be 192, the sample size was determined using the following formula (Kothari, 2004):

$$n = \frac{Z^2.p.q.N}{e^2.(N-1) + Z^2.p.q}$$

Where:

n = Desired simple size

Z = Standard variate at a given confidence level which is 1.96

p = Proportion of the target population estimated to have characteristics being measured. [50% (0.50) was used since the nutritional status of older persons in these homes was not well established]

q = Population without the characteristics being measured [1-p]; therefore (1-0.50)

e = Acceptable error, which is 0.05 (5%)

N = Total population of older persons in selected homes (192)

This resulted in a minimum size of 128. The sample size was increased by 10% to account for non-response, resulting in a required sample size of 141 respondents.

3.5.2 Sampling Techniques

Nairobi City County was purposively selected as its cosmopolitan. At the time of conducting the study, Nairobi had five older persons' care facilities, three of which did not meet the inclusion criteria. Inclusion criteria for selecting the homes were; facilities that consented and allowed access to some documents (admission lists, menus) for verification purposes and facilities that served on the basis of long-term residency for a period of six months or more. The two remaining homes were then purposively selected, one was public and the other one was privately owned. The total population in the selected homes was 192. Out of 192, home A had 140 while home B had 52 older persons respectively. The study used proportionate allocation to determine the number of participants from each home using the formula below.

Key

Home A= Institution A for the older persons

Home B= Institution B for the older persons

Formula;

$$n_i = \frac{N_i}{N} \times n$$

Where:

N = the total population size (192)

N_i = Population size for each home (Home A = 140, Home B = 52)

n = Study sample size (141)

n_i = Home sample size

Therefore, the sample size for Home A = $n_1 = \frac{140}{192} \times 141$ = **103**

The sample size for Home B = $n_2 = \frac{52}{192} \times 141$ = **38**

Using simple random technique, and from a random start, 103 older persons from home A and 38 older persons from home B were selected to form the sample size. This ensured that each institution's sample size was directly proportional to the population size of the entire population of the two homes.

3.6 Data Collection Tools

A researcher administered questionnaire was used to collect dietary intake, morbidity, and demographic characteristic data of the older persons. Dietary intake was collected using a food frequency questionnaire and a 24-hour recall. An observational checklist was used to observe certain physical attributes of food, servings, and the meals that were served in a day in each home for all the respondents. Medical and physiological data was collected using a modified Mini Nutritional Assessment (MNA) tool. The MNA is an assessment tool that can be used to identify older persons (60 years or above) who are at risk of malnutrition (Guigoz & Vellas, 2021). It has two components: screening and assessments. The scores, denoted by malnutrition indicator ranged from; 24- 30 points (normal nutrition status), 17- 23.5 (At risk of malnutrition) and less than 17 points as malnourished**.** The scores supplemented other information such as other health factors, preferences, social needs and their influence on nutrition status of the older persons.

3.7 Pre- Testing

The study tools were tested for validity, accuracy and clarity before the actual study on a selected 10% of the sample size from the sampled institutions in Nairobi City County. Eleven (11) and three (3) older persons were proportionately selected from home A and B respectively. During the study, Nairobi City County had only five elderly care facilities, and after applying the inclusion criteria for selecting homes to be included in the study, only two were available for both pretesting and the main study. The pretesting procedures involved the collection of data for anthropometric measurements, dietary intake, Mini Nutritional assessment, and an observational checklist. This was followed by questionnaire completeness checks, data entry, cleaning and analysis to verify if they produced the intended results and if the procedures were same to those that were to be used in the actual study. Thereafter, data collection tools were revised. The pretest participants were also excluded from the main study.

3.7.1 Validity

Validity of the tools was assessed by experts in the field including the university supervisors who are specialized in Food, Nutrition and Dietetics related research. They individually examined the questionnaire; and provided feedback and recommendations which were included in the final tools. The tools were also validated by KUERC before data collection.

3.7.2 Reliability

A test-retest method was used to test consistency in producing similar results. The sample of the pre-test comprised 14 older persons who were selected randomly from the study area. The questionnaire was administered to the same group of respondents after a week. Correlation was made between the answers obtained both times and a

correlation coefficient of 0.91 was obtained. According to Piedmont (2014), a correlation coefficient of above 0.70 is considered acceptable. The pre-test respondents were encouraged to give comments and suggestions about the questionnaire.

3.8 Data Collection Techniques

3.8.1 Recruitment and training of research assistants

The study recruited 4 research assistants who were selected from the community. Criterion for their selection included a degree in health or Nutrition related course, familiarity with Kiswahili, English and any other one local language, culture, administrative units, working with institutionalized older persons and previous experience in nutrition research or studies. The research assistants went through a comprehensive three-day training facilitated by the researcher which covered key concepts such as use of anthropometric equipment, 24- hour recall, FFQ and MNA tools, practical exercises using training aids, role plays and pre-testing of the questionnaires. During role plays, the responses recorded by the research assistants were compared to those recorded by the investigator and feedback was given to the assistants on areas that required improvement. Additionally, the training content also covered ethics in research, data collection techniques, overall content of the questionnaire, objectives of the study and content validity to ensure that all elements were within the measurement procedures as well as maintaining their relevance.

Furthermore, with consent and guidance from the institutions' administration, institution staff supported with translating in cases of language barrier during data collection, assisted older persons during collection of anthropometric data, physical support and access to any additional information if it was needed.

3.8.2 Anthropometric data collection for the older persons

Weights and heights were taken using standard procedures (World Health Organization, 2016). Heights for bed or wheelchair-bound older persons and those with bent backs, arm span measurement was used. Weight was measured to the nearest 0.1 kg and height to the nearest 0.1cm. MUAC was measured using a flexible tape. Tool used is annexed as (Appendix II- Part A).

3.8.3 Dietary intake data collection for the older persons

A food frequency questionnaire (FFQ) was used to find out the frequency of consumption of food items or beverages over a reference period. The FFQ recall periods vary greatly typically ranging from 7 to 30 days although some are as long as 12 months (INDDEX Project, 2022; National Institutes of Health, National Cancer Institute, 2022). Dietary patterns take time to develop and to report the "usual intakes", the study arbitrarily chose a 6 months' recall period as the time within which the respondents were required to report what they mostly consumed. Respondents were also interviewed using 24-hour recall about food and beverage consumption during the preceding 24 hours. In addition, an observational checklist was used to observe certain physical attributes of food, servings, and the meals that were served in a day in each home. With consent, third-party support was sought in cases of memory loss, inability to speak or deafness. Any additional information was obtained with permission from the homes' administration. The tools used are annexed as (Appendix II- Part B).

3.8.4 Morbidity data collection for the older persons

Morbidity data was collected using the Mini Nutritional Assessment tool which had specific questions on presence of illness, questions on common illnesses within this cohort that the respondents were to mention if they had or not, and information on whether the respondent was on any prescription drugs and how many, had pressure sores or ulcers and their mode of feeding. Any additional information was obtained with permission from the homes' administration. The MNA tool is annexed (Appendix II- Part C).

3.9 Data Analysis

For anthropometric measures, Mid-Upper Arm Circumference (MUAC) cut-off used was: Women; (<19.0 cm) underweight; (20.0- 21.0 cm) moderately malnourished and above 21.0 cm for normal. For men; (<20.0 cm) underweight; (20.0- 21.0cm) moderately malnourished, and above 21.0 cm for normal. Nutrition status of the older persons was determined using MUAC, Body Mass Index (BMI) from weight and height, and the Mini Nutritional Assessment (MNA) tool. MUAC was measured at the midpoint of the upper arm, with values <21 cm indicating malnutrition and ≥22 cm suggesting adequate status. BMI was calculated as weight divided by height squared (kg/m^2) and using WHO cut-offs, <18.5 denoted underweight, 18.5–24.9 normal, ≥25 overweight, and ≥30 obese (World Health Organization, 2016). The MNA tool, which incorporates anthropometric, dietary, health, and subjective indicators, classified respondents as well-nourished with BMI of 21- <23 and those overweight, a BMI of ≥23 (Guigoz & Vellas, 2021).

Portion sizes of foods consumed reported during 24-hour recall were estimated using standard household utensils, food models, life-size graduated photographs, and standard weight for foods that were served as units such as slices of bread. The portion sizes were collected in volumes and then converted to gram amounts or amounts in a standard unit (ml for liquids). 24-hour recall data was analyzed using Nutrisurvey. In addition, to measure dietary intake, the study used a Household Dietary Diversity Score (HDDS) measure which reflects the nutritional quality of the diet for a specific individual, and used the 24-hour recall of food items eaten, grouped the food into 16 categories, and defined a minimum dietary diversity as consuming at least three out of the 16 food groups.

Coding the filled questionnaires, data entry, cleaning and checks were conducted for completeness of the questionnaires. Quantitative data was analyzed using SPSS version 22. Data quality was done by conducting consistency and range checks. Frequencies were used describe the characteristics of the sample. Regression analysis, Chi-Square and odds ratio were conducted to test the relationship between dietary intake, morbidity and nutrition status. Qualitative data was analyzed thematically. Data was presented in tables.

3.10 Logistical and ethical considerations

Before conducting the research, the faculty reviewed and provided guidance to the proposed study. Approval from the Graduate School and Ethical Clearance from the Ethical Review Commission (Kenyatta University Ethical Review Commission (KU ERC) was also sought. A research permit was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI). Authorization was also sought from the County Government of Nairobi and the older persons institutions' local

administration. The questionnaire was administered to respondents upon obtaining their informed consent. Additional consent and permission were sought from the administration if the researchers required third-party assistance from the institution staff. Participants were guaranteed confidentiality of the information they gave and that it was to be used for purposes of the study only. The consent form (Appendix I) and Ethical approvals (Appendix V) are annexed.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter gives the analysis and interpretation of data gathered in line with the objectives of the study. The main purpose of the study was to assess dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County. The study was carried out in homes for older persons in urban and semi-urban settings in Nairobi City County. The response rate was 100% of the calculated sample size.

4.1 Demographic characteristics of institutionalized older persons in Nairobi City County

The study looked at only three demographic characteristics; Age, Sex and Older persons institution. Most respondents fell within the age range of 60-70 years. There were more males (55.8%) than females while most of them were from the privately owned home A for the older persons (73.9%) as shown in table 4.1.

Table 4.1: Demographic characteristics of institutionalized older persons in Nairobi City County

	Characteristic	Frequency N = 138	%
Age	60 – 70 yrs	68	49
	71-80 yrs	48	35
	>81 yrs	22	16
Sex	Male	77	55.8
	Female	61	44.2
Older persons Institution	Home A	102	73.9
	Home B	36	26.1

4.2 Dietary intake among institutionalized older persons in Nairobi City County

Dietary intake data was collected using 24-hour recall for food and drinks taken in the preceding 24 hours, a FFQ to determine the frequency of consumption of foods and beverages over a recall period of the last six months, an observational checklist to observe certain physical attributes of food, servings, and the meals that were served in a day in each home, and the use of the MNA tool for specific food consumption markers.

4.2.1 Meal time observations among institutionalized older persons in Nairobi City County

To assess the meals served and eaten by older persons within the institution in a typical day during data collection using an observational checklist, results indicated 81.2% consumed one meal, 13.0%, two meals, 4.4%, three meals while 1.4% consumed four meals. Although the homes had a general menu with scheduled meal times for breakfast, lunch and dinner, respondent's preferences in terms of time when they wanted to eat, the quantity of food they desired to be served, special meals, incoming well- wishers with diversified dry foods and fruits that were distributed through the administration, and food from relatives including own purchases contributed to differences in the amounts and types of food each person consumed. This meant that respondents had varied foods consumed and in different quantities.

Additionally, 94.2% were able to eat their food while 5.8% declined to eat at the time of data collection. Findings further showed that 63.8% of the older persons indicated that the meals served were appropriate and of good quality against 32.6%. Other characteristics of food that were sought in this study found that 50.7% of the

respondents appreciated food that was served hot against 49.3%. This is shown in Table 4.2.

Table 4.2: Meal time observations among institutionalized older persons in Nairobi City County

Observation	Response	n= 138	%
Quality of meal served	Good	88	63.8
	Poor	50	36.2
Finishing food	Yes	108	78.3
	No	30	21.7
Refusal to eat	Yes	8	5.8
	No	130	94.2
Spitting out food	Yes	2	1.4
	No	136	98.6
Appetite	Yes	128	92.8
	No	10	7.2
Posture while eating	Upright with head inclined forward	126	91.3
	Not upright	12	8.7
Temperature of food preference	Hot	70	50.7
	Warm	68	49.3
Aesthetic appeal of food	Good	42	30.4
	Average	84	60.9
	Bad	12	8.7
Quantity/ Serving size of meal (Adequate)	Yes	122	88%
	No	16	12%

4.2.2 Frequency of consumption of foods and beverages among institutionalized older persons in Nairobi City County

This study also sought to find out how often certain types of foods and beverages were consumed by the older persons in the sampled homes to determine the respondent's dietary patterns over a six months' period using FFQ. Table 4.3 gives a general overview of the frequency reporting of specific foods by food category.

A significant number of respondents reported having consumed table sugar at 71%. In the Cereals, carbohydrates, and starch food category, porridge had the highest reporting of daily consumption at 56.5% compared to Githeri at 72.5% reporting as never consumed. Further analysis also indicates that cereals, carbohydrates, and starch were the most provided for with porridge having a mean of 4.55 (SD 2.97) followed by white rice at 2.71 (SD 2.22).

Under the Dairy food group, low-fat milk reporting was comparable across most consumption frequency categories with a mean of 2.35 (SD 2.83). The consumption of fruits was however dependent on seasonality with the widely consumed being ripe bananas at 57.9%, one to three times per week. The same was the case with Meats, Meat products, and Eggs in which category, beef was the most provided with a mean of 0.70 (SD 1.04).

Table 4.3: Frequency of consumption of foods and beverages among institutionalized older persons in Nairobi City County

		Frequency of consumption (n=138)			
Food Group	**Food item**	Daily (7 times a week)	Frequently (4-6 times a week)	Sometimes (1-3 times a week)	Never
Cereals, carbohydrates and starch	Ugali	.	.	94%	6%
	Porridge	57%	6%	17%	20%
	White bread	.	22%	41%	38%
	Whole bread	3%	9%	20%	68%
	White rice	15%	12%	54%	20%
	White Chapati	1%	.	46%	52%
	Githeri	2%	3%	23%	73%
	Mandazi	9%	6%	35%	51%
Roots & Tubers	Sweet Potatoes	2%	.	13%	86%
	Green Bananas	.	.	10%	90%
Dairy	Low fat milk	25%	.	33%	41%
Meats, Meat Products & Eggs	Beef	.	3%	45%	52%
	Eggs	.	.	29%	71%
Legumes	Beans	15%	17%	48%	20%
	Green grams	4%	9%	54%	33%
Vegetables	Kales	10%	16%	32%	42%
	Cabbage	1%	9%	39%	51%
	Spinach	3%	9%	25%	64%
	French Beans	.	6%	35%	59%
Fruits	Ripe Banana	1%	10%	58%	30%
Sugar, Alternatives, Sweets	Table sugar	71%	3%	4%	22%
Beverage	Soda	.	.	20%	80%
	Juice	.	.	1%	99%
Spreads	Margarine	1%	.	1%	97%

Further analysis of 24- hour recall data was conducted to give a qualitative overview of the dietary intake which reflects access to diverse food groups and is also an indicative measure of nutrient adequacy of the diet of the respondents. To calculate diet diversity, the study considered 16 food groups, and the scores across the different groups are shown in (Appendix IV). Cereals, oils and fats, legumes, nuts and seeds, and fruit food groups had the highest reporting at 138, 138, 122, and 102 out of 138 respondents. Low dietary diversity was considered as eating ≤ 3 food groups; Medium as eating 4 -7 food groups and high as eating ≥ 8 food groups. In terms of ranking, 46.4% of older persons had high diet diversity scores, followed by 44.9% who had moderate and 8.7% who had low diet diversity scores.

The analysis further highlighted the adequacy of individual diets consumed by the respondents and their quantities in the past 24 hours which was useful in providing estimates of the mean intake of foods and nutrients, and also giving an overview of the diet diversity within the homes as highlighted in Table 4.4. The energy consumption across the subset population indicated a mean of 2663.5 (SD 1490.53) Kcal across the homes. Overall, the analysis shows a high energy intake. For the macronutrients, the means were Protein- 77.1g (SD 41.47), fat- 32.3g (SD 19.93), and Carbohydrates- 580.3g (SD 329.40) while the micro-nutrients were Vitamin A- 556 µg (SD 605.95), Calcium- 367mg (SD 191.35), Iron- 53.8mg (SD 58.99) and Vitamin C- 80.6mg (SD 56.74).

Table 4.4: Nutrient intake among institutionalized older persons in Nairobi City County

Nutrient	Mean Intake	Recommended Dietary Allowance (RDA)	
		Male	**Female**
Energy	2663.5 Kcal	**2000- 2800 Kcal**	1600- 2200 Kcal
Protein	77.1g	1.0- 1.5g/kg body Wt	1.0- 1.5g/kg body Wt
Fat	32.4 g	**20-35% of total calories**	**20-35% of total calories**
Carbohydrates	580.3 g	45-65% of total calories	45-65% of total calories
Vitamin A	557 µg	900 µg	700 µg
Calcium	367.2 mg	1200 mg	1201 mg
Iron	53.8 mg	8 mg	9 mg
Vitamin C	80.6 mg	90 mg	75 mg
Zinc	2.9 mg	11 mg	8 mg
Vitamin B6	0.5 mg	1.7 mg	1.5 mg

In terms of selected consumption markers for protein intake, all the respondents reported having at least consumed a protein with a mean intake of 77.1g (SD 41.47) which is above the recommended dietary allowance of 1.0 - 1.5g/kg body weight as shown in Table 4.4. Results obtained using the MNA tool indicated that the common sources of protein include dairy products, eggs, legumes, fish, meat and poultry. The MNA tool is annexed as (Appendix II- Part C).

For the consumption of fluids such as water, cold and hot beverages, 63.8% consumed < 3 cups while 36.2% consumed more than 5 cups. On average, men consumed more

fluids compared to women at 2.8 and 2 liters per day respectively. Furthermore, 60.9% of the older persons indicated not having consumed >2 servings of fruit or vegetables in a day compared to 39.1% who did. Reported fruits and vegetables included: Kale, Cabbage, Spinach, French Beans, Ripe Bananas, Citrus Fruits, and Avocado. Women consumed more fruits and vegetables compared to men at 63.7 and 37.3 percent respectively. Home A for the older persons provided a fruit serving once a week whereas Home B for the older persons only served a fruit when it was available. Additionally, if well-wishers walked in with dry food and fruit donations to any of these homes, the fruits were redistributed through the administration. Occasionally, a few of the older persons reported eating a fruit that they individually purchased or was brought in by a visiting relative or friend. Vegetable portions were served as part of the main meal depending on availability or seasonality.

4.3 Morbidity status among institutionalized older persons in Nairobi City County

Objective three sought to assess the morbidity status of institutionalized older persons in Nairobi City County. These comprised of common illnesses such as cardiovascular diseases, diabetes, hypertension, mental illness, musculoskeletal disorders, neurological diseases, oral diseases, and respiratory diseases among others. Respondents were asked to mention whether they had any of the listed common illnesses in the last 6 months. Results of the analysis showed that 53.6% of the total population indicated suffering from various illnesses such as asthma, oral diseases, osteoporosis, hypertension, and diabetes among others as indicated in Table 4.5.

Table 4.5: Presence of illness among institutionalized older persons in Nairobi City County

Presence of illness	n=138	%
Arthritis	6	4.3%
Diabetes	16	11.6%
Hypertension	22	15.9%
Stroke	4	2.9%
Dementia	3	2.2%
Osteoporosis	4	2.9%
Oral diseases	11	8.0%
Asthma	8	5.8%

4.3.2 Assessment of morbidity markers among institutionalized older persons in Nairobi City County

Table 4.6 summarizes the distribution of morbidity markers among institutionalized older persons in Nairobi City County, highlighting variations in food intake, mobility, weight changes, medication use, psychological stress, feeding ability, and neuropsychological status. These further augmented the presence of morbidity among in the study sample. 62.3% of respondents reported a moderate decrease in food over the past three months. Most participants, at 93.5% were mobile, while 1.4% were bed- or wheelchair-bound. About 64.5% reported a 1–3 kg weight loss, and a quarter took more than three prescription drugs daily. Majority of the respondents, at 97.1% could feed independently, while 37.7% had reported neuropsychological problems.

Table 4.6: Assessment of morbidity markers among institutionalized older persons in Nairobi City County

Assessment		n = 138	%
Food intake decrease over the past 3 months	Severe Decrease	17	12.3
	Moderate Decrease	86	62.3
	No Decrease	35	25.4
Mobility	Bed/Wheelchair bound	2	1.4
	Able to get out of bed but not out	7	5.1
	Goes out	129	93.5
Weight loss in the last 3 months	Weight loss >3kg	24	17.4
	Weight loss (1 – 3kg)	89	64.5
	No weight loss	11	8
	Do not know	14	10.1
Takes more than 3 prescription drugs/day	Yes	36	26.1
	No	102	73.9
Psychological stress or acute disease in the past 3 months	Yes	87	63
	No	51	37
Mode of Feeding	Able to feed on their own	134	97.1
	Unable to eat without assistance	4	2.9
Neuropsychological problem	Severe dementia or depression	2	1.4
	Mild dementia	52	37.7
	No psychological problem	84	60.9

4.4 Nutrition status among institutionalized older persons in Nairobi City County

In terms of nutrition status, findings obtained using the MNA tool indicated that 97.8% of the sampled older persons had a body mass index (BMI) of ≥ 23 kg/m2. Using WHO

BMI categorization reference, 66.7% were categorized as overweight, 26.1% as obese, and 7.2% as normal. A further screening using MUAC indicated that 98.6% had a reading >22 cm compared to 1.4% that had a reading of < 21 cm. On the respondent's view about their nutrition status, 53.6% viewed themselves as having no nutrition problem. The results of nutrition status are highlighted in Table 4.7. Despite many of the respondents viewing themselves as having no nutrition problem, they were asked to compare themselves with other older persons of similar age and describe how they considered their overall health. In view of this, 42% indicated that their health was good and 31.9% felt that their health was not as good as compared to that of other older persons of similar age.

Table 4.7: Nutrition status among institutionalized older persons in Nairobi City County

Assessment	Reading	n=138	%
BMI (MNA tool ref)	21-<23 kg/m2	3	2.2
	≥ 23 kg/m2	135	97.8
MUAC	≥22 cm	136	98.6
	< 21cm	2	1.4
BMI (WHO ref)	18.5-24.9 (Normal)	10	7.2
	≥ 25.0 (Overweight)	92	66.7
	≥ 30.0 (Obese)	36	26.1
Self-view of Nutrition status	As malnourished	30	21.7
	Uncertain of nutrition status	34	24.6
	As having no nutritional problem	74	53.6
Respondents' comparison of health with other older persons of the same age	Not as good	44	31.9
	As good	58	42
	Better	36	26.1

In addition, using the MNA tool, the analysis sought to present the screening score in categories that align with the different severity levels of malnutrition. Overall, the total aggregated assessment score for malnutrition indicator using the MNA tool showed that 81.2% of the respondents were malnourished compared to 18.8% who were at risk of malnutrition. This is shown in table 4.8.

Table 4.8: Total assessment malnutrition indicator score using MNA tool among institutionalized older persons in Nairobi City County

Malnutrition indicator score	n=138	%
Malnourished	112	81.2
At risk of malnutrition	26	18.8

4.5 Relationship between demographic characteristics, dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County

The study also sought to establish the association between demographic characteristics, dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County. The analysis is highlighted below.

4.5.1 Relationship between dietary intake and demographic characteristics among institutionalized older persons in Nairobi City County

To establish the association between dietary intake and the demographic characteristics of the respondents, a chi-square test was done and the results are presented in Table 4.9. There was no significant association between the participants' dietary intake and their age (P value = 0.081), and their institution (P value = 0.145). This meant that there

was a weak association between these variables and as such, participants' dietary intake was not determined by their age or the institution. However, there was a significant association between the participants' dietary intake and their sex (P value = 0.007). To further elaborate on the magnitude and dimensions of the relationship between dietary intake and sex, a regression analysis test was done and the results are highlighted in Table 4.10.

Table 4.9: Association between dietary intake and demographic characteristics among institutionalized older persons in Nairobi City County

Demographic characteristic	$\chi 2$	df	P – value
Age	8.299	4	0.081
Sex	9.931	2	**0.007**
Older persons Institution	3.861	2	0.145

Results shown in Table 4.10 are consistent with those of the chi-square test which indicated that the relationship between the participants' dietary intake and their sex is significant (P value = 0.024, df= 1, OR= 11.0). These results also indicate that males were 11 times more likely to be malnourished in comparison to females (OR = 11.0; CI, 1.372-88.188). The Mean DDS between males and females was significantly different with females having a higher DDS (7.75) as compared to that of males DDS (6.64).

Table 4.10: Regression analysis for dietary intake and sex among institutionalized older persons in Nairobi City County

DDS Category		df	Sig.	OR	95% Confidence Interval	
Low dietary diversity	Male	1	**0.024**	11	1.372	88.188
	Female	0	.	.	.	.
Medium dietary diversity	Male	1	0.196	2	0.7	5.716
	Female	0	.	.	.	.

4.5.2 Association between morbidity status and demographic characteristics among institutionalized older persons in Nairobi City County

Results of the cross-tabulation of variables as indicated in Table 4.11 shows that there was no difference in the number of those who had some form of illness and those who did not have in the 60-70 years age bracket. However, the percentage of those with illness increased to 56% in the 71-80 years age bracket and to 59% percent in the respondents who were above 80 years.

In addition, 56% of males reported suffering from illness compared to female older persons at 51% and in terms of the institution, home B had 61% older persons reporting to have some form of illness. To determine if there was any association between demographic characteristics and presence of illness, a Chi- square test was conducted.

Table 4.11: Tabulation of morbidity and demographic characteristics among institutionalized older persons in Nairobi City County

		Presence of Illness (n=138)	
		Yes (%)	**No (%)**
Age Categories	60 – 70 yrs	50	50
	71 – 80 yrs	56	44
	≥ 80 yrs	59	41
Sex	Male	56	44
	Female	51	49
Older persons Institution	Home A	51	49
	Home B	61	39

4.5.2.1 Association between presence of illness and demographic characteristics among institutionalized older persons in Nairobi City County

Table 4.12 shows that there is no significant relationship between the presence of illness and the age of the older persons (P value = 0.685). Similarly, the analysis showed that there is no significant relationship between the presence of illness and the sex of the older persons (P value = 0.558) and, no significant relationship between the presence of illness and the home in which the older persons lives (P value = 0.335).

Table 4.12: Association between presence of illness and demographic characteristics among institutionalized older persons in Nairobi City County

Demographic characteristic	**$\chi 2$**	**OR**	**P – value**
Age	0.757	2	0.685
Sex	0.343	1	0.558
Older persons Institution	1.09	1	0.335

4.5.3 Nutrition status and demographic characteristics among institutionalized older persons in Nairobi City County

The study findings showed that 77.9% males were malnourished compared to females at 50.8%. In addition, screening results obtained using the MNA tool also showed that an average of 65.9% of the sampled older persons in both homes were malnourished. This is as highlighted in Table 4.13. To ascertain the nature of the association between the demographic characteristics of the older persons and their nutrition status, a chi-square test was done and the results highlighted in Table 4.14.

Table 4.13: Tabulation of nutrition status screening score and demographic characteristics among institutionalized older persons in Nairobi City County

		Screening Score Categories (n=138)	
		Malnourished (%)	**At risk of malnutrition (%)**
Age Categories	58 – 70 yrs	64.7	35.3
	71 – 80 yrs	62.5	37.5
	≥ 80 yrs	77.3	7.4
	Total	**65.9**	**34.1**
Sex	Male	77.9	22.1
	Female	50.8	49.2
	Total	**65.9**	**34.1**
Older persons Institution	Home A	61.8	38.2
	Home B	77.8	22.2
	Total	**65.9**	**34.1**

Results of the chi-square test indicated that there was no significant relationship between the age of the older persons and their nutrition status (P value = 0.459). In addition, the results also indicated that there was no significant relationship between the older persons homes where they lived and their nutrition status (P value = 0.103).

However, there was a notable relationship between the sex of the older persons and their nutrition status (p-value = 0.001). This is as highlighted in Table 4.14. To further elaborate this association, a regression analysis was done.

Table 4.14: Association between nutrition status and demographic characteristics among institutionalized older persons in Nairobi City County

Demographic characteristic	$\chi 2$	Df	p – value
Age	1.557	2	0.459
Sex	11.132	1	**0.001**
Older persons Institution	3.038	1	0.103

Table 4.15 indicates the results of the regression analysis at values (P value = 0.019 df= 1, OR= 2.919) which highlights a significant relationship between the sampled older person's sex and their nutrition status. Males were 2.9 times more likely to be malnourished in comparison to females (OR = 2.9; CI, 1.196-7.127).

Table 4.15: Regression analysis for the association between sex and nutrition status among institutionalized older persons in Nairobi City County

Total assessment malnutrition indicator		Df	Sig.	OR	95% Confidence Interval	
Malnourished	Male	1	**0.019**	2.919	1.196	7.127
	Female	0	.	.	.	.

4.5.4 Relationship between dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County

Results of a Chi-square test highlighted in Table 4.16 indicates that there was a significant relationship between dietary intake and the nutrition status of the respondent (P value = 0.034) and between morbidity and the nutrition status of the respondent (P value < 0.001).

Table 4.16: Association between dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County

Variable	$\chi 2$	Df	p – value
Dietary intake	6.737	2	**0.034**
Morbidity	13.506	1	**0**

To assess the nature of these associations in terms of the magnitude, a regression analysis was done and the results are highlighted in Tables 4.17 and 4.18.

Results of the regression analysis as shown in Table 4.17 indicated that there was a significant relationship between the older person's dietary intake and their nutrition status as manifested in the malnutrition indicator score (P value = 0.039 df= 1, OR= 2.641). Additionally, the results showed that those who had moderate dietary diversity scores were 2.6 times more likely to be malnourished compared to those who had higher dietary diversity scores (OR = 2.6; CI, 1.052-6.634).

Table 4.17: Regression analysis for association between dietary intake and nutrition status among institutionalized older persons in Nairobi City County

Total assessment malnutrition indicator		Df	Sig.	OR	95% Confidence Interval	
Malnourished	Low DDS	1	.	1144748051	1144748051	1144748051
	Moderate DDS	1	**0.039**	2.641	1.052	6.634
	High DDS	0	.	.	.	.

Further, results of the regression test highlighted in table 4.18 indicated that there was a significant relationship between the sampled older persons having some form of illness and their nutrition status as manifested in malnutrition indicator score (P value = 0.035 df= 1, OR= 0.383). This means, those who did not have any disease were 0.38 times less likely to be malnourished compared to those who had (OR = 0.383; CI, 0.157-0.933).

Table 4.18: Regression analysis for association between presence of illness and nutrition status among institutionalized older persons in Nairobi City County

Total assessment malnutrition indicator		Df	Sig.	OR	95% Confidence Interval	
Malnourished	Presence of illness=No	1	**0.035**	0.383	0.157	0.933
	Presence of illness=Yes	0	.	.	.	.

4.6 Predictors of nutrition status among institutionalized older persons in Nairobi City County

To understand the factors that influence the nutrition status of institutionalized older persons, a regression test was done to establish these predictors and are reported in Tables 4.19 below.

Table 19: Predictors of nutrition status among institutionalized older persons in Nairobi City County

Total assessment malnutrition indicator		df	Sig.	OR	95% Confidence Interval	
Malnourished	≤ 7 food groups	1	**0.007**	3.875	1.45	10.352
	≥ 8 food groups	0	.	.	.	.
	Sex=Male	1	**0.039**	2.689	1.053	6.866
	Sex=Female	0	.	.	.	.
	Presence of illness=No	1	**0.013**	0.295	0.112	0.777
	Presence of illness=Yes	0	.	.	.	.

Presence of illness (AOR = 0.295, C.I, 0.112-0.777, p-value = 0.013), dietary intake denoted by dietary diversity score (AOR = 3.875, C.I, 1.450-10.352, p-value = 0.007) and sex (AOR = 2.689, C.I, 1.053-6.866, p-value = 0.039) were the predictors of the participants' nutrition status. Older persons who consumed less than seven food groups were 3.875 more likely to be malnourished compared to those who consumed more than eight food groups; males were 2.698 times more likely to be malnourished compared to females and older persons who did not have any illness were 0.294 times less likely to be malnourished compared to those who had some form of illness.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Demographic characteristics of institutionalized older persons in Nairobi City County

The minimum age of participants in this study was 60 years and the maximum was 105 years which was consistent with international definitions of older persons in both developing and developed contexts for example retirement age at 60–65 years or 50+ years in some developing contexts, and with local socio-cultural references of old age such as such as family status (grandparenthood), physical appearance, age-related health conditions, and life expectancy (Government of Kenya, 2010; UNDESA, 2017; UNHCR, 2018; World Health Organization, 2015).

Traditionally, women are more likely to reside in homes for older persons due to longer life expectancy, widowhood and social factors (National Gender and Equality Commission (NGEC), 2016). However, in this study 55.8 % of residents were male and 44.2 % female, deviating from that conventional pattern. This finding is consistent with Kenyan evidence showing institutionalized older persons may differ in demographic structure and functional profile compared to community-based older populations (Wairimu Mugo, 2018). Moreover, studies highlights that older persons often remain in multigenerational rural households and that institutional care is limited and often privately run (Gaugler & Kane, 2015; Murage et al., 2021), with most publicly owned older persons' homes being few and under-resourced. In this study, 73.9 % of respondents resided in a faith-based private home and 26.1 % in a government institution, echoing patterns observed in Kenyan institutional care settings.

5.1.2 Dietary intake among the institutionalized older persons in Nairobi City County

The ability to have a sufficient dietary intake in both quality and quantity to meet the recommended dietary allowances may be directly affected by pathological, physiological, sociocultural, and economic factors that come as a result of old age (Motadi et al., 2022; Norman et al., 2021). In this study, although the majority (81.2%) of older persons reported consuming only one meal per day, their diet was largely energy-dense, characterized by cereal-based foods and starchy staples. This pattern may suggest limited dietary diversity which may predispose older persons to both undernutrition and diet-related non-communicable diseases.

Comparable findings were reported in Kiambu County, where only 26.6% of elderly persons ate three meals per day and meal skipping was significantly associated with malnutrition risk (Wambui et al., 2018). Similarly, a study in Igembe South, Meru County found that 39.4% of older persons were undernourished and linked this to reduced dietary intake, morbidity, and limited access to diverse foods (Munoru, 2018). In contrast, a South African study reported that most older persons consumed three main meals per day, with only a small proportion skipping breakfast or dinner (Motadi et al., 2022). These variations highlight how contextual factors such as food accessibility, cultural practices, and institutional factors can shape dietary patterns among older adults.

Additionally, 94.2% of respondents were able to eat their food independently, while 5.8% required assistance. Similarly, 78.3% were able to finish their meals, whereas 21.7% could not. In terms of appetite, 92.8% of the respondents reported having a good

appetite during the study period. These findings are comparable to other studies showing that reduced food intake among older persons often results from progressive health decline due to old age and chronic diseases that impair taste and smell, thereby affecting food preference, meal enjoyment, and overall nutrient intake (Derbie et al., 2022; Geissler & Powers, 2017; Norman et al., 2021). Comparable trends were also reported in a Kenyan study among institutionalized older persons in Kiambu County, where diminished appetite and feeding dependence were linked to underlying morbidity and reduced dietary intake (Wambui et al., 2018).

The present study found that cereals, carbohydrates, and starches formed the predominant food group consumed among institutionalized older persons, consistent with evidence that cereal-based staples remain the primary source of dietary energy in Kenya and many developing countries (Mohajan K, 2014). The reliance on Ugali, rice, porridge, and starchy vegetables reflect a monotonous, energy-dense diet that may meet caloric requirements but lacks diversity in micronutrient sources. Similar cereal-dominated dietary patterns have been reported in Kiambu County among older adults, where limited inclusion of animal-sourced and dairy foods contributed to increased risk of undernutrition (Wambui et al., 2018)

In terms of proteins, comparable findings have been observed across sub-Saharan Africa, including South Africa, Ghana, and Rwanda, where older persons' diets are characterized by low intake of milk, meat, and eggs due to chewing difficulties, sensory decline, high food cost, and cultural or religious restrictions which may further clarify the reasons why participants did not meet their dietary intake of calcium. Zinc, iron, and vitamins B1 and B2 (Habumugisha et al., 2024; Mensah et al., 2021; Motadi et al.,

2022). In contrast, studies from high-income countries such as Sweden and the United States have shown that older adults maintain more diverse diets with higher consumption of dairy, lean meats, and fortified products, partly due to better income levels, nutrition awareness, and access to elderly care services (Norman et al., 2021).

Fruit and vegetable consumption among institutionalized older persons appeared to be influenced by seasonality, with commonly available options such as bananas and kales mostly provided for. This pattern reflects challenges in achieving adequate intake of fruits and vegetables among older adults. Similar findings have been observed in other studies, where older persons often fail to meet the WHO recommendation of at least five servings per day, largely due to limited access, affordability, and preference changes with age (Clum et al., 2016; Olaya et al., 2019). Regionally, a study conducted in Uganda also reported low fruit and vegetable consumption among institutionalized and community-dwelling older adults, attributing this to seasonal variability and reduced appetite (Kabwama et al., 2019).

The present study found generally low consumption of key micronutrients, including Vitamin A (556 µg), Calcium (367 mg), Iron (53.8 mg), and Vitamin C (80.6 mg), suggesting inadequate dietary diversity and reinforcing existing evidence of micronutrient deficiencies in this population due to limited access to nutrient-dense foods and age-related physiological changes. Although big studies on the micronutrient status in older adults are rare due to the costs and efforts, few studies that have been done generally indicate micronutrient deficiencies for example, 52% of older adults had vitamin D deficiency and 27.3% had low vitamin B12 levels, consistent with global trends of micronutrient decline with age (Norman et al., 2021).

Similarly, fluid intake was suboptimal, with most respondents consuming less than three cups of beverages daily, reflecting potential hydration challenges among the older persons. Similarly, low fluid intake among older persons aligns with findings from U.S. studies showing reduced water consumption with advancing age, partly due to diminished thirst and functional limitations (Rosinger & Herrick, 2016). Additionally, evidence suggests that physiological changes that lead to reduced thirst sensation among other changes including environmental stressors, social and institutional factors can present barriers to fluid intake and increase dehydration risk in older persons (Hooper et al., 2014).

Although cereals, oils and fats, legumes, nuts and seeds, and fruits were most commonly reported in the dietary diversity scores, nearly half the older persons achieved moderate (44.9%) to high (46.4%) DDS levels despite prevalent chronic illness and elevated BMI. In Kenya, a study among older persons in Meru County documented similar patterns of limited dietary variety and highlighted how morbidity and care practices influenced nutritional outcomes (Munoru, 2018). In yet another cohort study from China, results showed that each unit increase in DDS was associated with a 9% reduction in all-cause mortality among the oldest old, emphasizing the potential protective effect of diet diversity against morbidity and death (Lv et al., 2020). In addition, results from a study in the United States also demonstrated that poor diet quality may increase the incidence of malnutrition, frailty and subsequently lead to a higher risk of mortality (Cristina & Lucia, 2021; Hengeveld et al., 2019).

Overall, the analysis showed a high energy intake across the homes which directly correlates with high body mass index. Cereals and starchy foods were the main

contributors, with limited intake of fruits, vegetables, and animal proteins. These findings however contrast with some studies in South Africa and Kenya, which reported inadequate dietary intake among older persons due to age-related physiological changes commonly referred to as “anorexia of aging,” including reduced lean body mass, diminished sense in taste and smell, and early satiation (Motadi et al., 2022; Munoru, 2018). The relatively high caloric intake and overweight cases in this study reflects monotonous, energy-dense institutional diets which may predispose this population to diet-related conditions.

5.1.3 Morbidity status among institutionalized older persons in Nairobi City County

The majority of respondents (53.6 %) indicated suffering from various illnesses, while 46.4 % reported none. Globally, older adults frequently experience a higher prevalence of chronic diseases and according to the National Council on Aging (USA), 94.9 % of adults aged 60 and older have at least one chronic condition and 78.7 % have multiple chronic conditions (National Council on Aging, 2025). In sub-Saharan Africa, multimorbidity among older persons is increasingly common, with estimates ranging widely and influenced by social determinants (Afshar et al., 2015; Le Reste et al., 2015) examined the distribution of multimorbidity in LMICs which was noted to be at 7.8%. In yet another Kenyan urban slum study, multimorbidity prevalence was reported at 28.7 % among adults including older persons in Nairobi (Mohamed et al., 2021). Further, research in the US noted that percent of older persons with hypertension was 60%; arthritis 35%; coronary heart disease 29%; diabetes 27%); obesity 42%; chronic kidney disease 25% and dementia 12% among others. Similar to this study, these conditions may contribute to loss of appetite or reduce functional ability which leads to

altered food intake, and ultimately impairment of nutritional status (Fostinelli et al., 2020) and quality of life (Maresova et al., 2019).

5.1.4 Nutrition status among institutionalized older persons in Nairobi City County

The assessment of nutritional status revealed that the majority of respondents had BMI ≥ 23 kg/m² and elevated MUAC readings, while the MNA tool categorized most as malnourished or at risk of malnutrition. In comparison, other studies have reported low prevalence of malnutrition in nursing homes at 13.8% (Alzahrani & Alamri, 2017) while regionally, a meta-analysis across Africa found wide variability in malnutrition prevalence among older adults, highlighting the influence of setting and socio-economic factors (Seid & Babbel, 2022).

Causes of malnutrition in older persons stem from a complex interaction between dietary intake, nutrition adequacy and illness which may negatively impact nutrition status (Norman et al., 2021). In addition, high energy intake reported in the study may correlate with an increase in BMI due to decreased basal metabolic rate and sedentary lifestyles which increases the risk of morbidity and mortality (Cunningham et al., 2020). These findings underline the complex interplay between dietary intake, nutrition adequacy and chronic illness in older adults, which may lead to functional decline, morbidity and mortality (Geissler & Powers, 2017; Norman et al., 2021).

5.1.5 Relationship between demographic characteristics, dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County

5.1.5.1 Dietary intake and demographic characteristics of institutionalized older persons in Nairobi City County

In this study, dietary intake did not differ significantly by age or institutional setting, suggesting that these factors may have limited influence on food consumption patterns among participants. However, it was significant in terms of gender, with males showing lower dietary diversity and a higher likelihood of malnutrition compared to females. This aligns with findings from other international studies, which have demonstrated that men are more prone to dietary deficiencies and less likely to adopt healthy eating habits, whereas women tend to make more health-conscious food choices, including seeking dietary counseling (Maila et al., 2021; Norman et al., 2021). Another study in Zambia involving older persons reported that good dietary diversity scores were linked to better BMI outcomes and were directly correlated with adequate dietary intake. The same study further revealed that older men showed lower dietary diversity and higher rates of undernutrition than women, indicating that gender differences in food choice and nutritional awareness may influence dietary quality (Maila et al., 2021).

In contrast, a scoping review observed that older individuals with low socio-economic status, unhealthy dietary habits, and underlying disease conditions are at a higher risk of malnutrition, emphasizing that nutritional outcomes are influenced by multiple interrelated factors. Collectively, these findings suggest that while gender is an important determinant of nutritional status, it is not the only factor influencing dietary intake, as socio-economic status, health conditions, and lifestyle practices also play

significant roles, which is consistent with evidence from regional and global research (Obeng et al., 2022).

5.1.5.2 Morbidity and demographic characteristics of institutionalized older persons in Nairobi City County

The findings from this study showed that the homes did not significantly predict morbidity among older persons, and neither age nor sex showed a statistically significant association with reported illnesses. These results contrasts with broader evidence indicating that demographic factors such as age advancement, gender, and socio-economic status often influence morbidity patterns in older populations. The US National Council of Aging 2022 statistics highlights that age, family genetics, and gender may influence the risk of having chronic diseases in old age (National Council on Aging, 2025) and similarly, a study in India also suggested that multimorbidity had a positive relationship with advancing age (Patel et al., 2023). These variations suggest that while the current study did not observe significant demographic predictors of morbidity, evidence from local and regional studies underscores that morbidity in old age is a multifactorial outcome shaped by the interaction of physical, social and environmental factors.

5.1.5.3 Nutrition status and demographic characteristics among institutionalized older persons in Nairobi City County

The study findings showed that demographic characteristics such as age and older person's institution did not have an influence on the nutritional status of the respondents, however, gender was significant, with males showing greater vulnerability to malnutrition compared to females. These findings align with other studies that

revealed that being underweight was more prevalent in men than in women and may be linked to low dietary diversity amongst male older persons leading to poor nutrition status (Maila et al., 2021). Further, existing literature also indicates that nutritional status in older adults is influenced by gender differences in addition to a combination of physiological, psychological, social, and medical factors (Agarwalla et al., 2015). Similarly, a Kenyan study among elderly persons in Meru County also highlighted the influence of socio-economic and lifestyle factors beyond age or residence as factors affecting nutrition status of older persons (Munoru, 2018).

Collectively, these findings underscore that while gender differences may affect nutrition status, nutritional outcomes among the elderly are multifactorial and are shaped by a web of biological, social, and contextual determinants that vary across settings.

5.1.5.4 Relationships between dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County

The study findings suggest that dietary intake and morbidity were closely associated with the nutritional status of older persons, where inadequate dietary diversity and the presence of illness appeared to increase the likelihood of poor nutrition status. These outcomes are consistent with existing literature, which highlight that the nutritional status of older adults may be influenced by multiple interrelated factors, including food intake, disease burden, socio-cultural and economic factors, and physiological changes associated with aging (Rahman et al., 2021).

In addition, Similar results have been observed in studies showing that nutritional well-being among older persons may deteriorate not only due to insufficient dietary intake

but also because of illness-related nutrient loss, poor absorption, and metabolic alterations (Cristina & Lucia, 2021). In Kenya, Munoru (2018) likewise, found that inadequate dietary intake and illness were key factors of malnutrition among community-dwelling older adults which further illustrate the link between dietary intake, health status, and overall nutritional status. These findings support that nutrition in older age is a multifactorial phenomenon shaped by the interaction between dietary practices, disease conditions, and social contexts.

5.1.5.5 Predictors of nutrition status among institutionalized older persons in Nairobi City County

The study also noted that morbidity, dietary diversity, and sex were the predictors of the participants' nutrition status. These findings are in concurrence with other nutrition-related studies which indicate that nutrition status is influenced by both dietary intake and the presence of diseases. In a synergistic cycle, poor nutrition status predisposes an individual to diseases, and diseases on the other hand may also affect nutrition outcomes (Cristina & Lucia, 2021; Volkert et al., 2019). If continuous, the cycle may lead to weight loss, compromised immunity, and poor health outcomes (Abdu et al., 2020). Additionally, these results are comparable to those of another research which highlighted poor nutrition status may manifest itself in reduced weight, obesity, or in micronutrients deficiencies. Poor nutrition status may ultimately lead to significant morbidity and mortality among this population (Norman et al., 2021).

5.2 Conclusion

This study highlighted that the age of the majority of the older persons was between 60 to 70 years which was consistent with the steady and rapid geriatric population (60

years plus) growth globally and in Kenya. Further, there were more males (55.8%) compared to females (44.2%) which is inconsistent with previous studies that indicate that women are more likely than men to be admitted to a residential home for the older persons. Dietary diversity varied across individuals although females notably had a higher dietary diversity compared to that of males. The study also revealed that majority of the older persons consumed cereals, oils and fats, legumes and fewer than three meals a day, with low frequency of fruit and vegetable intake. Although energy intake was found to be high, there were significant inadequacies in micronutrients such as calcium, vitamin A, vitamin C, and zinc. Morbidity was prevalent among more than half of the respondents, with common illnesses such as hypertension, diabetes, arthritis, and oral diseases with some taking at least 3 prescription drugs per day. Nutrition status assessment indicated that the majority of respondents were malnourished or at risk of malnutrition, with males more likely to be malnourished compared to females. A further analysis using the MNA tool highlighted that 97.8% of the sampled older persons were overweight with a BMI of ≥23 kg/m2 which may be attributed to high energy intake alongside reduced metabolic rate and sedentary lifestyle. Overall, the results demonstrated significant associations between dietary intake, morbidity, and nutrition status. Dietary diversity, presence of illness, and sex were found to be predictors of malnutrition among the institutionalized older persons. These findings highlight the complex interplay of dietary intake, disease, and demographic factors in determining the health and nutrition status of the older persons population in Nairobi City County.

5.3 Recommendations

This section outlines the recommendations made in this study; recommendations from the study and for further research.

5.3.1 Recommendations from the Study

The study made the following suggestions in line with the research findings, considerations and conclusion:

i. While homes that institutionalize the residence of older persons focus on the dietary intake of the older persons they support, the study recommends to stakeholders working with older persons to diversify services to include not only sound dietary practices but also physical activity sessions considering the number of the respondents who had higher BMI.

ii. Findings revealed a relationship between the sex of the respondents and their nutrition status. Therefore, the study recommends that the managers in these homes be sensitive to the differences in dietary intake in male and female that may influence nutrition outcomes.

iii. Given that the findings of the study indicated that those with lower dietary diversity were vulnerable to malnutrition, the study recommends, if resources allow, that the managers of institutions try to ensure diverse dietary intake through provision of a wide variety of food groups with emphasis on fruits, vegetables, and animal-source food to promote good nutrition outcomes for the older persons.

5.3.2 Recommendations for further research

i. Results of regression analysis indicated the existence of a significant association between the sampled older persons' sex and their nutritional status. The association was such that the males were 2.9 times more likely to be malnourished in comparison to females. While these are results of data collected by a questionnaire, not much explanation could be generated by such a tool to explain this finding. It would therefore be recommendable to carry out further

studies, preferably of a qualitative nature, to find out the explanation for this finding.

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APPENDICES

Appendix 1: Informed Consent

My name is Lorraine Ombogo, I am a postgraduate student from Kenyatta University. I am conducting a study on dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County, Kenya. The information will be beneficial to older persons, stakeholders involved in older persons' care and support and GOK as it will propose recommendations for older persons interventions with a focus on integrated nutrition programmes.

Procedures to be followed

Participation in this study will require that I ask you some questions and I also examine you in order to screen you for malnutrition. I will record the information from you in a questionnaire. You have the right to refuse to participation in this study. You will get the same care and treatment whether you agree to join the study or not and your decision will not change the care you will receive from the institution today or that you will get from any other facility at any other time.

Please remember that participation in this study is voluntary. You may ask questions related to the study at any time. You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you receive from this institution or any other organization now or in the future.

Discomforts and Risks

Some of the questions you will be asked are on intimate subject and may make you uncomfortable. If this happens, you may refuse to answer these questions if you so

choose; you may also stop the interview at any time and counselling through the psychosocial support system within the institution will be provided upon request. The interview will take approximately thirty to forty-five minutes.

Benefits

If you participate in this study, you will help us to learn how to provide effective nutrition services that can improve the health of the older persons and reduce the risk of malnutrition.

Reward

There will be no reward for agreeing to participate in this study.

Confidentiality

The interviews and screening will be conducted in a private setting within the institution. Your name will not be recorded on the questionnaire. The questionnaires will be kept private and safe guarded in lockable storage facilities and will only be used for the study.

Contact Information

If you have any questions you may contact Lorraine Ombogo on 0722 755 972 or Professor Judith Kimiywe on 0722 915459 or Dr. Peter Chege on 0722 642356 or the Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke, secretary.kuerc@ku.ac.ke, secretariat.kuerc@ku.ac.ke.

Participant's statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will still get the same care whether I decide to leave the study or not and my decision will not change the care that I will receive from the institution at any other time.

Name of Participant:

……

Signature or Thumbprint Date

Investigators statement

I, the undersigned, have explained to the volunteer in a language s/he understands, the procedures to be followed in the study and the risks and benefits involved.

Name of Interviewer:

……

Signature or Thumbprint Date

Appendix II: Questionnaire

Questionnaire on dietary intake, morbidity and nutrition status among institutionalized older persons in Nairobi City County.

Administrative details

Questionnaire NO_____ Home_____

Date of Interview _____Questionnaire checked _____Date checked_____

SECTION A: Demographic Data

1. Sex (M) (F) 2. Age _____

3. Highest level of education.

I. University ( ) Tertiary ( )

II. Secondary ( ) Primary ( )

III. No formal Education ( )

4. Employment History

I. Formal (Specify) ( )……

II. Informal (Specify) ( )……

SECTION B: Dietary Intake Data

1. **24-hour recall recording sheet**

Tick the day of the week that you are recalling **(it should be the day before the interview)**

Table 2: 24-hour recall recording sheet

Mon	Tue	Wed	Thurs	Fri	Sat	Sun

Step 1: Please think back to when you woke up yesterday morning to the time you went to sleep in the evening. Now, I want you to try and remember what you ate or drank yesterday from the moment you got up until you went to sleep again last night. Run through the whole day in your mind and try to remember everything that you ate or drank. (**The interviewer must give the respondent a little time to do this**). AFTER THE PARTICIPANT

MENTIONS AN ITEM, THE INTERVIEWER SHOULD PROMPT THE RESPONDENT BY SAYING "AND THEN?" **ENTER THE INFORMATION IN COLUMN 1)**

Table 3: 24 hr recall recording sheet

STEP 1: Food/drink eaten/drank during The day	**STEP 2:** Forgotten foods (PROMPTED)

STEP 2: NOW ASK THE FOLLOWING QUESTIONS ABOUT FORGOTTEN FOODS

AND ENTER THEM IN COLUMN 2.

Did you have any cold drinks or soda yesterday?

Did you have any sweets and or chocolate yesterday?

Did you have any (other) fruit yesterday?

Did you have any (other) vegetable yesterday?

Did you have anything else yesterday?

Q. What you ate/ drank yesterday; was it same as, more than or less than usual?

(MARK **X** WHERE APPROPRIATE)

Table 4: 24 hr recall recording sheet

	Same as usual		More than usual		Less than usual

Step 3: To find out more detail about each item that was eaten or drunk, the following can be said and asked: *"now i am going to ask you more about each food or drink that you ate/drank yesterday. Let us start with the first item on the list. At what time did you eat…(= item 1 on the list)".* (Do not spend too much time trying to find out the exact time. Any comments on the time can be entered in **column 2)**. *Now I want you to tell me more about this food item…."* (This will include a description of the food as well as the preparation. **enter this information in column 4).** *"now we are going to find out how much of this item you ate/drank."*(The interviewer now uses the different aids to help the subject to identify the portion size. A description of the portion size in terms of cups, spoons, bowls, glasses, matchboxes, manual picture size or centimeters (using the ruler) is then **entered in column 5.** If the food code and the portion size in grams of this particular item is easy to find, it can be **entered in column 6).** If it is not clear or easy, the code and gram weight can be left out to be completed after the interview. This process is repeated for each food item that was entered on form 1).

STEP 4: RECORDING SHEET FOR INFORMATION COLLECTED IN STEP 3 OF THE 24-HOUR RECALL

Table 5: 24 hr recall recording sheet

Time (1)	Comment on the time (2)	Food items carried from steps 1 and 2 (3)	Detailed description of the item (ingredients and cooking method) (4)	Detailed description of portion size(household measures) (5)

2. **Food Frequency Questionnaire**

Table 6: Food frequency questionnaire recording sheet

How many times did you consume the following foods in the last 7 days?

	Frequency of consumption in the last one week (Tick where appropriate)								
	Once	2 times	3 times	4 times	5 times	6 times	Daily	Never	Type
Cereals, Carbohydrates, Starch									
Ugali (*specify if sifted or whole meal)*									
White bread									
Whole meal bread									
Brown rice									
White rice									
Pasta									
Porridge									
Whole meal chapatti									
Sifted wheat flour chapatti									
Githeri									
Mandazi									
Roasted maize									
Commercial breakfast cereals									
Chips									
Others (Specify)									
Roots and tubers									
Arrow roots									

Yams									
Sweet potatoes									
Green bananas									
Others (Specify)									
Dairy foods									
Whole milk									
Low fat milk (<2% fat)									
Skimmed milk									
Fermented milk (mala)									
Yogurt(specify *if whole fat)*									
Ice cream									
Butter									
Ghee									
Margarine									
Others (Specify)									
Meats, meat products, eggs									
Beef									
Mutton									
Chicken									
Fish									
Pork									
Matumbo									
Processed meat (sausages,									

bacon, ham, smokies etc)									
Eggs									
Others (Specify)									
Legumes / pulses and nuts									
Dry peas									
Dry beans									
Lentils (kamande)									
Green grams									
Mbaazi									
Black eye peas (Njahi)									
Groundnuts									
Simsim									
Coconut									
Others (Specify)									
Vegetables									
Kales									
Cabbage									
Tomatoes									
Carrots									
Spinach									
Cucumber									
Kunde (cow pea leaves)									

French beans									
Other African leafy vegetables (Specify)									
Fruits									
Apples									
Bananas									
Citrus fruits									
Melon									
Passion									
Pawpaw									
Pineapple									
Mangoes									
Avocado									
Others (Specify)									
Sugar Alternatives, Sweets									
Sugar									
Honey									
Cakes									
Biscuits									
Sweets									
Others (Specify)									
Beverages and Spreads									

Soda									
Juice									
Alcohol									
Peanut Butter									
Margarine									
Jam									
Others (Specify)									

SECTION C: Mini Nutritional Assessment for the older persons (MNA)

Weight 1, kg: Height 1 cm: Weight 2, Kg: Height2, Cm:

BMI, Weight (kg)/ Height (m^2)

Complete the screen by filling in the brackets with the appropriate numbers. Add the numbers for the screen. If score is 11 or less, continue with the assessment to gain a Malnutrition Indicator Score.

Screening

A. **Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?**

0 = severe decrease in food intake

1 = moderate decrease in food intake

2 = no decrease in food intake ( )

B. **Weight loss during the last 3 months**

0 = weight loss greater than 3kg (6.6lbs)

1 = does not know

2 = weight loss between 1 and 3kg (2.2 and 6.6 lbs)

3 = no weight loss ( )

C. Mobility

0 = bed or chair bound

1 = able to get out of bed / chair but does not go out

2 = goes out ( )

D. Has suffered psychological stress or acute disease in the past 3 months?

0 = yes

2 = no ( )

E. Neuropsychological problem

0 = severe dementia or depression

1 = mild dementia

2 = no psychological problems ( )

F. Body Mass Index (BMI) (weight in kg) or (height in m)

0 = BMI less than 19

1 = BMI 19 to less than 21

2 = BMI 21 to less than 23

3 = BMI 23 or greater ( )

Screening score ( ) ( )

(Subtotal max. 14 points)

12-14 points: Normal nutritional status

8-11 points: At risk of malnutrition

0-7 points: Malnourished

For more in-depth assessment continue with G-P

G. Lives independently (not in nursing home or hospital)

1 = yes

0 = no ( )

H. Takes more than 3 prescription drugs per day

1 = yes

0 = no ( )

I. Pressure sores or skin ulcers

1 = yes

0 = no ( )

J. How many full meals does the older persons eat daily?

0 = 1 meal

1 = 2 meals

2 = 3 meals ( )

K. Selected consumption markers for protein intake

- At least one serving of dairy products (milk, cheese, yoghurt) per day

Yes ( ) No ( )

- Two or more servings of legumes or eggs per week

Yes ( ) No ( )

- Meat, fish or poultry everyday

Yes ( ) No ( )

0.0 = if 0 or 1 yes

0.5 = if 2 yes

1.0 = if 3 yes ( )

L. How much fluid (water, juice, coffee, tea, milk...) is consumed per day?

0.0 = less than 3 cups

0.5 = 3 to 5 cups

1.0 = more than 5 cups ( )

M. Consumes two or more servings of fruit or vegetables per day?

0 = no

1 = yes ( )

N. Mode of feeding?

0 = unable to eat without assistance

1 = self-fed with some difficulty

2 = self-fed without any problem ( )

O. Self-view of nutritional status?

0 = views self as being malnourished

1 = is uncertain of nutritional state

2 = views self as having no nutritional problem ( )

P. In comparison with other people of the same age, how does the patient consider his / her health status?

0.0 = not as good

0.5 = does not know

1.0 = as good

2.0 = better ( )

Q. Mid-upper arm circumference (MUAC) in cm

0.0 = MUAC less than 21

0.5 = MUAC 21 to 22

1.0 = MUAC 22 or greater **( )**

Assessment (max. 16 points) ( )

Screening score ( )

Total Assessment (Maximum 30 points) ( )

Malnutrition Indicator Score

24 to 30 points	( )	Normal Nutritional Status
17 to 23.5 points	( )	At risk of Malnutrition
Less than 17 points	( )	Malnourished

R. Presence of morbidity. Select as appropriate.

0.0 = none ( )

0.5 = at least one illness ( )

1.0 = at least two illnesses ( )

2.0 = more than two illnesses ( )

R. (i) Type of illness in the last 6 months; Select specific examples mentioned and indicate any other not included in the list: (**Cardiovascular diseases, Stroke, Hypertension, Dementia or any other mental illness, Musculoskeletal disorders (Osteoarthritis, Osteoporosis), neurological diseases, oral disease, respiratory diseases and any other**).

Appendix III: Observation checklist

Select appropriate answer

1. What number of meals is served per day in the home?

a) 4 b) 3 c) Below 3

2. Is the meal served appropriate or of a high nutritional value?

a) Yes b) No

3. Does the older persons:

- Finish his or her food- a) Yes b) No
- Refuse to eat a) Yes b) No
- Spit out food a) Yes b) No
- Show appetite a)Yes b) No

4. What is the posture while eating?

a) Upright with head inclined forward b) Not upright

5. Rate the food in reference to the following:

- Temperature: a) Hot b) Warm c) Cold
- Aesthetic appeal: a) Good b) Average c)Good
- Quantity/ Serving size: a) Adequate b) Inadequate

Appendix IV: Dietary Diversity by Food Group

Food Group		Frequency (N)	Percent (%)
Cereals	Yes	138	100
White Roots and Tubers	No	96	69.6
	Yes	42	30.4
Vitamin A Rich Vegetables and Tubers	No	32	23.2
	Yes	106	76.8
Dark Green Leafy Vegetables	No	42	30.4
	Yes	96	69.6
Other Vegetables	No	18	13
	Yes	120	87
Vitamin A Rich Fruits	No	80	58
	Yes	58	42
Other Fruits	No	36	26.1
	Yes	102	73.9
Organ Meat	-	-	-
Flesh Meats	No	66	47.8
	Yes	72	52.2
Eggs	No	98	71
	Yes	40	29
Fish And Sea Food	-	-	-
Legumes, Nuts, and Seeds	No	16	11.6
	Yes	122	88.4
Milk and Milk Products	No	50	36.2
	Yes	88	63.8
Oils and Fats	Yes	138	100
Sweets	No	26	18.8
	Yes	112	81.2
Spices, Condiments, Beverages	No	134	97.1
	Yes	4	2.9

Appendix V: Research Approvals

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke
P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School
DATE: 11th April, 2014

TO: Ombogo Lorraine
C/o Food, Nutrition and
Dietetics Dept.
REF: H60/12699/2009

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting of 27th March, 2014, approved your Research Proposal for the M.Sc. Degree Entitled, "Chronic Illness and the Effect on Dietary Intake and Nutritional Status of Institutionalized Elderly Persons in Nairobi County."

Thank you.

JOSEPHINE K. NJAGI
FOR: DEAN, GRADUATE SCHOOL

C.c. Chairman, Department of Food, Nutrition and Dietetics

Supervisors:

1. Prof. Judith Kimiywe
   C/o Department of Food, Nutrition and Dietetics
   Kenyatta University
2. Dr. Peter Chege
   C/o Department of Food, Nutrition and Dietetics
   Kenyatta University

JKN/cm

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: kuerc.chairman@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

P. O. Box 43844,
Nairobi, 00100
Tel: 8710901/12

Our Ref: KU/ERC/ APPROVAL/VOL.1 (243) Date: 26th February, 2019

Lorraine Ombogo
P.0 Box 43844-00100
Nairobi

Dear Lorraine,

APPLICATION NUMBER: PKU/954/11010 CHRONIC ILLNESS AND THE EFFECT ON DIETARY INTAKE AND NUTRITIONAL STATUS OF INSTITUTIONALIZED ELDERLY PERSONS IN NAIROBI, KENYA

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic "**Chronic Illness And The Effect On Dietary Intake And Nutritional Status Of Institutionalized Elderly Persons In Nairobi, Kenya** " received on 7th November, 2018 and discussed on 12th February, 2019

2. **APPLICANT**
Lorraine Ombogo

3. **SITE**

Nairobi, Kenya

4.DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED that the research may proceed for a period of ONE year from 12th February, 2019**

5. **ADVICE/CONDITIONS**

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY
OFFICE OF THE DIRECTOR
01 MAR 2019
ETHICS REVIEW COMMITTEE
P.O. BOX 43844 - 00100 NAIROBI

PROF. JUDITH KIMIYWE
CHAIRMAN ETHICS REVIEW COMMITTEE

I ...Lorraine Ombogo....accept the advice given and will fulfill the conditions therein.

Signature.....Ombogo..... Dated this day of...1st March..... 2019.

cc.

DVC-Research Innovation and Outreach

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-4213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/14852/28879**

Date: **1st April, 2019**

Lorraine Akinyi Ombogo
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Chronic Illness and the Effect on Dietary Intake and Nutritional Status of Institutionalized Elderly Persons in Nairobi County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **1st April, 2020.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

16/07/2019

The County Director of Education
Nairobi County.

NAIROBI CITY COUNTY

TELEGRAM "SCHOOLING"
TELEPHONE: 2221166/224281
EXT: 2426 /2590

CITY HALL ANNEXE:
P. O. BOX 30298 GPO- 00100,
NAIROBI, KENYA

EDUCATION, YOUTH AFFAIRS & SOCIAL SERVICES SECTOR
EDUCATION DEPARTMENT

Ref. No. GL/NC/141/VOL VI/312

16th July, 2019

Lorraine Akinyi Ombogo
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application to carry out Research and Subsequent approval by National Commission for Science, Technology and Innovation vide letter Ref: **NACOSTI/19/14852/28879** dated **1st April, 2019;**

I am pleased to inform you that authority has been granted to you to carry out research on ***"Chronic Illness and the Effect on Dietary Intake and Nutritional Status of Institutionalized Elderly Persons" in Nairobi County, Kenya.***

On conclusion of the study, you are expected to submit a copy of the research findings to the undersigned:

LEONARD MITITI
AG. DIRECTOR – VOCATIONAL & TEACHER TRAINING

Copy to: Chief Officer – Education, Social Services & Gender
Director City Education

Republic of Kenya
MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING & BASIC EDUCATION

Telegrams: "SCHOOLING", Nairobi
Telephone: Nairobi 020 2453699
Email: rcenairobi@gmail.com
edcnairobi@gmail.com

When replying please quote

REGIONAL DIRECTOR OF EDUCATION
NAIROBI REGION
NYAYO HOUSE
P.O. Box 74629 – 00200
NAIROBI

Ref: **RCE/NRB/GEN/1/VOL. 1**

DATE: **16th July, 2019**

Lorraine Akinyi Ombogo
Kenyatta University
P O Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

We are in receipt of a letter from the National Commission for Science, Technology and Innovation regarding research authorization in Nairobi County on **"Chronic illness and the Effect on Dietary Intake and Nutritional Status of Institutionalized Elderly Persons in Nairobi County, Kenya".**

This office has no objection and authority is hereby granted for a period ending **1st April, 2020** as indicated in the request letter.

Kindly inform the Sub County Director of Education of the Sub County you intend to visit.

REGIONAL DIRECTOR OF EDUCATION
16 JUL 2019
P.O. Box 74629, NAIROBI

DRUSCILLA MOSIORI
FOR: REGIONAL DIRECTOR OF EDUCATION
NAIROBI

c.c
Director General/CEO
National Commission for Science, Technology and Innovation
NAIROBI