CONTEXTUAL ASSESSMENT OF FOOD SYSTEM, SAFETY-NETS AND NUTRITIONAL STATUS OF PEOPLE LIVING WITH HIV/AIDS IN KADUNA CITY, NIGERIA

By

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ABSTRACT

HIV/AIDS status and food system interact in a vicious cycle which influence nutrition at individual and household levels. Safety nets are important mechanisms to promote health and nutrition among People Living with HIV/AIDS (PLWHA), however, these mechanisms are being weakened following dwindling resources among other factors. Understanding the food system and safety net types of PLWHA is important to promoting nutritional status and improved treatment outcomes. This study was designed to assess food system, safety nets and nutritional status of PLWHA in Kaduna city, Nigeria.

Descriptive cross-sectional and a mixed-methods approach were used. A total sampling of consenting 532 PLWHA across 14 support groups in Kaduna was conducted. Three key informant interviews and three focus group discussion sessions were conducted among support group leaders and male/female members, respectively using structured guides. Interviewer-administered questionnaire was used to collect information on socio-demographic characteristics, CD4 cell count, safety net types, food system and dietary intake of PLWHA. A 24-hour recall was conducted to assess dietary intake and analysed using adapted Total Diet Assessment software and dietary diversity according to the FAO standard. Body weight and height were assessed to determine the Body Mass Index (BMI) and categorised using WHO standards. Qualitative data were analysed thematically. Quantitative data were analysed using descriptive statistics, and Chi-square tests at $\alpha_{0.05}$.

There was declining involvement of PLWHA in food production following poor productive capacity. Respondents expressed understanding of the link between nutrition and treatment outcomes and identified poor income as a constraint to food access. Respondents' age was 38.1±9.7 years, 78.0% were females, 44.9% were married, and 40.3% earned <₦5000 monthly. About 20.0%, 25.0% and 55.0% had CD4 cell count (cells/µl) of ≥500, 200-499 and <200, respectively. Safety net types included counselling (39.2%), treatment for opportunistic infections (27.5%), food and nutrition aid (15.7%), prayer (15.7%), and drug aid (1.9%). Majorly produced staple was cereals (93.7%), 40.3% raised livestock/poultry, and 27.4% had vegetable garden. Majority (58.1%) experienced hindrances to market access, 45.2% skipped meals and 59.7% consumed street foods. Rice (71.0%), beans (61.3%) and maize (50.0%); orange (61.3%), banana (25.8%) and watermelon (24.2%); and pumpkin leaves (*ugwu*) (41.9%) and okro (9.7%) constituted the widely consumed staples, fruits, and leafy vegetables. Intakes of energy, protein, vitamin A, zinc and iron were 1065.1±148.1Kcal, 50.3±42.7g, 10491.5±1510.6mcg, 6.7±6.1mg and 8.9±7.5mg, respectively. Mean dietary diversity was 4.8±1.12, reflecting a poor-quality diet. Prevalence of underweight, overweight and obesity was 5.1%, 28.9% and 12.4%, respectively. Among respondents with normal BMI, 80.0% had received financial empowerment, 64.5% received counselling /psychosocial support and 63.6% had food support. Body Mass Index was significantly associated with age, dietary diversity, income, and intakes of energy, protein and zinc.

Access to food among people living with HIV/AIDS is constrained by poor income, reduced productive capacity and limited support mechanism and this reflect in form of poor diet quality, overweight and obesity. Household economic strengthening activities and food and nutrition support are hereby recommended for PLWHA in Nigeria.

Keywords: Body mass index, Safety-net types, Dietary diversity, PLWHA, Food production
Word count: 484

CERTIFICATION

I certify that Victor Uche Ohuruogu, of the Department of Human Nutrition, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria carried out this work.

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DEDICATION

This work is dedicated to all persons living with HIV/AIDS in Nigeria and around the world and to the many Scientists whose works have impacted this subject.

To the memories of my late father, Mark Chikere.

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PLWHA:	People living with HIV & AIDS
HIV/AIDS:	Human Immunodeficiency Virus/Acquired Immune Deficiency syndrome
WHO:	World Health Organisation
UNAID:	United Nations
FAO:	Food and Agricultural Organisation
PLHA:	People living with AIDS
BMI:	Body Mass Index
NACA:	National Agency for the Control of AIDS
NASCOP:	National AIDS and STI'S Control Programme
NAIIS:	Nigeria HIV/AIDS Indicator and Impact Survey
UNSCN:	United Nations System Standing Committee on Nutrition
USDA:	United State Department of Agriculture
UNAIDS:	United Nations Programme on HIV/AIDS
HLPE:	High Level Panel of Experts
GLOPAN:	Global Panel on Agriculture and Food Systems for Nutrition
GAIN:	Global Alliance for Improved Nutrition
NARHS:	National HIV/AIDS and Reproductive Health and Serological Survey
WASH:	Water, Sanitation, and Hygiene
CDC:	Centers for Disease Control and Prevention
FANTA:	Food and Nutrition Technical Assistance
MUAC:	Mid Upper Arm Circumference
FFQ:	Food Frequency Questionnaire
PEPFAR:	The President’s Emergency Plan for AIDS Relief
ART:	Antiretroviral Therapy
DACA:	Diocesan Action Committee on AIDS
CBCS:	Community Based Care and Support
DDS:	Dietary Diversity Score
OND:	Ordinary National Diploma

CHAPTER ONE

1.1 Background

HIV/AIDS, before the outbreak of the COVID-19 pandemic, has been one of the most challenging global and public health crises. Since the onset of the HIV/AIDS epidemic, approximately 70 million people have been infected with the human immunodeficiency virus (HIV) and about 36 million people have died from HIV, according to Global HIV/AIDS statistics (2018). By the end of 2017, 36.9 million people worldwide had been infected with HIV, with 940,000 deaths attributed to HIV-related illnesses (UNAIDS, 2018). Globally, about 0.8 percent of persons aged 15 to 49 years are infected with HIV, but the severity of the epidemic varies greatly between countries and regions (UNAIDS, 2018). According to UNAIDS, Sub-Saharan Africa is the most impacted region in the world, with roughly 26 million individuals living with HIV (UNAIDS, 2018). However, as the end of 2020, of the estimated 37.7 million people living with HIV globally, two-thirds of them (25.4 million) are in the African Region thus the region with the largest burden of the disease (WHO, 2021). Nigeria has the world's second-largest HIV epidemic, as well as one of the highest rates of new HIV infections in Sub-Saharan Africa (NACA, 2017). Though there has been a decrease to a current prevalence rate of 1.4% as reported in the Nigeria National HIV/AIDS Indicator and Impact Survey (FMoH, 2019), Nigeria still has the second highest rate of new infections in sub-Saharan Africa (UNAIDS, 2019).

The virus has spread swiftly since it was first discovered and reported in Nigeria in 1986. However, the prevalence of HIV in adults (15-49 years) has decreased significantly over time, with an estimated 1.9 million HIV- infected Persons in Nigeria (National Agency for the Control of AIDS and UNAIDS, 2018). HIV prevalence in Nigeria was 5.8% in 2001, 5% in 2003, 4.4 percent in 2005, 3.6 percent in 2007, 4.6 percent in 2008, 4.1 percent in 2010, 3.4 percent in 2013, 3.0 percent in 2014, and 2.8 percent in 2017 and 1.9% in 2019 (NARHS, 2007, HSS, 2010; NARHS 2013; National AIDS/STI Control Program, 2014; UNAIDS, 2017; FMoH, 2019). According to the Nigeria HIV/AIDS Indicator and Impact Survey, the prevalence rate among adults (15-64 years old) is currently at 1.4 percent (NAIIS, 2019). However, prevalence rates differ by region. A large percentage of adults aged 15-49 years in the South-south region (3.1%) are infected with the virus. The prevalence of HIV is also

high in the Central part of North (2.1%) and Eastern (1.9%) regions but low in Western (1.2%), North East (1.1%) and North West (0.6%). Kaduna State is in the Northwest region of the six geopolitical zones with population of over 6 million people. Current HIV prevalence rate in Kaduna state is 1.1%, however, compared to other states within its region, Kaduna State has the highest HIV prevalence (NACA, 2019). Generally, national prevalence rates exceeded 5% in two states (NAIIS, 2019). These findings back up concerns that some states are experiencing major, regional outbreaks. Human Immunodeficiency Virus complications are mainly caused by malnutrition which happens to be a significant factor involved in the disease progression. Human Immunodeficiency Virus causes nutrient mal-absorption and alters metabolism, leading to weight loss, suppressed immune function and increased vulnerability to opportunistic infections. While HIV increases energy needs, People Living with HIV/AIDS (PLWHA) are usually faced with poor accessibility to food due to inability to work and stigma (Crush *et al*., 2006; Bukusuba *et al*., 2007). HIV/AIDS is finally being recognized as a socio-economic problem, with the disease wreaking havoc on sustainable developments. Food insecurity and HIV/AIDS are intrinsically related, according to numerous studies (Weiser *et al*., 2007; Miller *et al*., 2011). Food insecurity is exacerbated by HIV-related disability, which reduces household economic strength and increases caregiver responsibility (Gillespie and Kadiyala, 2005). Food insecurity successively increase the susceptibility of women to unsafe sexual practices and has a detrimental impact on their empowerment, worsening HIV/AIDS spread (Weiser *et al*., 2007; Shannon *et al*., 2011). Moreover, poor nutrition and HIV create vicious circles.

Malnutrition is a common problem associated with HIV-positive populace. It hastens the progression of HIV into AIDS. As a result of low nutritional intake, mal-absorption, and altered metabolism, HIV infection can lead to poor nutrition (Hailemariam, Bune, Ayele, 2013; Molla, Fekadu and Dereje, 2013). Human Immunodeficiency Virus undermines the body's natural defences against infections and makes them less effective. When the body's defences are compromised, other microorganisms seize opportunity to further weaken the body and cause numerous ailments. As a result, the body steadily weakens and weight loss/wasting becomes a serious issue (Duggal, Chugh, Duggal, 2012). Malnutrition is thus a severe threat to HIV/AIDS patients. Even in the early phases of HIV infection, when no symptoms are

visible, the virus makes demand on the nutritional status of the body (FAO 2002). Adequate nutrition assists HIV/AIDS people to maintain and improve their nutritional condition while also slowing the progression of the disease, enhancing their quality of life (Sztam, Fawzi, Duggan, 2010).

Food systems involve many stages of transforming natural resources and human effort into food to sustain human life. These stages – from "farm to flush" – include growing, harvesting, processing, packaging, distributing, marketing, trading, consuming, and disposing of waste (United Nations System Standing Committee on Nutrition, 2016). According to FAO (2013), Food systems influence the availability and accessibility of diverse, nutritious foods and thus the ability of consumers to choose healthy diets. But the linkages from the food system to nutritional outcomes are often indirect – mediated through incomes, prices, knowledge and other factors. Food systems are shaped by a multitude of factors, such as geography, demography, urbanization, and globalization; socioeconomic status and income, marketing, and consumer attitude; and religion and culture (Kearney, 2010). This and other definitions of food systems emphasize that food systems produce food, that they are made up of a broad set of components from production to consumption and that they are influenced by external social, political and other drivers (Neff, Merrigan and Wallinga (2015); Babu and Blom (2014); Ericksen (2008); Reardon and Timmer (2012); Sobal, Khan and Bisogni (1998); Combs et al. (1996); HLPE (2014); Dixon (2015).

1.2 Statement of the Problem

HIV/AIDS is associated with physiological and social factors that impair a person's ability to ingest, utilize, and obtain food (Duggal, Chugh, Duggal, 2012). Various studies revealed a high prevalence of malnutrition among PLWHA (Thapa *et al*, 2015; Habtamu, Leja, Fesehaye, 2016; Mitiku *et al*, 2016). People living with HIV and AIDS are more prone to become malnourished as a result of reduced food intake, higher energy needs, and impaired nutritional absorption and metabolism occasioned by HIV (Palermo et al. (2013)). Moreover, HIV exerts extra demands on the body's nutritional state even in the early stages of infection, when no symptoms are apparent. And during the course of the infection, the likelihood of malnutrition increases significantly (Hailemariam, Bune, Ayele, 2013). The negative effects of the HIV/AIDS epidemic on nutrition and food

systems in affected areas demand attention, as well as strategies that includes safety nets to address these issues (FAO, 2002

HIV/AIDS also has a negative impact on the food systems and social conditions of HIV/AIDS patients, especially in developing countries (Peltzer & Ramlagan, 2011). Moreover, food security and HIV/AIDS are inextricably linked, with each condition heightening susceptibility to and exacerbating the severity of the other (Gillespie & Kadiyala, 2005; Anema et al., 2009). More so, food insecurity has a deleterious impact on patients living with HIV/AIDS in Nigeria, according to a study conducted by Adetutu et al. (2012). There is however insufficient and up-to-date information and data on the effect of HIV/AIDS on the food systems, dietary practices, and its attendant effect on nutritional and health status of HIV/AIDS persons in Nigeria. This insufficient access to adequate information and data poses a challenge to sustainable food systems and sustainable development.

There is also a challenge of regular, up-to-date hyperlocal data on nutritional indicators (e.g. dietary intake levels, weight, etc.) of categories of HIV/AIDS infected people in various regions of Nigeria. This is important for adequately monitoring trends and changes in nutrition and health status of HIV/AIDS populace and track its impact on this sub-group of the Nigerian population. Moreover, an understanding of the food and nutrition issues affecting HIV/AIDS infected persons including how the various food and nutrition-related safety-nets or support networks available to this group in Nigeria is impacting their health and nutrition outcomes will be important for policy and program. Insights from this study is thus crucial for informing efforts at mitigating the impact of the HIV/AIDS epidemic in Nigeria. This will also provide evidence for appropriate policy and programmes review and development, and the mainstreaming of food and nutrition security considerations into HIV/AIDS response in Nigeria.

1.3 Research Questions

1. What effect does HIV/AIDS have on the food system, nutritional status and key sociodemographic indicators of people living with HIV in the city of Kaduna?

2. How does HIV/AIDS affect the dietary pattern and nutrient adequacy of people living with HIV in the study location?

3. What are the available safety nets interventions and how have they impacted the food, nutrition and livelihood situation of people living with HIV/AIDS in the study location?

1.4 Objectives of the Study

1.4.1 General Objective

The study seeks to provide a comprehensive foundational outlook of the food systems, nutritional status and safety nets of persons living with HIV/AIDS in the studied locations of Kaduna city, Kaduna State, Nigeria.

1.4.2 Specific Objectives

The specific objectives are to:

1. assess the nutritional status of PLWHA using nutritional anthropometry, and dietary/nutrient intakes,
2. determine the relationship between nutritional anthropometry and socio-demographics, socioeconomics and health conditions of PLWHA,
3. assess the food systems (food production/availability, accessibility/affordability and food consumption patterns) of PLWHA,
4. determine the association between food systems of PLWHA with their socio-demographics and nutritional status,
5. assess the association between dietary intakes of PLWHA with their nutritional anthropometry, socioeconomic, demographic characteristics and health conditions,
6. identify and assess available safety nets or support systems for PLWHA,
7. determine the association between available safety nets and nutrition status of PLWHA.

1.5 Research Hypotheses

1. Socioeconomic and demographic characteristics of the PLWHA will not have any significant relationship with the food systems and nutritional status of the subjects

2. There will be no significant relationship between the dietary intakes of subjects and their nutritional anthropometry.

3. Available and accessible safety nets will have no significant relationship with the health and nutrition status of subjects.

1.6 Justification for the Study

Nutritional considerations and intervention are crucial at all stages of the disease since malnutrition results in morbidity and mortality among individuals diagnosed with HIV/AIDS. Severe malnutrition, which is common in people with AIDS, can worsen the disease's consequences and reduce quality of life. Individuals infected with HIV/AIDS frequently experience weight loss, dietary deficits, and malnutrition (particularly protein-energy malnutrition). As reported by certain studies, HIV/AIDS has a negative influence on household food security and nutrition in endemic regions, rendering it challenging to obtain food; demand for care rises, along with time restrictions, making it extremely tough to maintain health (Gedle *et al*, 2015; Gebremichael *et al*, 2018).

Nutritional assessment of individuals living with HIV/AIDS is also very crucial given that they experience have changes in body composition (loss of weight and body cell mass, as well as fat accumulation) and morbidity status, which affect their food consumption and utilization (Suttajit, 2007). There is an urgent need to pay attention to and address the issues of individual, community and household food security, household care-giving capacity and practices, availability and access to health and healthy environment, and other crucial issues affecting people living with HIV/AIDS.

Up-to-date and periodic data on food systems, existing nutrition status, and appropriateness of HIV/AIDS patients' diets is crucial in identifying risk factors for

developing nutritional problems and provide evidence for designing nutritional care and support interventions. Individuals living with HIV/AIDS, as well as their families and communities, require nutritional care and assistance. In order to understand how HIV/AIDS impacts on nutrition, a contextual assessment and analysis of the food systems of PLWHA, nutritional status, identification and prioritization of safety nets and interventions, is pertinent and important for policy and strategic program decisions.

Consequently, findings from this study will be of significant value to nutrition scientists, researchers and policy makers who are committed to HIV/AIDS prevention, management, care and support in Nigeria. The recent Nigeria's National HIV and AIDS Strategic Framework, 2019-2021 (NACA, 2019) provided no consideration, as part of its strategic interventions, for the promotion of food and nutrition interventions for vulnerable population groups like people living with HIV/AIDS. Interventions targeted at strengthening food systems impact individual and household food and nutrition security and are therefore critical entry points for promoting health and quality of life for PLWHA in Nigeria. In this regard, evidence from this study can used for advocacy by the nutrition community in calling for an urgent review of current policy frameworks and plans to include addressing the food system, food and nutrition security of vulnerable groups like people living with HIV/AIDS.

1.7 Definition of Terms

1.7.1 HIV/AIDS

HIV means *Human Immunodeficiency Virus*. Human because the virus lives only in the human body not in animals or insects. It's called immunodeficiency because the virus reduces the body's capacity to resist infections and diseases. A virus is a microscopic organism that can only multiply inside a living cell. AIDS means Acquired Immune Deficiency Syndrome. Acquired means it is not hereditary but results from exposure to a source of infection (a retrovirus known as HIV); Immune (a system that defends the body against infections and diseases), and Syndrome (a group of symptoms due to immune system deficiency).

1.7.2 Food Systems

All of the stages that allow food to reach the final consumer make up a food system. Cultivation, harvesting, packaging, processing, converting, marketing, preparation, consumption, and disposal of food wastes are all part of this process (FAO, 2016). Food system also refers to the process of integrating food production, processing, distribution, and consumption in order to improve a location's environmental, economic, social, and nutritional health (Gillespie, A. and Gillespie, G. 2000). The food system is affected by and functions within social, political, economic, and environmental settings.

While these factors cannot be overlooked, understanding the challenges food systems in Nigeria face also requires significant attention to HIV and its connection to the food system, considering its large disease burden and Nigeria's reliance on the agricultural sector. An analysis of the food system empowers researcher to discover where the most important issues lie regarding HIV and the food system and identify intervention points for enhancing food security and health outcomes, and thus the overall sustainability of the food system (UNEP 2016). Analyzing the whole food system is more appropriate given its holistic nature than an approach focused on agriculture, markets, nutrition and health separately (Ericksen 2007; van Berkum, Dengerik & Ruben 2018).

1.7.3 People living with HIV/AIDS (PLWHA)

These are individuals (that is adults and children alike) who have been confirmed to be infected and carrying the Human Immunodeficiency Virus (HIV).

1.7.4 Safety nets

The World Bank defines safety nets as "structured and unstructured processes that protect people against the adverse consequences of poverty." Safety nets refer to society's methods to meeting the needs of its most vulnerable groups, particularly those whose security is endangered by processes of economic growth and change.

1.7.5 Physical Activity

Any movement of the body produced by the muscles that leads in an increase in energy expenditure is referred to as physical activities. These are activities that are beneficial to both the mind and the body (howtobefit.com).

1.7.6 Nutritional Status

The condition of the body as a result of the intake, absorption and use of nutrition, as well as the influence of disease-related factors.

1.7.7 Contextual environment.

Contextual environment refers to the socio-economic, cultural, natural resources and political settings that facilitate or hampers individuals and organizations' functional ability. The level of political acknowledgement and support for HIV and AIDS-related activities is one example. (http://web.ng.undp.org/documents/nhdr/nhdr-2004-chapter-4.pdf)

CHAPTER TWO

LITERATURE REVIEW

2.1 HIV/AIDS and Malnutrition

Severe weight loss and wasting are recognized as common visible signs of malnutrition as the patient progresses from human immunodeficiency virus (HIV) to Acquired Immune Deficiency Syndrome (AIDS), especially in resource-limited settings (Amza, Demissie and Halala 2017; Delelegn *et al*., 2018). According to Gedle *et al*. (2015), malnutrition was found to be common among PLWHA, with 49 percent, 19 percent, and 9 percent slightly, moderately, and severely malnourished, respectively. HIV infection causes a malfunction in an individual's metabolic ability to absorb, retain, and use nutrition, leading in nutrient deficiencies, a weakened immune system, and an increased risk of infectious diseases (Katona & Katona-Apte, 2008). According to Palermo *et al*. (2013), PLHIV are more prone to become malnourished as a result of reduced food intake, higher energy needs, and impaired nutritional absorption and metabolism. HIV puts demands on the body's nutritional state even in the early stages of infection, when no symptoms are apparent. During the course of the infection, the likelihood of malnutrition increases significantly (Hailemariam, Bune, Ayele, 2013).

The link between nutrition and HIV infection is complicated. Malnutrition, even in the absence of HIV, can weaken the immune system, and CD4 T cells can be reduced in HIV-negative people who are malnourished (Anabwani & Navario, 2005). Individuals with HIV are susceptible to suboptimal nutrition due to reduced food intake, nutrient absorption, and nutrient utilization, and poor nutrition increases vulnerability to opportunistic infections, which can lead to HIV progression to AIDS. Malnutrition and HIV both lead to a downward cycle of impairment. HIV targets immune system cells and destroys them. Other organs become more prone to infections as a result of the weakened immune system. These infections impair a person's nutritional status by reducing nutrient intake and increasing nutrient loss, resulting in malnutrition (FAO, 2002). Weight loss and wasting are common in adult patients who have advanced from HIV to AIDS due to this cycle. Figure 1 below shows the complex link between malnutrition and HIV.

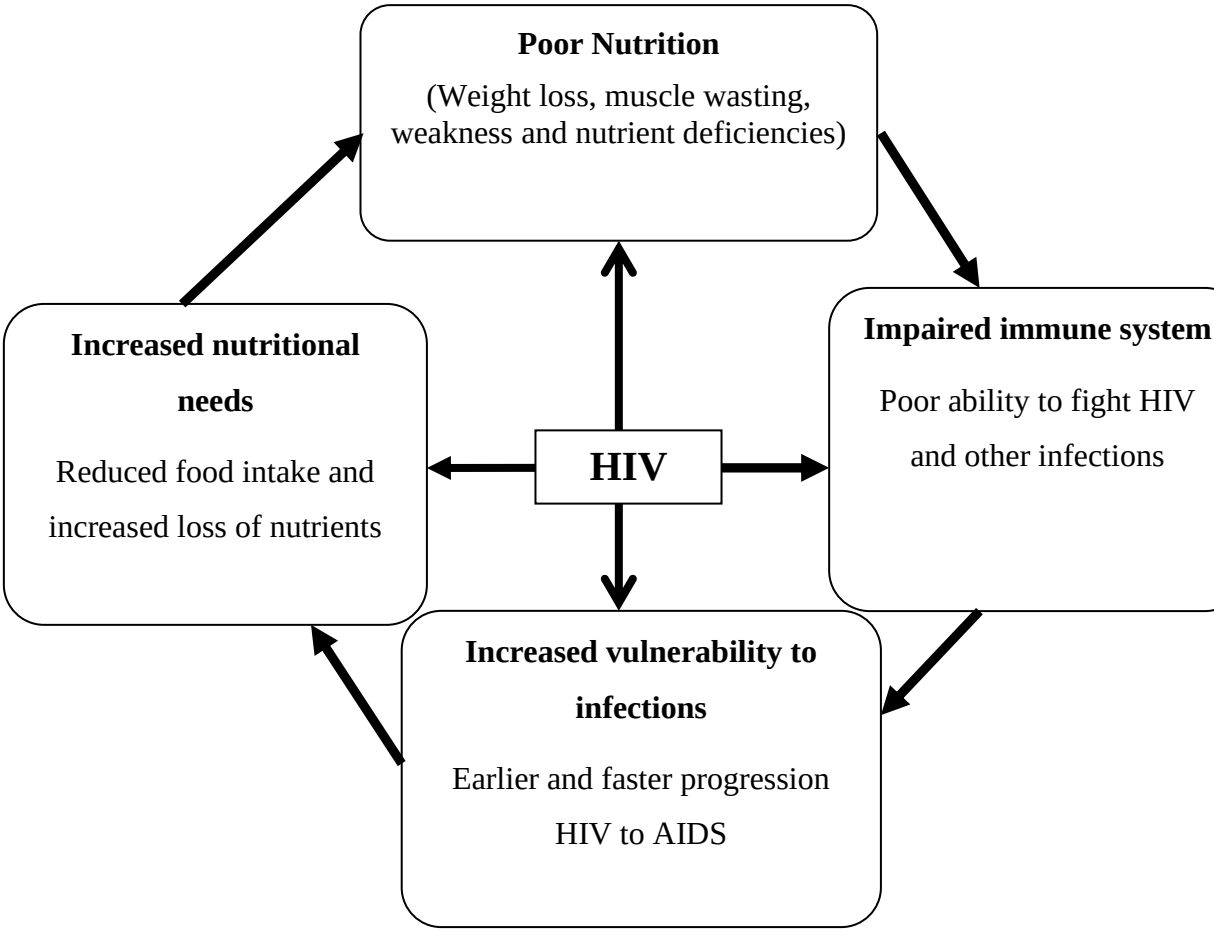

Figure 2.1: Relationship between malnutrition and HIV.

Source: Food and Agriculture Organization of the United Nations (FAO). 2002. *Living Well with HIV/AIDS: A Manual on Nutritional Care and Support for People Living with HIV/AIDS. Rome.*

2.2 Effect of good nutrition on HIV/AIDS

Acquired immune deficiency syndrome (AIDS) is caused by a retrovirus known as the human immunodeficiency virus (HIV). The virus attacks the immune system and impairs the body's ability to combat infection. Some infected individuals do not show symptoms for years after contracting the virus. The immune system weakens during this 'asymptomatic stage' of the infection, and other viruses and bacteria can take advantage of the 'opportunity' given by the repressed immune system to create opportunistic infections like pneumonia or tuberculosis. These opportunistic infections are a clear sign of an immune system that has been compromised. When these opportunistic infections become visible, the person is diagnosed with AIDS. (Montero & Nadler, 2005). The progression of HIV to AIDS is influenced by one's overall health and nutritional status both before and after infection. Malnutrition is caused by a reduction in food intake. Other factors include nutritional malabsorption and metabolic changes.

Good nutrition is highly important in the comprehensive care and management of HIV/AIDS by delaying the progression of the infection and improving quality of life (FAO, 2002). Optimal nutrition is crucial in the management of opportunistic infections, improvement of immune system and improvement of CD4 T cells count in PLWHA (Castleman, Seumo-Fosso & Cogill, 2003). A report by World Bank (2013) revealed the contribution of adequate nutrition to HIV suppression. Sztam, Fawzi & Duggan, (2010) showed the impact of appropriate nutrition in the maintenance and advancement of the nutritional states of PLHIV and also the delay in the progression of the virus, thus promoting the quality of life of PLHIV. More so, nutrient intake has been proven to improve antiretroviral absorption and tolerance (Maertens, 2011). Adequate nutrition sustains and improves the body's immune system ability to fight against infection-and thus lead a healthy life (WHO & FAO, 2002). **Figure 2** below reveals the positive impact of adequate nutrition for PLHIV.

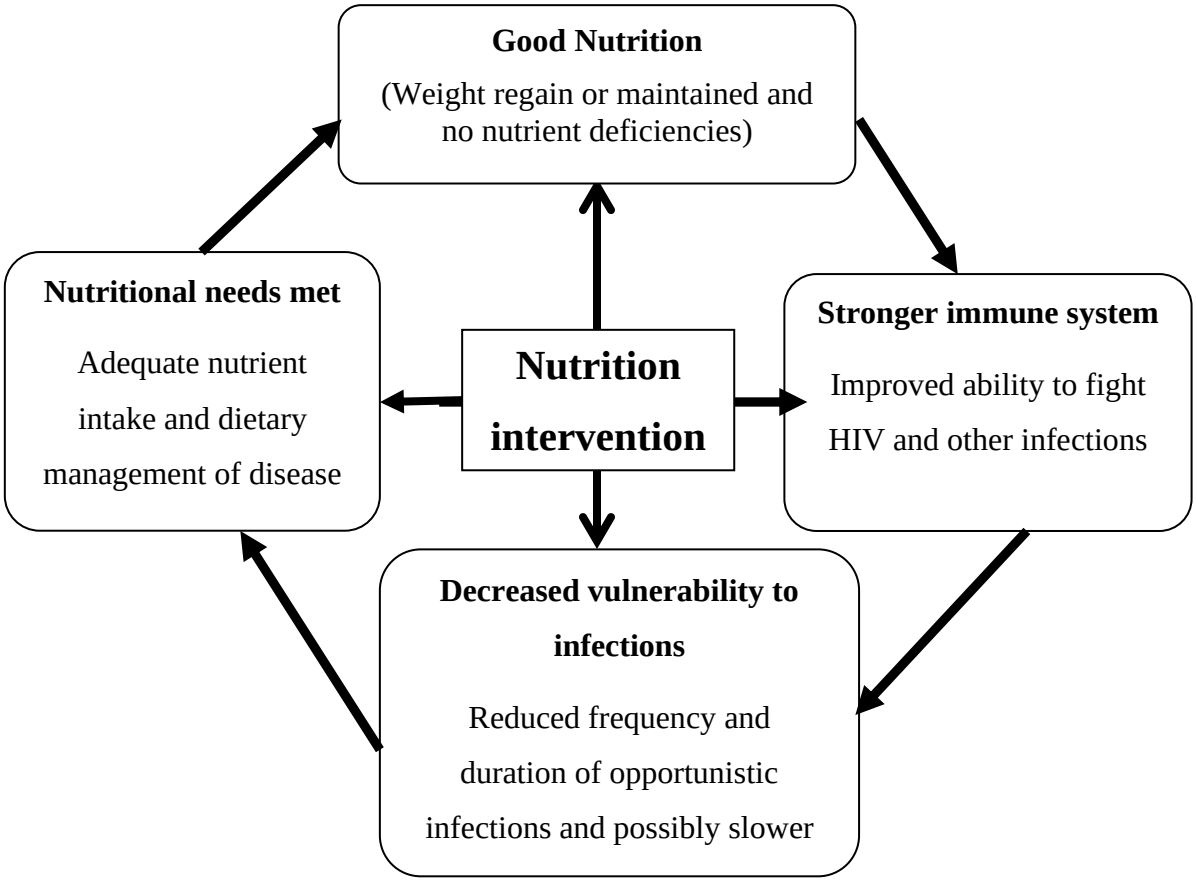

Figure 2.2: Effect of good nutrition on HIV/AIDS

Source: Food and Agriculture Organization of the United Nations (FAO). 2002. *Living Well with HIV/AIDS: A Manual on Nutritional Care and Support for People Living with HIV/AIDS. Rome.*

2.3 Nutrients requirements in HIV/AIDS

Nutrient deficiencies in PLHIV results in immune system suppression accompanied with increased susceptibility to infections. Gershwin *et al*. (2000) revealed essential nutrients that promote and strengthen immunity in the body. Optimal nutrition alters immunological function of PLHIV, prevents weight loss or maintains weight and builds or maintains muscle mass. Individuals infected with the virus have different nutrient requirements from those who are not infected, and these requirements alter as the disease develops (WHO, 2003). Due to HIV infections, opportunistic infections, and variations in metabolism, PLHIV have higher calorie requirements and require appropriate nutrition that includes both macronutrients and micronutrients. Onyango *et al*. (2012) found that HIV-positive patients had insufficient nutritional consumption, with iron being excluded.

2.3.1 Macronutrient Requirements

Energy

Energy requirements of PLHIV differ based on the different stages of the viral infection (asymptomatic and symptomatic). Energy requirement for HIV-positive adults, adolescents, and children increases by 10% and 20-30% above the recommended level for a non-HIV infected person during the asymptomatic and symptomatic stage respectively while for children, it increases by 20-30% and 50-100% during the symptomatic stage for children with no weight loss and weight loss respectively (WHO, 2003). People living with HIV/AIDS should not consume less protein or micronutrients as a result of their increased energy consumption. Whenever possible, HIV/AIDS patients should increase their intake of high-nutrient-density foods rather than high-calorie foods that are poor in protein and micronutrients to fulfil their extra energy needs (such as high fat and high sugar foods).

Protein Requirements

Proteins are vital in the production of antibodies, cytokines, transcription factors, enzymes and components of the complement pathways. Protein deficiency inhibits the synthesis of molecules required for the immune response and causes disruption of immune-related enzyme (Frills, 2006). Various studies conducted revealed a lower concentration of albumin (which could be an indicator for poor

nutritional status) among PLHIV (Mehta *et al*., 2006; Fields-Gardner and Campa, 2010; Sowmyanarayanan *et al*., 2017). No scientific proof that PLHIV requires more protein than a healthy person (0.8g/kg of ideal body weight per day). However, in the stable periods of the disease, protein intake should be 1.2 g/kg of body weight daily, and in acute cases, it can be increased to 1.8 g/kg (Ockenga *et al*., 2006).

Fat Requirements

In HIV-positive people, dietary fat is an excellent source of essential fatty acids and concentrated energy. The amount of fat they require to maintain the proportion of energy derived from fat increases proportionally with increased energy intake (WHO, 2003). Fat intake should be similar to that of uninfected people, i.e. no more than 30-35 percent of total energy requirements. PLHIV on specific antiretroviral medicines, as well as those with fat malabsorption or diarrhoea, may need to adjust their fat intake (National AIDS and STI'S Control Programme, 2007).

2.3.2 Micronutrient Requirements

PLHIV needs the same amount of micronutrients (vitamins and minerals) as HIV-negative people. Vitamin C has been discovered to have many effects on immunological function (WHO, 2005). It has the ability to boost the synthesis of interferons, a protein that defends cells from viral invasion. According to Onyango *et al*. (2012), even mild micronutrient insufficiency might affect immunological function, especially in patients who are not taking antiretroviral medications. Micronutrient requirements are met by consuming diversified diets, fortified foods and micronutrient supplements especially in micronutrient deficiencies endemic areas. Vitamin A supplementation has been shown to prevent mortality due to diarrhoea in PLHIV (Papanikolaou, 2002), while Vitamin E supplementation (800 mg/day) has been shown to minimize oxidative stress, increase viral load reduction, and improve cell viability in people on antiretroviral medication (Kittaros *et al*., 2004). More so, Childs and colleagues (2012) reported that Vitamin D supplementation may have further benefits in terms of preventing HIV transmission, disease progression, and immunological benefits.

2.4 HIV/AIDS and Contextual Food Systems/Food Security

HIV/AIDS has a negative impact on the food systems and social conditions of HIV/AIDS patients, especially in developing countries (Peltzer & Ramlagan, 2011). Poverty and food insecurity are known risk factors for HIV-positive women (Weiser *et al*., 2007; Miller *et al*., 2011). The effect of the HIV epidemic on food and agriculture is clearly linked to people's livelihoods, and it will differ depending on ecological zones, farming techniques, and the stage of the disease which might lead to a shift from cash crops to less labour-intensive food crops, to more basic and less diversified food production, or to a decrease in productivity and cash revenue, all of which would have negative consequences on household food security (FAO, 2002). Food insecurity and malnutrition were the greatest immediate issues faced by female-headed AIDS-affected households in Uganda, according to Topouzis & Hemrich (1996).

FAO described Household food security as "physical and economic access to sufficient, safe, and nutritious food to meet their energy demands and food preferences for an active and healthy life at all times" (FAO 1996). Improving household food security is the natural entry point for reducing the impact of the epidemic in the agricultural sector (FAO, 1995). HIV/AIDS has a variety of effects on food production and availability, both in terms of quantity and quality (FAO, 2001). Food security and HIV/AIDS are inextricably linked, with each condition heightening susceptibility to and exacerbating the severity of the other (Gillespie & Kadiyala, 2005; Anema *et al*., 2009). According to a study conducted in Kenya, almost all HIV-positive patient's households were either moderately or severely food insecure (Mbugua *et al*., 2008). Food insecurity was most prevalent among PLHIV/AIDS who used ART, according to an earlier research conducted in rural Uganda (Weiser *et al*., 2012). Evidence of the negative impact of the HIV/AIDS epidemic on individual/household health, nutrition, and food security in afflicted areas abounds around the world (Hawkins & Hussiens, 2002; Anema *et al*., 2009; Weiser *et al*. 2012; Delelegn *et al*., 2018). More so, food insecurity has a deleterious impact on patients living with HIV/AIDS in Nigeria, according to a study conducted by Adetutu and colleagues (2012).

In the face of the HIV/AIDS crisis, such individuals and families' ability to get appropriate food, either through their own production or through purchases, to meet the nutritional demands of their members so that they can live a healthy and active life is limited (FAO 1995). The negative effects of the HIV/AIDS epidemic on nutrition and

household food security in affected areas demand attention, as well as strategies to address these issues (FAO, 2002).

2.5 Impact of HIV/AIDS on Livelihoods

HIV/AIDS has become increasingly linked to malnutrition and household food insecurity, necessitating the inclusion of food and livelihood security as a critical component of HIV/AIDS prevention (FAO 2003). Masanjala (2007) found that HIV-affected households are more likely to experience financial difficulties (poverty), which might exacerbate individuals' symptoms, and that poverty is associated with increased morbidity and mortality among PLHIV (Birbeck *et al*., 2011; Weiser *et al*., 2009; Weiser *et al*., 2009). HIV/AIDS poses health and socio-economic threat to individuals, families and communities, as well as destroys households' livelihoods (UNAIDS, 2008).

Quite a lot of HIV/AIDS affected households depend on agriculture for their means of livelihood in sub-Saharan Africa including Nigeria (Parker *et al*., 2009). HIV/AIDS pandemic reduces agricultural productivity and threatens household food security (UNAIDS, 2008). Chapoto and Jayne (2008) revealed that prolonged HIV pandemic in Zambia harmed rural households' ability to produce food and other agricultural products, earn money, and provide for their families. AIDS-related illnesses have had a significant impact on household economies, reducing human capital, agricultural production, and labour supply, and thereby reversing gains on other development issues (Fauci, 2007).

Various studies showed that household welfare of PLHIV were affected (Drimie, 2003; Beegle, 2005; Nabyonga-Orem *et al*., 2008) and this leads to a decrease in household available capital, as cash is needed for medical attention, and nutrition-dense foods that are recommended to be taken with ART (Beegle, 2005; Onyango, Swallow & Mukoya-Wangia, 2005). Topouzis (2003) argues that HIV/AIDS affects household labour at quality and quantity level, this is seen firstly in terms of productivity as a result of illness and then reduction in the supply of household labour due to death of the infected people.

Reduced productivity, along with an increase in medical costs, often leads to a deterioration in the PLHIV/AIDS' and their household's livelihood security situation.

Senefeld and Polsky, (2005) revealed that there is a difference in livelihood security between households with HIV/AIDS and homes that are not affected.

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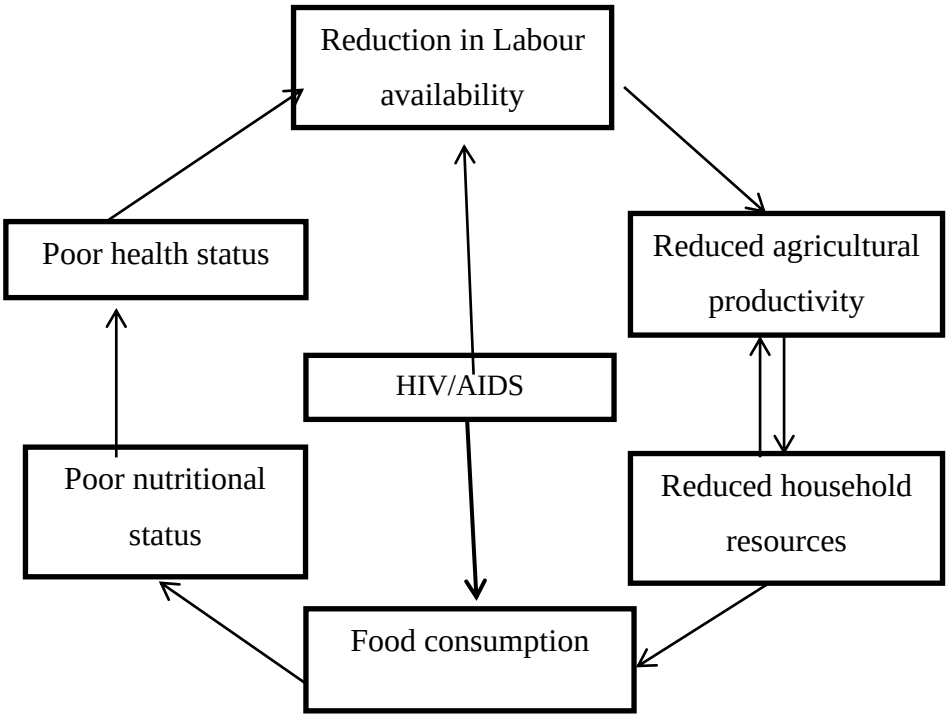

Source: adapted from Parker *et al*., 2009

Figure 2.3: Model of the interrelationship between HIV/AIDS and determinants of Livelihood

The figure above depicts what happens when a member of the household becomes infected with the virus. Household labor declines as a result of the PLHIV/AIDS population's declining health and the need for caretakers. In addition, a loss in labor can result in lower agricultural productivity, and household resources are likely to be depleted as a result of increasing HIV-related expenses. Reduced household resources may lead to further losses in agricultural productivity and lower food consumption, which is a severe concern given the potential for increased demand for nutrient-dense foods among PLHIV/AIDS. Poor food consumption has a detrimental influence on nutritional status, which has a negative impact on the health of people living with HIV/AIDS and other family members. Illness and exhaustion caused by poor nutrition and health lead to even less labor, and the cycle continues.

2.6 Impact of Hygiene and Sanitation Practices on HIV/AIDS

Particularly in developing countries, access to adequate sanitation and water sources is limited (Yates *et al*., 2015). The Human Immune Virus impairs PLHIV's immune system, making them more susceptible to infections. Diarrhoea is a typical symptom of HIV infection. In developing countries, diarrhoeal and gastrointestinal diseases are majorly the result of poor sanitation, and hygiene which often results from ingestion of contaminated water (World Health Organization, 2016).

Studies have revealed that individuals infected with HIV/AIDS are at highly susceptible to enteric infections from water-borne pathogens causing diarrhoea (Dwivedi *et al*., 2007; Nkenfou, Nana & Payne, 2013 World Health Organization, 2014) which also persevere for those on antiretroviral treatment (Pavlinac *et al*., 2014; Abebe *et al*., 2014). Intestinal parasites have been identified as the most common enteric pathogens among PLHIV where they result in severe and prolonged illness when compared to immuno-competent persons (Kipyegen, Shivairo & Odhiambo, 2012; Nkenfou, Nana & Payne, 2013). A study conducted in Botswana by Ngweny and Kagathi (2006) revealed the necessity of water among PLHIV in taking medications especially anti-retroviral treatment and preventing dehydration.

The World Health Organization (2008) and the United States President's Emergency Plan for AIDS Relief (2008) both recognized the importance of safe water and appropriate sanitation for people living with HIV/AIDS, and both urged for policy changes to include WASH activities in HIV/AIDS programs. WASH projects such as installing a protected well (water supply), distributing chlorine tablets (water quality), building latrines (sanitation), or promoting hand washing (hygiene) aim to eliminate the fecal-oral transmission route and provide optimal health, nutrition, a healthy environment, and improved quality of life (Yates *et al*., 2015). Due to an increased risk of diarrheal disease and enteric infections, improving access to proper water, sanitation, and hygiene (WASH) practices for PLHIV is critical (Mermin *et al*., 2005). A systematic review of the effects of water sanitation and hygiene interventions on the health of people living with HIV/AIDS found that they were beneficial to their health (Yates *et al*., 2015). Peletz *et al*. (2013) showed that adequate WASH practices resulted in an improved health status among PLHIV. Furthermore, Fischer Walker *et al*. (2011) conducted a research that demonstrated the potential of good water, sanitation and hygiene practices to drastically reduce morbidity and mortality.

Hand washing interventions among PLHIV have been reported to be very effective against diarrhoea (Clasen *et al*., 2007; Waddington & Snilstveit, 2009). Several obstacles to enhanced WASH services and facilities, however, have been identified. Lack of understanding, attitudes, cost, and incapacitating illness are only a few of them (Yallew *et al*., 2012; Mugambe, Tumwesigye and Larkan, 2013).

2.7 Impact of Coronavirus Pandemic on Food Systems of PLWHA

All inputs (environment, people, process, infrastructures, institutions), activities, and actors relating to food production, processing, distribution, preparation, and consumption, as well as the outcomes of these activities (nutrition and health, social and economic outcomes) are referred to as food systems (HLPE, 2014). Food systems are affected by external factors that can either push or pull at food systems and as such result in either a positive or negative nutritional and health outcome (High Level Panel of Expert, 2017; Willett *et al*., 2019).

The current global outbreak of Coronavirus (COVID-19) has thrown both industrialized and developing countries' food systems into disarray. Globally, food environment (a place where consumers interact with food system for the purpose of acquiring and consuming food) is rapidly changing in food availability, accessibility and affordability (Turner *et al*., 2018). The United Nations System Standing Committee on Nutrition reported that rapid changes in food environment impacts negatively on dietary practices of consumers especially the vulnerable population (PLWHA) which could further result in retrogression in their nutrition and health status (UNSCN, 2020). The COVID-19 pandemic has led to a severe loss of human life worldwide and presents an unforeseen challenge with profound social and economic consequences, including compromise of the entire food systems thus affecting food and nutrition security.

Food systems are meant to provide diversity of foods that makes a healthy diet (Glopan, 2016). Diets which comprise of foods that individual consume to meet their energy and nutritional needs are influenced by all aspects of food system (USDA. 2015). World Health Organisation states that a healthy diet should commence early in life and should consist of diversity of foods that includes starchy staples, legumes, fruits, vegetables, and foods from animals (diary and meat), however people across the

world still experience poor access to adequate nutrient-rich foods which leads to micronutrient deficiencies (WHO, 2018).

Apshin *et al* (2019) and Willett *et al* (2019) revealed that a diet influenced by a poor food system is one of the leading causes of malnutrition. COVID-19 presents major issues for food systems by disrupting activities, actors and drivers of sustainable food systems. Disruption of PLHIV food networks contributes to both an increase in poverty by disrupting a crucial source of income and a worsening of poverty's effects by restricting access to foods, particularly healthy ones (GAIN, 2020). Sustainable healthy diets are important in improving and maintaining an optimal immune system, especially among vulnerable groups which includes HIV/AIDS positive patients and as such promoting and sustaining health food system is very crucial (FAO, 2020).

2.8 HIV/AIDS and Social Safety Nets

As part of a larger social protection agenda, safety net programs seek to address risks, vulnerability, and social exclusion (FAO, 2012). Vulnerable households are helped by safety nets to protect their livelihoods by maintaining an adequate level of food consumption, improving food security, and preventing them from adopting harmful coping techniques and depleting their assets. Also, from the agricultural context, the capacity to mitigate liquidity constraints for smallholders, increase demands for farm products, promote income-generating strategies, and create multiplier effects all through the local economy (Devereux *et al*., 2008). Examples of social safety nets include cash transfer or food vouchers (FAO, 2011), universal food subsidy (World Bank, 2008; FAO, 2011), employment-based safety nets (International Labour Organization, 2010).

HIV/AIDS is much more than just a health and under-development issue; it is a unique disease due to its devastating, systemic, and cumulative effects. It differs from diseases like malaria in terms of the severity of morbidity and mortality among those aged 15 to 50, as well as the spread pattern (FAO, 2003). Long-term illness and untimely death among these age groups have significant implications for the agricultural sector, resulting in reduced productivity at the household and community levels; irreversible depletion of rural household assets; and activation of undesirable, irreversible reaction mechanisms; wreaking havoc on community structures and emptying community safety nets; eroding the resilience of farming and livelihood

systems; reducing family and community recovery capability; and increasing their vulnerability to food shortages (FAO, 2003). HIV/AIDS poses a danger to social and economic stability in a number of regions. Since individuals and households are the first to suffer the effects of HIV/AIDS, the first line of defence should be to reduce the socioeconomic impact on affected communities. Support is needed to build community social safety nets in addition to augmenting household economic resources and income flows (through access to credit and savings, micro enterprise services, and market linkage). Material relief, labour support, emotional support, mollifying care, on-going prevention programs, and other assistance provided by community-based organizations and community members sharing limited resources make up the safety net that reduces the impact of HIV/AIDS and strengthens the resilience of communities (Geoff Foster, 2005).

2.8.1 Support Groups in HIV/AIDS Situation

A support group is a collection of individuals for the purpose of communicating their problems, experiences, and/or shared role without being judged, blamed, stigmatized, or isolated (Fanelli & Moyo, 2008). Support groups are beneficial because members get first-hand counsel and learn new techniques from peers who are going through similar situations. Support groups are developed to help people develop and maintain positive strategies for living with HIV and AIDS, as well as to improve their awareness of the disease (Fanelli & Moyo, 2008).

The World Health Organization recommends support groups as a way to improve retention and adherence among HIV-positive people on antiretroviral medication (WHO, 2013). The function of such groups is sharing experiences, encouraging disclosure at all times, supporting adherence to medication, mitigating stigma and discrimination, improving retention in HIV care, enhancing confidence, patients' coping abilities and psychosocial functioning (Haberer *et al*., 2010; Peterson *et al*., 2012). One of the possible benefits of support groups in HIV testing, according to the Centers for Disease Control and Prevention (CDC), is the revelation of HIV-positive status. The formation of a support group necessitates the creation of a constitution that tackles the following: the group's overarching vision and mission, membership (e.g., how new members will be recruited), and finances; maximum number of members; if applicable, a membership fee), group members' rights and

obligations, confidentiality, conflict resolution and grievance procedures, leadership (positions, selection, term length and succession), meeting frequency, and group life span (Fanelli & Moyo, 2008).

There are various studies that show the benefits of support groups for HIV-positive persons. Dageid and Duckert (2007) found that support groups were linked to a lower prevalence of HIV-related symptoms like somatic symptoms, anxiety, and insomnia in a research done in South Africa. The support group that was developed, according to Pappin *et al*. (2012) and Kaaya *et al*. (2013), resulted in a decrease in depression among HIV-positive people. According to a Nigerian study, being a part of a support group was linked to a lower risk of depression in HIV-positive people (Ndu *et al*., 2011). Furthermore, a Rwandan study found that forming support groups with PLHIV enhanced adherence to antiretroviral therapy and reduced viral levels (Elul *et al*., 2013). According to a study conducted in Uganda, patients who are involved in a support groups were more likely to seek medical attention (Kim *et al*., 2012). Other advantages were increased access to ART, treatment success, an increase in CD4 cell count, and a reduction in symptoms (Wouters *et al*., 2009; Achieng *et al*., 2012).

2.9 Food Income Expenditure by PLWHA

Income has a significant impact on household purchasing power and food access. As a result, low-income households may be unable to obtain high-quality food in sufficient quantities to meet the needs of all family members. A number of research have established the influence of HIV on infected households' food income expenditures. According to a survey performed in Southwest Nigeria, approximately half of the respondents spent half to three quarters of their household income on food (Sholeye *et al*., 2017). According to a study conducted in Kenya by Onyango and colleagues (2010), people living with HIV/AIDS spend less money on food and more money on medications than those who are not affected with the virus. He further explained that the reason for less income on food was due to viral infection, death, lack of funds and job loss.

Food items accounted for a larger percentage of household expenditure, according to research performed for the United Nations World Food Programme in four rural Ethiopian districts in 2008. A survey done in India also revealed that household income was spent more on food than other things such as medicine,

clothing, accommodation amongst others (International Labour Organisation, 2003). On the contrary, Bukusuba *et al* (2007) revealed that larger proportions were spent on medicines and a lesser part on food. In Uganda, a study conducted by Nakakawa *et al* (2020) registered greater percentages of the income of HIV positive households spent on food.

Socioeconomic status impacts on household food income expenditure. Research conducted by Hendriks (2005) showed that income is an important determinant that ensures ample food supply to satisfy the needs of family members. A survey conducted in South Africa revealed that low socioeconomic status of PLHIV impacts negatively on the amount spent on foods (Piennar *et al*., 2017). A Kenyan study revealed that a household that had suffered HIV-associated death spends less on food as a result of reduction in household income (Musita *et al*., 2009).

2.10 HIV/AIDS and Nutritional Assessment

Nutritional assessment can be defined as the interpretation from dietary, laboratory, anthropometric, and clinical studies. It is used to determine the nutritional status of individual or population groups as influenced by the intake and utilization of nutrients (Gibson, 2005). Nutritional status assessment provides the data necessary to study the effects of nutrition on health and disease, to identify critical nutrients in a specific population and the group within this collective that are at risk of deficiency, and to develop effective public health policies to prevent and cure nutrition-related diseases. Nutritional status can be assessed by anthropometry, biochemical, clinical and dietary assessment methods.

2.10.1 Anthropometry

Anthropometry is the study of the dimensions of bone, muscle, and adipose (fat) tissue in the human body. The most globally applicable, affordable, and non-invasive way of determining the size, proportion, and composition of the human body is anthropometry evaluation (WHO, 1995). Anthropometric measures can be used to calculate a variety of indexes and ratios. The body mass index, or "BMI," is perhaps the most well-known metric of body fatness, although others include the Middle upper-arm circumference (MUAC), waist-hip ratios, hip ratios, and waist ratios, among others.

2.10.1.1 Body Mass Index (Method/Procedure of Assessment and Cut-offs)

The BMI is calculated by dividing a person's weight in kilograms by the square of their height in meters (kg/m2). BMI can be used to determine an individual's nutritional status, whether they are sick or not. It is the most often used tool to associate the risk of health problems with population weight since it is simple to measure and compute. Underweight (BMI values 18.49), normal weight (BMI values 18.5-24.99), overweight (BMI values 25.0-29.99), obese—Class I (BMI values 30.0-34.99), obese—Class II (BMI values 35.0-39.99), and extremely obese—Class III (BMI values > 40.0) are the weight categories that BMI criteria are used to screen for. (National Institutes of Health, 1998, WHO, 2007). BMI was formulated as a disease risk indicator; as BMI rises, the risk of certain diseases rises as well. Premature death, cardiovascular disease, high blood pressure, osteoarthritis, certain malignancies, and diabetes are only a few of the disorders linked to being overweight or obese. In adolescents, the BMI/Age method is recommended. It's a screening tool for determining the risk of being overweight in children and adolescents. The following is how cut-offs are interpreted; Overweight: >+1SD (equivalent to BMI 25 kg/m^2 at 19 years), Obesity: >+2SD (equivalent to BMI 30 kg/m^2 at 19 years), Thinness: <-2SD and Severe thinness: < -3SD (WHO, 2007)

2.10.1.2 MUAC (Method/Procedure of Assessment and Cut-offs)

The circumference of the left upper arm, measured at the midpoint between the tip of the shoulder and the tip of the elbow (olecranon process and acromium), is known as the MUAC (UNSSCN, 2002). Collins *et al*. (2006) found that MUAC is beneficial in assessing nutritional status and that it is very good in predicting health outcomes, as well as mortality. (Charles *et al*., 2010). MUAC has been shown to be effective in assessing acute malnutrition in children under the age of five and in enhancing the quality of community-based acute malnutrition management (Brown *et al*., 2009; Nyirandutiye *et al*., 2011).

In resource-limited settings, MUAC is increasingly being used to determine nutritional status and identify eligibility for nutritional support among adolescents and adults, notably pregnant women and PLHIV who are eligible for antiretroviral medication (Bahwere *et al*. 2011; Ververs, 2013). The use of MUAC in adolescents and adults has the advantage of being an easy and relatively low-cost assessment that

may be used in both community and facility settings (FANTA, 2013). In comparison to weight and height measurements for calculating body mass index or other anthropometric measurements like waist ratio, hip-waist ratio, and others, measuring MUAC takes very less equipment and calculations. It has a greater sensitivity.

The measuring tape for MUAC has various colours, with the red (<110mm) indicating severe acute malnutrition and threat of death, the orange (110-124mm) indicating moderate acute malnutrition, yellow (125-134mm) indicating risk to malnutrition and the green (>135mm) indicating a normal nutritional status.

2.10.2 Dietary Assessment (24-Hr Dietary Recall and Food Frequency Questionnaires (FFQ))

Dietary assessment is a method of determining an individual's or a household's or population group's food and nutrient intake and dietary pattern over time (FAO, 2018). It is one of four nutrition evaluation methodologies for assessing an individual's nutritional status holistically. Dietary assessment can be done in a variety of ways, including indirect approaches (which use secondary data to analyse diets) and direct methods (which use primary data to assess diets of individuals). Prospective and retrospective methods are the two types of direct approaches available. Current food consumption is measured using prospective approaches. The diet is recorded at the time of consumption, including all foods and beverages ingested, providing for accurate tracking of current food intake. Weighed food records, approximated food records, and duplicate meal records are all examples of this approach. Food consumption is measured using retrospective approaches. They're based on a review of previously eaten meals and beverages. 24-hour recall, food frequency questionnaires (FFQ), and dietary history are examples of the approaches used. These methods rely heavily on the respondent's memory and ability to recall all items and portion sizes ingested within a given time period. Food models, photographs of foods, normal home measuring cups, spoons, and other tools can be used to determine the amount of food consumed. Prospective approaches, which rely significantly on respondents having high literacy and numeracy skills, can be more labour expensive than retrospective methods, depending on the study's aims (e.g., the weighed food record and duplicate meal method).

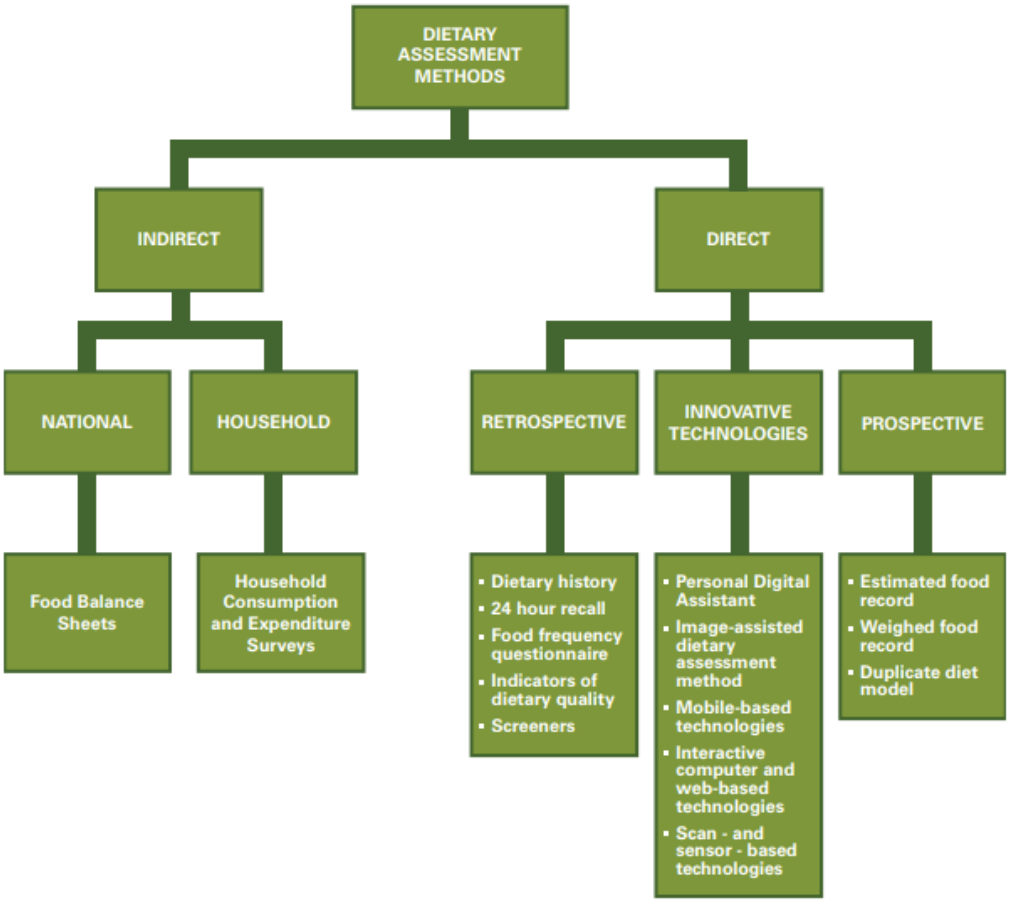

Figure 2.4: Overview of dietary assessment methods to estimate food and nutrient consumption at national, household and individual level (adapted from FAO, 2018).

2.10.2.1 24-hour Dietary Recall

This method evaluates a person's real intake. Multiple 24-hour dietary recalls can help to improve quality control, reduce errors, and improve reliability. An open-ended format is used to collect data on 24-hour recall. The estimation of energy and nutrient intakes is possible using quantitative information on food intake, as specified by portion size. The use of measurement aids such as standard household measures, picture atlases, food models, and so on can help with portion size estimation.

2.10.2.2 Food frequency questionnaire (FFQ)

The Food Frequency Questionnaire (FFQ) measures how frequently meals and/or food groups are consumed over time. The questionnaire is self-administered or

can be conducted by an interviewer and comprises a meal list (typically closed-ended) and a frequency category section. FFQs can be created from scratch or adapted from existing surveys (Cade *et al*., 2002). FFQs are frequently used in research to collect data on dietary intakes and trends, to analyze diet–disease connections, and to calculate correlations or relative risks (Corsi *et al*., 2008; Hutanasu *et al*., 2009). Seasonal food habits can also be evaluated using FFQs (Campbell *et al*., 2014).

2.11 Selected Feasible High Impact Nutrition Interventions in HIV/AIDS

Nutrition is an important part of comprehensive care for HIV/AIDS patients, particularly in resource-constrained settings where poor nutrition and food security are common. Musumari *et al*., (2014) and Gedle *et al*., (2015) found that PLWHA's nutrition management is critical to their capacity to continue working and contribute to the development of their socioeconomic status. These studies show that consuming meals from various dietary groups is connected to beneficial health effects, such as a lower mortality rate. The President's Emergency Plan for AIDS Relief (PEPFAR) began providing direct funding for nutritional support for people living with HIV/AIDS, and established a program known as Food by Prescription, which effectively regarded food as medicine in the context of combating HIV infection and malnutrition (Aberman *et al*., 2014).

Nutrition supplements, food aid, and livelihood interventions have been shown to improve persons living with HIV's quality of life, adherence to treatment, nutritional status, and food security, according to available research (Ivers *et al*., 2010; Singer *et al*., 2015; Young *et al*., 2014). A quasi-experimental, longitudinal study conducted by Rawat *et al* (2014) among PLHIV in Uganda revealed significant decreases in food insecurity and increase in BMI. A study conducted in resource-limited settings revealed that nutritional support programme for PLHIV significantly reduced mortality rates (Serrano *et al*. 2010). On the contrary, other studies observed no difference in the impact of nutritional support on mortality rate of PLHIV (Bowie *et al*., 2005; Manary *et al*., 2010; van Oosterhout *et al*., 2010).

PLHIV CD4+ cell counts improved on food support and food supplement programs, according to Sadler *et al* (2012) and Nyamath *et al* (2013). According to a study conducted in Zambia, a clinic-based food assistance program significantly improved adherence to antiretroviral therapy among PLHIV (Tirivayi, Koethe &

Groot, 2012). Furthermore, Fawzi *et al* (2004) revealed a significant increase in the level of CD4+ and CD8+ cell counts as well as reduction in viral loads of HIV positive pregnant women due to multivitamin supplementation. Food support interventions have been proven to be effective in improving the nutritional status of PLHIV in low-resource settings in a systematic review (Fauk *et al*., 2016). In South Africa, a nutritional supplementation intervention had a beneficial impact on CD4+ cell counts among PLHIV (Evans *et al*., 2013).

2.12 Food System

The food system consists of several activities whose primary aim is to increase food security (van Berkum, Dengerik & Ruben 2018). These includes growing, harvesting, packaging, processing, transforming, transporting, marketing, consuming and disposing of food (Haddad *et al*., 2016). They include the necessary inputs and outputs generated at each step. A food system operates within and is influenced by social, political, economic and natural environments (Eames-Sheavly *et al*., 2011).

Nugent (2011), Fanzo, Cogill, and Mattei (2012) compartmentalized food systems into several areas of production, consumption, and nutrition, and defined the key determinants of each area: food production as agriculture, food storage and processing, distribution, wholesaling and retailing, as food marketing; food consumption as food availability, food quality and quantity, food affordability, dietary diversity, dietary habits, cultural and social influences, taste and enjoyment, and physical environment; and nutrition as balanced diets, malnutrition, and wellness. As a result, they lay emphasis on the importance of linking production and consumption while putting into consideration its implications on nutrition and health of the consumer.

Food systems impact on human health and nutrition in various ways, perhaps the most obvious is the availability of food to meet the energy and dietary requirement of individuals. (Kanter et al., 2015 & Galanakis, 2020). The food systems play a crucial role in achieving the United Nations Sustainable Development Goals (SDGs), for example the goal to end hunger through achieving food security and improved nutrition (SDG2) and to ensure sustainable consumption and production (SDG12) (Scherhaufer et al., 2018). SDGs require the optimum utilization of all raw materials

produced by food systems and integrated activities throughout all stages of the food chain.

2.13 Food systems and Pandemics

2.13.1.1 Food system and Coronavirus

Ever since the commencement of the COVID-19 pandemic, challenges to food supply chains that have major implications for food security and nutrition have emerged. These challenges include inadequate agricultural labour (often supplied by seasonal migrants) as a result of constraints on human mobility and physical isolation; restricted access to agricultural inputs due to constraints to inputs producers, transportation and import limitations; overcrowding and disruption in food logistics and delivery; closure of markets as a result of physical distancing and lack of preventive tools (Hilal et al., 2020). According to the United Nations Organization, the pandemic negatively impacted on food systems due to fear of contagion, worker illness, social distancing, quarantines measures, restriction of people's movements, 'thickening' of borders and lockdown (United Nations Organization, 2020). More so, the pandemic has disrupted agriculture activities leading to disruptions in food supply chains, and most importantly restrictions on the access of the consumers to the market for purchasing food items (Zurayk, 2020).

2.13.1.2 Food system and HIV/AIDS

The framework outlined below, was developed based on the literature on food systems (HLPE 2017; UNEP 2016; van Berkum, Dengerik & Ruben 2018) and the literature on health and agriculture (Hawkes & Ruel 2006; Aberman, Meerman & Benson 2015). The framework describes the components of the food system and how these components interact. The framework relies principally on the conceptual framework of food systems for diets and nutrition developed by the High-Level Panel of Experts on Food Security and Nutrition (HLPE 2017). However, it has been adapted and simplified to focus on the Nigeria's context and to include HIV as the driver of food system change, and health and food security as the final outcome of the food system.

There are two main components of the food system: the food supply chain and consumer behaviour (HLPE 2017). The food supply chain is comprised of production, storage and distribution of food, processing and packaging of food, retail and markets access (HLPE 2017) while the consumer behaviour refers to "the choices made by the consumer, at household or individual level, on what food to acquire, store, prepare and eat, and on the allocation of food within the household (HLPE 2017).

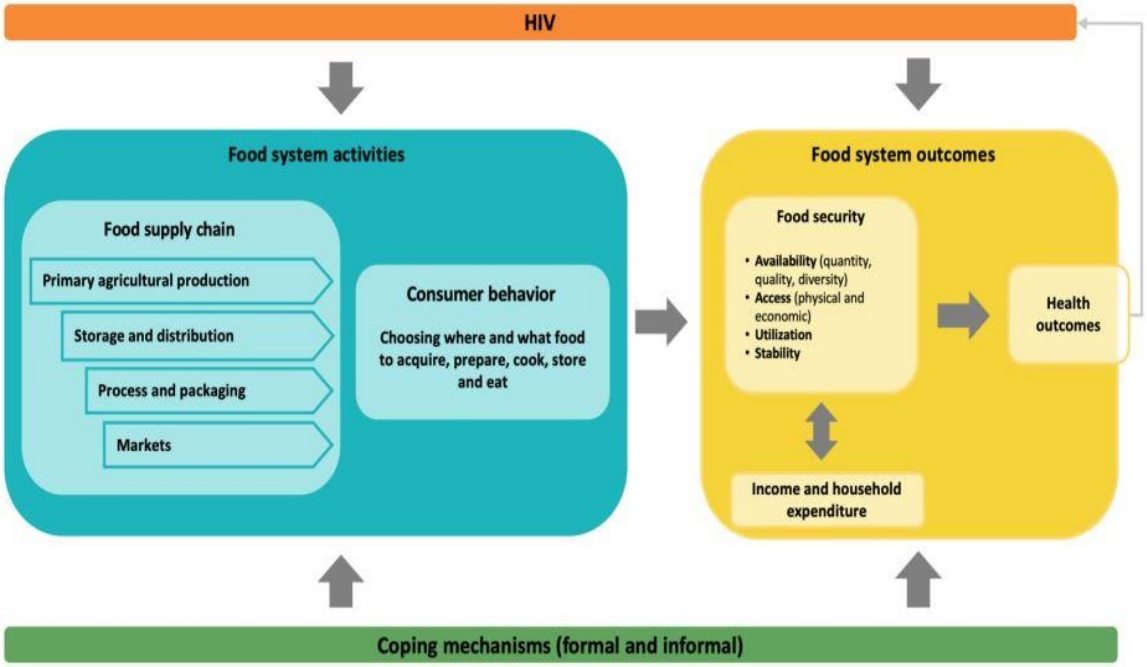

Figure 2: Analytical framework for the relationship between HIV and food systems

Source: Author, adapted from Eriksen 2007; UNEP 2016; HLPE 2017; van Berkum, Dengerik & Rueb 2018

According to a study by Aamodt, (2020), HIV impacts various components of food systems, including primary agricultural production, market access and consumer behaviours. Recently, the local food systems are associated with low dietary diversity, higher malnutrition under-five mortality prevalence (HLPE 2017).

CHAPTER THREE
METHODOLOGY

3.1 Study Design

A prospective, descriptive, and cross-sectional study design was employed for this study and which was informed by the need for a comprehensive foundational information on the food systems, nutritional status, and safety nets of People living with HIV in Kaduna city, Nigeria. This study combined a good mix of both qualitative and quantitative data collection methodologies.

3.2 Study Location and Data Collection Period

This research was carried out in Kaduna city, Kaduna State. Kaduna state is located on the southern end of northern Nigeria's high plains, defined by parallels 9°30'N and 11°32'N, and stretches from 6°05'E on the upper River Mariga to 8°48'E on the foot slopes of the Jos scarp. Agriculture is the mainstay of the economy, and it has a metropolitan city and industrial orientation. Kaduna is the capital of Kaduna State and is located along the Kaduna River in North West Nigeria which is a major tributary of the Niger river. Most industries are grouped south of the Kaduna river near the main railway junction. Kaduna city has cotton-textile spinning and weaving mills; knit fabrics are also produced there. There is also a considerable local trade in sorghum, millet, corn, kola nuts and cattle. These made Kaduna city a major industrial, commercial, and financial centre for the northern states of Nigeria. Kaduna city is the northern Nigeria's principal military hub where the Nigerian Defense Academy (1964) is located. Other places of importance in Kaduna city includes the National Museum, Kaduna (1975), the Nigerian Institute for Trypanosomiasis Research (1951), and the Kaduna Polytechnic (1968). Since 2020 to date, Kaduna state has experienced heightened security threats and, especially in the second quarter of 2021 with an attendant impact on social, economic and agricultural activities. This has continued to exact untold hardships on the citizens and communities across the state. Kaduna state is Nigeria’s fourth most populous state with a population of 12 million people and it’s the political headquarters of Nigeria’s North West region. It functions as the commercial and industrial hub of the sub-region while current farmer-herder conflict is intensifying challenges to food production and access.

Kaduna state was selected as it had the highest prevalence (5.1%) of HIV in Nigeria as at the time data collection for this study (ANCHIV Sentinel Survey Nigeria, 2011). Moreover, there was an established institutional HIV/AIDS response program by the Catholic Archdiocese which was been supported by the Catholic Relief Services (CRS) who has also given authorization to access the facility for data collection. The central data collection location for this study was the Community Based Care and Support (CBCS) facility of the Diocesan Action Committee on AIDS (DACA) of the Catholic Archdiocese of Kaduna located in Kaduna metropolis. Over fourteen (14) support groups for people living with HIV/AIDS come from across the city to access care and support interventions at the CBCS. Data collection took place within a period of eleven (11) months between 2009 and 2010. An initial three (3) to four (4) months was spent engaging the programme owner, Catholic Relief Services (CRS) Nigeria office; the Kaduna State Ministry of Health; the various support groups.

3.3 Study Population

The study population consisted of adult men and women of 18 years and above living with HIV/AIDS from various support groups spread across the city of Kaduna and accessing care and support interventions at the Community Based Care and Support (CBCS) facility of the Catholic Archdiocese of Kaduna.

3.4 Sample Size Determination

A minimum sample size for this study was determined using the Fischer (1935) formula:

$$n = \frac{z^2 pq}{d^2}$$

Where n = minimum sample size
z = constant (1.96)
p = Prevalence of HIV in Kaduna, Nigeria = 5.1% (ANCHIV Sentinel Survey, Nigeria, 2010)
q = 1-p
d = 0.05 (50% tolerance)

$$\frac{1.96^2\,(0.051)(0.95)}{0.05^2}$$

= 291

However, accounting for a ten percent (10%) attrition rate to make for an additional 29.1 study subjects, the minimum sample size was consequently increased to 320.1. Data was however successfully collected from 532 respondents spread from across fourteen (14) support groups in Kaduna city.

3.5 Sampling Procedure

The Community Based Care and Support (CBCS) office of the Catholic Archdiocese was approached following permission granted by the co-owner of the HIV/AIDS response programme, the Catholic Relief Services. The CBCS provides support and care services to several people living with HIV/AIDS (PLHA) spread across the city of Kaduna who access the facility. They are largely members of various support groups numbering more than fourteen of such support groups. These various groups, at different times, meet once every month with membership ranging from six (6) to sixty (60). Through support of the CBCS staff, the researcher addressed the gathering of the PLHA during their monthly meeting to introduce the study to them and explained the possible value of the research to include the fact that the outcome of the study would inform policy makers, relevant Government agencies, humanitarian organisations and other stakeholders to undertake crucial interventions for mitigating HIV/AIDS impact in Nigeria. It was also explained that all responses and information granted will be treated with utmost confidentiality as the data will be anonymized.

Additional visits were made to some of the communities where the support groups conducted their monthly meetings. Home visits were also made to certain leaders of the support groups with the aim of helping the PLHA to better understand the essence of the study, provide needed clarifications, address their fears and concerns and ultimately gain their trust, acceptance and confidence. Consequently, fourteen (14) of the support groups with good spread across the city and with higher membership averaging about sixty (60) members per month were purposively selected with consent of the CBCS, for inclusion into the study. Recruitment of the subjects was done on the days of visit and on the days at which the various support groups held their meetings.

Following additional engagements with the selected support groups and their leadership, convenience sampling (Venter et al., 2009) was used to approach and enlist participants who gave informed consent. Consent was received from about six hundred (600) participants across the support groups while complete data after several follow-up, was successfully collected from five hundred and thirty-two (532) participants.

3.6 Inclusion/Exclusion Criteria

Consenting persons living with HIV, aged 18 years and above, male and female from various religious and ethnic backgrounds and accessing care and support services at the CBCS in the city of Kaduna were included for enrolment into the study. These were adults who were not presenting with AIDS, or tuberculosis as at the time of the data collection. Those who were excluded included persons living with HIV who are less than 18years of age. Moreover, those who were above 18years of age but have progressed to the later stages of the illness (AIDS) and/or presenting with tuberculosis and including those who were HIV positive, within the required age range but who did not give consent for enrolment were excluded from the study.

3.7 Data Collection Instrument

3.7.1.1 Quantitative and Qualitative Instruments

Quantitative data were collected for this study through the use of a structured questionnaire containing both open-ended and pre-coded questionnaire which was interviewer-administered. The questionnaire contained sections such as Demography, Socioeconomic characteristics; Health and Hygiene practices; Food systems analyses (food production/availability, access/marketing and food consumption); 24-hr Dietary

Recall; Food frequency, Assessment of Safety nets/Support systems and quantitative nutritional status (nutritional anthropometry) assessment.

Qualitative data were collected through observations at support group meetings and few homes of support group leaders and through in-depth interviews and focus group discussions using guides containing key questions. Three (3) in-depth interviews were conducted on two main leaders (male and female) of the support groups and on one staff of the CBCS, to understand major challenges of PLWHA in respect of nutrition, food systems, and safety nets. Three (3) focus group discussion were conducted, using an interview guide, on two (2) men and one (1) women group each consisting of 7 participants per group.

3.7.1.2 Pre-test of the Questionnaire

The development of the questionnaire required its pretesting within the same study population and location. A small size of ten (10) randomly selected and consenting persons living with HIV were used for the pretesting of the questionnaire and were not included in the final study to enable validity. This process was aimed at ensuring that the study subjects understand and sees the questions as relevant to the issue been discussed and are able to respond effectively to the content of the questionnaire.

3.7.1.3 Validating the Instrument

Validity of the content and construct were determined so as to ensure that the relevant variables of interest in the study were captured. Validation of the content and tool were determined through a ‘‘Face validation’’ and ‘‘Content validation’’ by the researcher and through support of a wide range experts including nutrition scientists, HIV/AIDS field researchers, PLWHA, palliative care providers, sociologist, psychologist and a statistician.

3.7.1.4 Data Quality Control

Data was collected by the researcher, in line with appropriate standards and assisted by trained staff of the facility among whom were nurses and one doctor. Members of the team were trained by the researcher prior to the commencement of the study. Other data quality control approaches deployed include: the use of personnel/field assistants who have at least, minimal knowledge of research

methodology and were trained and engaged for data collection. These personnel were consistently used throughout the course of the study so as to ensure reliable and valid data collection. Some of the personnel were nurses, volunteers working with various support groups of PLWHA in Kaduna city, some PLWHA etc.

3.8 Data Collection Procedure

During the data collection process, both qualitative and quantitative methodologies were used. Observations, in-depth interviews, and focus group discussions were deployed for qualitative data collection While for the quantitative data collection, a structured interviewer-administered questionnaire was administered on consenting subjects participating in the study from the various support group centres.

Data was collected by the researcher who was assisted by some trained staff of the facility amongst whom were nurses and doctors. Prior to the start of the investigation, the researcher provided training to the 6-member team. At each data collection period, the team refreshes its knowledge of the various sections of the questionnaire as well as the anthropometric measurement techniques. The data collection team comprised of two (2) research assistants per team of three with at least one member of the team able to communicate in Hausa where interpretation was needed in the course of data collection. Observations were also made at each support group meeting and 2 home visits made in communities.

3.9 Preliminary Field Visits

Prior to the commencement of the investigation, the study sites were visited for the purpose of familiarization and to conclude necessary arrangements with the staff of the CBCS facility. Necessary engagements with some support groups and their leaders were undertaken to achieve their acceptance and trust and obtain permissions and consent from the subjects required for data collection. Pre-test of the data collection tool in a similar study area was also undertaken.

3.10 Ethical Consideration

Ethical approval to conduct this study was granted by the University of Ibadan/University College Hospital (UI/UCH) Ethical Review Committee. Ethical approval was also granted by the Kaduna State Ministry of Health, through the

Ministry's Ethical Committee having committed, in the application, to uphold the principles of ethics in biomedical research which will ensure that the subjects concerned in this study will suffer no harm; that their identity would be kept secret and will not be part of the data to be harvested; that the study would be carried out under professional fair treatment and transparency; and that the study will be non-invasive as only questionnaires, weight and height measurements will be taken. Approval was also granted by the Catholic Relief Service-Nigeria for use of their support facility for the study while consents for inclusion and participation were also received from each of the study's participants.

3.11 Description and Measurement of Independent Variables

3.11.1 Demographic and Socioeconomic Characteristics

Socio-demographic (age, sex, household size, household heads, religion and marital status) and socioeconomic characteristics (occupation, monthly income, income spent on food, type of apartment and educational status) of participants were elicited via a semi-structured interviewer questionnaire.

3.11.2 Health and Hygiene Practices

Semi-structured interviewer questionnaire was employed to elicit responses on health conditions (available CD4 cell count of subjects was extracted from the facility records while clinical symptoms of HIV/AIDS was self-reported) and hygiene practices (major source of water, water treatment and refuse disposal) among PLWHA.

3.11.3 Safety Networks

Social safety network was assessed through the use of a semi-structured interviewer-administered questionnaire which sought responses to questions on whether or not they belong to a support group, what type of activities takes place within the groups, what does he/she hope to gain by joining the support group, what benefits is he/she getting, how would they rate the impact of the benefit, kind of assistance received among others.

3.11.4 Food Systems Analyses

Food system encompasses food availability, accessibility/affordability and utilization/consumption (Ingram *et al*., 2005). Data on food system was elicited through a semi-structured questionnaire and focus group discussion.

3.12 Description and Measurement of Dependent Variables

3.12.1 24-Hour Dietary Recall to measure Food/Nutrient Intake

24-Hour Dietary Recall, a retrospective assessment method, was used to estimate the individual nutrient intake. The participants were asked to recall all foods and beverages ingested in the 24-hour period between waking up the day before and waking up the day of the interview. Household portion sizes of raw and cooked foods, as well as solids and fluids, were taken and measured using standardised equipment (Subar, 2004). The 24-hour dietary recall approach was also utilized to assess the nutritional adequacy of the items ingested by participants (Arimond *et al*., 2010). Information on the range of meals consumed by individuals in a household was gathered using a 24-hour recall method. The 24-hour diet recalls were conducted over two days with no previous notification of the interview date.

3.12.2 Food Frequency Questionnaire (FFQ) to measure dietary pattern/preference

FFQ was used to measure dietary pattern of respondents. On the FFQ form, respondents were asked about their frequency of consumption of each food item. The respondents' intake frequency was then categorized over a set length of time, such as daily, weekly, monthly, or rarely (Subar *et al*., 2001). Respondents' consumption pattern and preference were assessed through a list of 54 food items categorised into the various food groups while the frequency captured whether they consumed the food each food item 2-3times/day, once per week, 2-3times/week or 2-3times/month.

3.12.3 Dietary Diversity Score

Dietary Diversity Scores (DDS) are a total number of various food groups consumed throughout the course of the previous 24 hours. DDS were calculated using data gathered from a 24-hour dietary recall (FAO, 2007). This study approach for determining HIV/AIDS patients' dietary diversity scores (DDS) was adopted from Steyn *et al* (2006). Foods eaten in the previous 24 hours (both at home and outside) were divided into eating groups. According to the studies of Steyn *et al* (2006), Ray *et al* (2010), Darapheak *et al* (2013), and Ayogu, the sixteen food groups proposed by FAO (2010) were compressed into nine food groups (2019). A 0–9 scale was used for scoring: (1) starchy staples (cereals and starchy fruits, roots, and tubers); (2) legumes,

nuts, and seeds; (3) organ and flesh meats, fish, and sea foods; (4) eggs; (5) milk and milk products; (6) vitamin A-rich fruits and vegetables such as mango, pawpaw, carrots, pepper, and orange flesh sweet potatoes; (7) other fruits, including fruit juices; (8) other vegetables. Each food group consumed over the previous 24 hours was given a single point, and if a food group was not consumed, a score of 0 was assigned.

The points given to each food group were added together to provide a maximum score of 9 points to the person who ate from every food category. Individual meal scores were categorised into low, medium, and high dietary diversity, with scores of 3 or less were considered low, 4 to 5 were considered medium, while 6 and above were considered high (Kennedy, Ballard and Dop, 2011).

3.13 Nutritional Anthropometry

Standardized and internationally accepted methodology was used to take the subjects anthropometric parameters. Portable electronic scale, stadiometer/height-stick and non-stretchable tape rule were used to ascertain the weight, height and MUAC to the nearest measurements. Participants BMI were derived from their height and weight measurements.

3.13.1 Weight

The respondent's weight was measured using a 150Kg Max. Binatone electronic bathroom scale (Model BS-8020). Respondents were made to stand erect and barefoot on the scale with light clothing. Measurements were taken in duplicate and to the nearest 0.1kg for each respondent and the mean weight was taken.

3.13.2 Height

Respondent's height was taken with an improvised but standardized and vertical measuring stick graduated in metres. Both weight and height measurements were taken according to the techniques described by Jellife (1966) and Zerfas (1979).

3.13.3 Mid-upper Arm Circumference (MUAC)

MUAC was measured using a non-stretch tape (in centimeters). The left arm was assessed, and the measurement was taken mid-point between the greater tubercle and the medial epicondyle of the brachium (arm).

3.13.4 Body Mass Index (BMI)

The formula BMI=weight (in kg) divided by height is used to determine BMI based on weight and height measurements (in m-2). A person with a low BMI is underweight for their height since the ratio of weight to square of height is roughly constant in normal adults (Quetelet, 1871).

3.14 Qualitative Data Approaches

3.14.1 Key Informant Interviews (KII)

An in-depth interview (IDI) guide was used to collate information and understand the food systems and crucial needs of participants as well as health problem/challenges encountered; stigmatization; sources of assistance to PLHIV; knowledge on the relationship between food, nutrition and drugs; possible solutions to improve the lives of PLHIV.

3.14.2 Focus Group Discussion (FGD)

FGD was utilized to collect qualitative responses on food availability and access problems as well as coping methods for food accessibility and consumption challenges; knowledge of nutrition and how it affects their health; assessment of safety nets etc. from the subjects during the discussions and the responses of the interviewees was captured with a multidirectional tape recorder. Two FGDs were each conducted, one for men and women groups at the commencement and exit stage of the study. Information collected were transcribed and processed by content analyses and served to triangulate the quantitative data collection processes.

3.15 Data Management and Analyses

Quantitative data collected was sorted, cleaned, coded and entered into Microsoft Excel (Microsoft Office, 2010) which was then imported into the Statistical Package for the Social Sciences (SPSS) version 21.0 for relevant analyses.

Stage one data analysis included descriptive statistics of demographic and socioeconomic data, as well as measures of dispersion and central tendency like frequency counts, mean, percentages and standard deviations were used to describe respondents' demographic, socioeconomic, health and hygiene practices, food systems,

etc. For associations between categorical variables, inferential statistics was performed using chi-square while $p<0.05$ was used to determine statistical significance.

Food intake data from the 24-hour dietary recalls was entered into Microsoft excel and were analysed using Total Dietary Assessment (TDA) to determine the respondents' nutrient adequacy. The dietary diversity score of respondents was assessed using nine-category FAO criteria for measuring household and individual dietary diversity (FAO, 2010). The number of food categories eaten in the previous 24 hours was assessed and used to determine dietary diversity. The nine (9) food groups were divided into three (3) categories: low (1-3 food group), medium (4-6 food groups), and high (>6 food groups). Individual dietary diversity score (IDDS) was then adjudged based on their position on the scale. Anthropometric data of the respondents were analyzed through calculation of the Body Mass Index (BMI) using the formula of body mass (with weight measured in Kg) divided by the square of the body height (measured in metres) and expressed in units of kg/m^2. SPSS v21.0 was then used to classify nutritional status based on the World Health Organisation classification.

Qualitative data collected via recordings of indepth interviews and focus groups discussion were carefully transcribed verbatim and word-processed using Microsoft word. The data was organized based on relevant objectives of the study and on the questions asked. The content analysis method was then used to thematically analyse the data in terms of identifying patterns and categories of the responses based on the questions and themes of interest. All hypotheses were analysed using chi-square test.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Demographic, Socio-economic Characteristics and Nutritional Status of Respondents

4.1.1 Demographic characteristics of respondents

Table 4.1.1 below reveals that less than half (47.3%) of the respondents had between five (5) and eight (8) household members while the mean household size was about 6±3 persons. Majority (78%) of the respondents were females while few (22.0%) were males. Mean age of respondents was 38.1+9.7 years. 42.1% of the respondents were between the ages of 31 and 40 years, while few (0.4%) were ≤20years. Also, 110 respondents (44.9%) were married, 45 respondents (18.4%) were single, 78 (31.8%) were widowed while 12 respondents (4.9%) were divorcees. Majority (73.1%) of the respondents were from a monogamous family setting while others (26.9%) were from a polygamous family setting. On educational status of respondents in this study, 31.8% of the respondents had primary education, 2.5% had secondary/modern education, 13.5% had HND/B.Sc. while the largest proportion (45.7%) of respondents had the Ordinary National Diploma (OND) qualification.

Table 4.1.1: Socio demographic characteristics of respondents

Variables	Categories	Frequency	Percentage
Household size	<5 people	92	37.6
	5-8 people	116	47.3
	9-12 people	34	13.9
	>12 people	3	1.2
Mean Household size = 6±3 persons			
Sex	Male	117	22.0
	Female	415	78.0
Age	≤20years	2	0.4
	21-30years	119	22.4
	31-40years	224	42.1
	41-50years	112	21.1
	≥51years	60	11.3
	Non-respondents	15	2.8
Mean age of respondents =38.1±9.7years			
Marital status	Married	110	44.9
	Single	45	18.4
	Separated	12	4.9
	Widowed	78	31.8
Household type (n=223)	Monogamous	163	73.1
	Polygamous	60	26.9
Educational qualification	No formal Education	16	6.5
	Primary Education	78	31.8
	Secondary/Modern Education	6	2.5
	OND	112	45.7
	HND/BSc	33	13.5

4.1.2 Socioeconomic characteristics of respondents

Assessing the primary occupation of respondents in this study showed that a relatively greater proportion (37.1%) were traders, civil servants made up 25.8% of the respondents, those involved in farming/fishing were 14.5% and 22.6% did not have any form of employment as at the period of this study. It was observed from the study that more than half (53.2%) of the respondents used kerosene as source of cooking energy while 46.8% of respondents used charcoal or firewood.

Regarding the source of water among respondents, a slightly high proportion (46.8%) used well water while rainwater and borehole water were used by a lesser proportion of the respondents (4.8 %). In terms of water treatment before use by the respondents, a greater proportion (79%) used chemical (here referred to as water guard). Only 6.5% of the respondents boiled their water before use while 11.3% did not treat their water before use.

An assessment of the water and sanitation situation of the respondents showed that majority (80.6%) of respondents disposed their refuse via refuse dumps while 19.4% disposed into the bush or available river. Regarding house ownership, more than half (59.7%) of the respondents lived in rented accommodation, 24.2% and 16.1% lived in their own accommodation and family home respectively. Of these, majority (61.3%) occupied rooming (popularly referred to as face-to-face) accommodation while few (38.7%) occupied flats.

As regards the level of income, 40.3% of the respondents earn below ₦5,000 per month, while a lesser proportion (3.2%) earned above N20,000 monthly. About 25.8% of the respondents did not have any income at the time of conducting the study. A large proportion (48.9%) of those surveyed, were reported spending more than 50% of their monthly income on food alone while 10 (21.3%) respondents spend between 31-50% of their income on food. Only 19.1% was reported spending less than 10% of their income on food.

Table 4.1.2: Socio-economic Characteristics of Respondents

Variables	Categories	Frequency	Percentage
Primary occupation	Farming/fishing	77	14.5
	Trading	197	37.1
	Civil servants	137	25.8
	No job/applicant	120	22.6
Major energy source	Kerosene	282	53.2
	Firewood/charcoal	249	46.8
Major source of water	Tap water	231	43.5
	Well water	248	46.8
	Bore hole	26	4.8
	Rain water	26	4.8
Type of water treatment	Use of alum	17	3.2
	Boiling	34	6.5
	Use of chemical	420	79.0
	No treatment	60	11.3
Refuse disposal	Bush and river	103	19.4
	Refuse dump	428	80.6
House ownership	Owned	128	24.2
	Rented	317	59.7
	Family house	86	16.1
House type	Rooming	325	61.3
	Flat	206	38.7
Level of income (₦)	<5000	214	40.3
	5000-10000	86	16.1
	11000-20000	77	14.5
	>20000	17	3.2
	No income	137	25.8
Percentage of income spent on food (n=47)	<10%	77	19.1
	10-30%	43	10.6
	31-50%	86	21.3
	>50%	197	48.9

4.1.3 Anthropometric Characteristics of Respondents

Mean weight of respondents in the study was 64.9±13.0kg, with a minimum and maximum weight of 20.9kg and 117.1kg, respectively. Respondents' mean height was 1.6±0.1m with the minimum and maximum height been 1.2m and 1.9m respectively. The mean height of male and female respondents were1.70±0.07m and 1.60±0.07m, respectively while mean weight of male and female respondents were 68.91±11.89kg and 63.76±13.09kg, respectively. Men in this study were significantly ($p<0.05$) taller than the women while they also have significantly higher weight.

The table below shows a description of the BMI of respondents, more than half (53.6%) of the responders were within the normal BMI compared to 28.9% who were within the overweight BMI category (25.0kg/m^2 - 29.9kg/m^2). Underweight and obese respondents made up 5.1% and 12.4% respectively. The mean and standard deviation of respondents' BMI was 24.8±4.9kg/m^2. Minimum BMI was 13.81kg/m^2 and maximum BMI was 58.7kg/m^2. Almost half (48.1%), 42.2%, 41.8% and 40.9% of respondents whose BMI fell within the underweight, overweight, normal and obese range respectively, were aged between 31 and 40 years old. Respondents who were obese and within 41-50years age range were 31.8%, 28.8% of those who were within the normal BMI range were aged between 21 and 30years. BMI and responders' age were shown to have a statistically significant association. Most of the respondents (87.9%, 81.2%, 77.8% and 74.0%) whose BMI fell within the obese, overweight, underweight and normal range respectively were females. No statistically significant relationship between BMI and sex of respondents was observed.

Table 4.1.3 Mean and standard deviation of respondents' height and weight by sex

Variables	Male	Female	All	Standard deviation	t-test	p-value
Height	1.70	1.60	1.60	0.1	14.1	0.000
	(0.07)	(0.07)	(0.1)			
Weight	68.91	63.76	64.9	13.0	4.0	0.000
	(11.89)	(13.09)	(13.0)			
Total (N)	117	415	532			

***p<0.05**

Table 4.1.4 Body Mass Index of respondents (BMI)

BMI(Kg/m^2)	Frequency (%)	Mean ± SD	Min	Max
Underweight	27(5.1)			
Normal	285(53.6)			
Overweight	154(28.9)	24.8 ± 4.9	13.81	58.70
Obese	66(12.4)			
Total	532(100.0)			

Table 4.1.5 BMI of respondents by age and sex

Variables	Categories	BMI				Total		
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)		χ^2	p-value
Age	≤20	0(0.0)	1(0.4)	1(0.6)	0(0.0)	2(0.4)	25.9	0.040*
	21-30	4(14.8)	80(28.1)	28(18.2)	7(10.6)	119(22.4)		
	31-40	13(48.1)	119(41.8)	65(42.2)	27(40.9)	224(42.1)		
	41-50	7(25.9)	48(16.8)	36(23.4)	21(31.8)	112(21.1)		
	≥51	3(11.1)	25(8.8)	22(14.3)	10(15.2)	60(11.3)		
	Non response	0(0.0)	12(4.2)	2(1.3)	1(1.5)	15(2.8)		
Total		27(100.0)	285(100.0)	154(100.0)	66(100.0)	532(100.0)		
Sex	Male	6(22.2)	74(26.0)	29(18.8)	8(12.1)	117(22.0)	7.3	0.064
	Female	21(77.8)	211(74.0)	125(81.2)	58(87.9)	415(78.0)		
	Total	27(100.0)	285(100.0)	154(100.0)	66(100.0)	532(100.0)		

*$p < 0.05$

4.1.6 Description of respondents' nutritional status by socioeconomic status

4.1.6a Description of respondents' BMI by primary occupation

50.0% of the respondents who had underweight BMI were primarily into farming while 16.7% were in the normal BMI category. 42.9% of respondents who were into trading had normal BMI while 30.8% were in the overweight category. A great proportion (60.4%) of the respondents that were either without job or are applicants were obese while 14.3% were in the normal BMI category. 26.1% of civil servants had a normal BMI while 22.0% were overweight. There was no statistically significant difference between respondents' BMI and primary occupation.

Table 4.1.6a Respondents' BMI and primary occupation

BMI	Respondents' Primary occupation					χ^2	p-value
	Farming/fishing (%)	Trading (%)	Civil servant (%)	No job/applicant (%)	Total (%)		
Underweight	8(47)	0(0.0)	9(53.0)	0(0.0)	17(100.0)		
Normal	60(16.7)	154(42.9)	94(26.1)	52(14.3)	360(100.0)		
Overweight	9(8.0)	34(30.8)	26(22.0)	42(38.5)	111(100.0)	11.5	0.243
Obese	0(0.0)	9(20.0)	9(20.0)	25(60.0)	43(100.0)		
Total	77(14.5)	196(37.1)	138(25.8)	119(22.6)	531(100.0)		

4.1.6b Description of respondents BMI by level of income

Half (50.0%) of the respondents who were underweight earns between ₦5,000 to ₦10,000 and ₦11,000 to ₦20,000. Half of the respondents who had normal BMI (50.0%) earned <₦5,000, only 4.8% earned >₦20,000 and 21.4% did not have any source of income at the time of conducting this research.

Among respondents who were overweight, 30.8% earned <₦5,000, another 30.8% did not have any source of income, 23.1% earned between ₦5,000 and ₦10,000 while 15.4% earned between ₦11,000 and ₦20,000. More than half of the respondents (60.0%) who were obese did not have any source of income. No statistically significant association was found between respondents' BMI and their level of income.

Table 4.1.6b Respondents' BMI by level of income

BMI	Level of income (₦)						χ^2	p-value
	<5,000(%)	5,000-10,000(%)	11,000-20,000(%)	>20,000(%)	No income (%)	Total (%)		
Underweight	0(0.0)	8(47)	9(53)	0(0.0)	0(0.0)	17(100.0)		
Normal	180(50.0)	43(11.9)	43(11.9)	17(4.8)	77(21.4)	360(100.0)		
Overweight	34(30.8)	26(23.1)	17(15.4)	0(0.0)	34(30.8)	111(100.0)	12.6	0.397
Obese	0(0.0)	9(19.8)	9(19.8)	0(0.0)	25(60.4)	43(100.0)		
Total	214(40.3)	86(16.2)	77(14.5)	17(3.2)	137(25.8)	531(100.0)		

4.2 Respondents' nutrient adequacy using the 24hr dietary recall

4.2.1 Adequacy of respondents' daily nutrient intake by BMI

26.1%, 20.9%, 30.6%, 41.7%, 34.8% and 36.3% of the surveyed respondents had inadequate energy, protein, vitamin B_{12}, vitamin C, iron and zinc intake respectively. Only 19.7% of the respondents had adequate energy intake 24hrs prior to the survey, among these 10.2% had normal BMI and 6.2% were overweight. Inadequate energy intake was reported by 12.6%, 7.7% and 3.8% of respondents who had normal, overweight and obese respondents respectively.

Protein intake was adequate for 10.3% of respondents who had normal BMI, 6.0% of respondents who reported excess protein intake had normal BMI. Inadequate protein intake was however reported to be higher among obese (3.0%) and overweight (7.9%) respondents respectively.

The Vitamin B_{12} intake of respondents was inadequate for 16.0%, 8.3%, 4.5% and 1.9% of respondents who had normal, overweight, obese and underweight BMI respectively. There was however adequate intake of Vitamin B_{12} for 5.8%, 5.3%, 1.7% and 1.3% of respondents who had normal, overweight, obese and underweight BMI respectively. Respondent iron intake was largely inadequate, especially among respondents who had normal BMI (16.9%). Excess iron intake was however reported by 3.0% of respondents with normal BMI, and 2.3% of respondents with overweight BMI.

In this study, 20.1% of those who had insufficient vitamin C intake were within the normal BMI. Respondents' zinc intake was inadequate for 17.9%, 10.5%, 5.3% and 2.6% of respondents who had normal, overweight, obese and underweight BMI respectively; and adequate for 5.1%, 4.3%, 2.1% and 0.9% of respondents who recorded normal, overweight, obese and underweight BMI respectively. Significant relationship was observed between respondents' BMI and nutrients adequacy (Energy, Protein, Vitamin A, Vitamin $B_{12,}$ Iron, Vitamin C and Zinc).

Table 4.2.1 Adequacy of respondents' daily nutrient intake by BMI

Nutrient	Adequacy	Underweight n (%)	Normal n (%)	Overweight n (%)	Obese n (%)	TOTAL N (%)	χ^2	p-value
	Inadequate	11(2.1)	67(12.6)	41(7.7)	20(3.8)	139(26.1)		
Energy	Adequate	7(1.3)	54(10.2)	33(6.2)	11(2.1)	105(19.7)	29.4	0.001*
	Excess	3(0.6)	13(2.4)	14(2.6)	13(2.4)	43(8.1)		
	Inadequate	6(1.1)	47(8.8)	42(7.9)	16(3.0)	111(20.9)		
Protein	Adequate	8(1.5)	55(10.3)	32(6.0)	12(2.3)	107(20.1)	26.8	0.001*
	Excess	7(1.3)	32(6.0)	14(2.6)	15(2.8)	68(12.8)		
	Inadequate	0(0.0)	7(1.3)	6(1.1)	5(0.9)	18(3.4)		
Vitamin A	Adequate	21(3.9)	127(23.9)	82(15.4)	39(7.3)	269(50.6)	21.3	0.002*
	Excess	6(1.1)	151(28.4)	66(12.4)	22(4.1)	245(46.1)		
	Inadequate	10(1.9)	85(16.0)	44(8.3)	24(4.5)	163(30.6)		
Vitamin B_{12}	Adequate	7(1.3)	31(5.8)	28(5.3)	9(1.7)	75(14.1)	24.6	0.003*
	Excess	4(0.8)	18(3.4)	16(3.0)	11(2.1)	49(9.2)		
	Inadequate	14(2.6)	90(16.9)	53(10.0)	28(5.3)	185(34.8)		
Iron	Adequate	5(0.9)	28(5.3)	23(4.3)	13(2.3)	68(12.8)	18.7	0.028*
	Excess	2(0.4)	16(3.0)	12(2.3)	4(0.8)	34(6.4)		
	Inadequate	17(3.2)	107(20.1)	66(12.4)	32(6.0)	222(41.7)		
Vitamin C	Adequate	0(0.0)	5(0.9)	2(0.4)	1(0.2)	8(1.5)	19.7	0.020*
	Excess	4(0.8)	22(4.1)	19(3.6)	11(2.1)	56(10.5)		
	Inadequate	14(2.6)	95(17.9)	56(10.5)	28(5.3)	193(36.3)		
Zinc	Adequate	5(0.9)	27(5.1)	23(4.3)	11(2.1)	66(12.4)	18.3	0.032*
	Excess	2(0.4)	12(2.3)	9(1.7)	5(0.9)	28(5.3)		

*$p < 0.05$

4.2.2 Adequacy of respondents' nutrient intake by sex

Energy intake was recorded as inadequate mostly by 20.9% of female respondents, adequate by 14.7% female respondents and excess by 6.4% respondents compared to 5.3%, 5.1% and 1.7% male respondents who reported inadequate, adequate and excess energy intake respectively in this study. Protein intake showed 15.8% and 10.0% female respondents having adequate and excess intake respectively, 4.9% of male respondents reported inadequate protein intake and 4.3% had adequate intake. Vitamin A intake was largely in excess by 39.1% of respondents who were females, and 11.5% who were males. Most (23.3%) of females had inadequate intake of Vitamin B_{12} compared to male (7.3%). Inadequate vitamin C intake was reported by 32.2% of respondents who were females and 9.4% who were males. Majority of the respondents (26.9%) of respondents who had inadequate iron intake were females and 9.8% were males. No significant relationship was seen between respondents' sex and the nutrient adequacy.

Table 4.2.2 Adequacy of respondents' nutrient intake by sex

Nutrient	Adequacy	Male n(%)	Female n(%)	Total N(%)	χ^2	P value
Energy	Inadequate	28(5.3)	111(20.9)	139(26.1)	1.2	0.760
	Adequate	27(5.1)	78(14.7)	105(19.7)		
	Excess	9(1.7)	34(6.4)	43(8.1)		
Protein	Inadequate	26(4.9)	85(16.0)	111(20.9)	0.2	0.981
	Adequate	23(4.3)	84(15.8)	107(20.1)		
	Excess	15(2.8)	53(10.0)	68(12.8)		
Vitamin A	Inadequate	3(0.6)	15(2.8)	18(3.4)	0.4	0.823
	Excess	61(11.5)	208(39.1)	269(50.6)		
Vitamin B_{12}	Inadequate	39(7.3)	124(23.3)	163(30.6)	0.6	0.892
	Adequate	15(2.8)	60(11.3)	75(14.1)		
	Excess	10(1.9)	39(7.3)	49(9.2)		
Iron	Inadequate	42(7.9)	143(26.9)	185(34.8)	0.5	0.910
	Adequate	16(3.0)	52(9.8)	68(12.8)		
	Excess	6(1.1)	28(5.3)	34(6.4)		
Vitamin C	Inadequate	50(9.4)	172(32.3)	222(41.7)	0.5	0.911
	Adequate	1(0.2)	7(1.3)	8(1.5)		
	Excess	13(2.4)	43(8.1)	56(10.5)		
Zinc	Inadequate	44(8.3)	149(28.0)	193(36.3)	0.4	0.942
	Adequate	15(2.8)	51(9.6)	66(12.4)		
	Excess	5(0.9)	23(4.3)	28(5.3)		

4.2.3 Relationship between mean nutrient intake of respondents and gender

Table 4.2.3 shows a description of the relationship between the respondents' mean nutrient intake and gender. Mean caloric intake of male respondents was higher compared to that of the female respondents (1176.8±1248.2 and 1033.6±1117.8 respectively). The male respondents in this study reported higher nutrient intake in the immediate past 24 hours prior to this study than was reported by the female respondents except for folate, vitamin B_{12} and zinc, with no significant difference.

Table 4.2.3 Relationship between mean nutrient intake and gender

Nutrients	Gender		Total	f-test	p-value
	Male	Female			
Calories	1176.8±1248.2	1033.6±1117.8	1065.1±1148.1	1.4	0.234
Protein	37.7±43.0	36.1±42.6	36.5±42.7	0.1	0.729
Carbohydrate	177.8±194.6	169.9±184.5	171.6±186.6	0.2	0.684
Fat	28.2±35.0	24.4±31.7	25.3±32.5	1.2	0.269
Vitamin A	12385.8±18222.2	9957.5±14364.1	10491.5±15310.6	2.3	0.130
Vitamin C	39.3±115.4	30.3±95.7	32.2±100.3	0.7	0.392
Folate	143.9±192.9	146.1±213.5	145.6±209.0	0.0	0.919
Vitamin B_{12}	1.1±1.4	1.4±6.2	1.4±5.5	0.4	0.513
Zinc	4.9±5.4	5.0±6.1	4.9±6.1	0.0	0.931
Iron	9.0±9.8	8.8±10.1	8.9±10.0	0.0	0.880

4.3.1 Respondents' dietary diversity and demographic and socio-economic characteristics

The table below shows a description of the dietary diversity of respondents in the immediate past 24 hours prior to this study, disaggregated by age, sex and level of income. All the respondents within the age category of ≤20 years old consumed foods from 4 food groups (cereals, roots/tubers, oils/fats and miscellaneous), but none consumed foods from the fruits, eggs and milk/milk products groups. Among respondents aged between 31 and 40 years old 96.8% consumed foods from cereals and oils/fats groups each, 11.3% each from meat/poultry and Eggs groups. Only 4.8% consumed fruits, respondents who consumed from roots/tubers and vegetables were 54.8% and 75.8% respectively. All the respondents aged ≥51 years consumed cereals and no respondent from this age group consumed fruits.

Respondents who earned <₦5000 and those who did not have any income source consumed foods from all the food groups. None of the respondents who earned ₦5000 - ₦10000, ₦11000 - ₦20000 and >₦20000 consumed foods from the fruits and eggs groups.

Table 4.3.1 Respondents' dietary diversity and socio demographic and economic factors (N=147)

Variables	Cereals (%)	Roots/ Tubers (%)	Vegetables (%)	Fruits (%)	Meat/ Poultry (%)	Eggs (%)	Fish/ sea foods (%)	Pulses/ legumes/ nuts (%)	Milk/milk products (%)	Oils/ Fats (%)	Sugar/ Honey (%)	Miscellaneous (%)
Age												
≤20 yrs	2(100.0)	2(100.0)	1(50.0)	0(0.0)	1(50.0)	0(0.0)	1(50.0)	1(50.0)	0(0.0)	2(100.0)	1(50.0)	2(100.0)
21-30 yrs	43(100.0)	24(55.8)	28(65.1)	2(4.7)	6(14.0)	7(16.3)	33(76.7)	26(60.5)	21(48.8)	42(97.7)	23(53.5)	43(100.0)
31-40 yrs	60(96.8)	34(54.8)	47(75.8)	3(4.8)	7(11.3)	7(11.3)	49(79.0)	41(66.1)	25(40.3)	60(96.8)	24(38.7)	61(98.4)
41-50 yrs	20(100.0)	9(45.0)	14(70.0)	1(5.0)	5(25.0)	2(10.0)	14(70.0)	15(75.0)	8(40.0)	20(100.0)	9(45.0)	20(100.0)
≥51yrs	12(100.0)	9(75.0)	7(58.3)	0(0.0)	3(27.3)	1(8.3)	8(66.7)	7(58.3)	4(33.3)	11(91.7)	4(33.3)	11(91.7)
Non response	8(100.0)	7(87.5)	8(100.0)	1(12.5)	2(25.0)	1(12.5)	6(75.0)	6(75.0)	1(12.5)	8(100.0)	1(12.5)	8(100.0)
Sex												
Male	35(100.0)	15(42.9)	26(74.3)	2(5.7)	9(25.7)	3(8.6)	24(68.6)	28(80.0)	10(28.6)	34(97.1)	13(37.1)	34(97.1)
Female	110(98.2)	70(62.5)	79(70.5)	5(4.5)	15(13.5)	15(13.4)	87(77.7)	68(60.7)	49(43.8)	109(97.3)	49(43.8)	111(99.1)
Level of income												
<5,000	17(94.4)	12(66.7)	16(88.9)	1(5.6)	4(22.2)	2(11.1)	14(77.8)	14(77.8)	6(33.3)	18(100.0)	9(50.0)	18(100.0)
5,000-10,000	7(100.0)	4(57.1)	6(85.7)	0(0.0)	1(14.3)	0(0.0)	6(85.7)	6(85.7)	2(28.6)	7(100.0)	3(42.9)	7(100.0)
11,000-20,000	3(100.0)	1(33.3)	2(66.7)	0(0.0)	0(0.0)	0(0.0)	3(100.0)	2(66.7)	1(33.3)	3(100.0)	1(33.3)	3(100.0)
>20,000	2(100.0)	2(100.0)	1(50.0)	0(0.0)	0(0.0)	0(0.0)	1(50.0)	1(50.0)	1(50.0)	2(100.0)	1(50.0)	2(100.0)
No income	10(90.0)	10(90.9)	9(81.8)	1(9.1)	1(9.1)	4(36.4)	10(90.9)	3(27.3)	6(54.5)	11(100.0)	5(45.5)	11(100.0)

4.3.2 Dietary diversity score (DDS) of Respondents

Dietary diversity was categorised as low, medium and high. Majority (62.6%) of respondents consumed foods between 4 to 5 food groups within the immediate past 24hr preceding the study, compared to 11.6% and 25.9% who had low and high DD respectively. On average, food groups from which respondents ate foods was 4.8±1.12 while minimum and maximum number of food groups were 2.0 and 8.0 respectively.

Table 4.3.2 Respondents' dietary diversity score (DDS)

Variable	Dietary diversity score			
Dietary diversity score	**Frequency (%)**	**Mean ± SD**	**Min**	**Max**
Low dietary diversity	62(11.6)			
Medium dietary diversity	332(62.6)	4.8±1.12	2.0	8.0
High dietary diversity	137(25.9)			
Total	531(100.0)			

4.3.3 Dietary diversity score and sociodemographic and economic characteristics

Table 4.3.3 describes the association between Dietary Diversity Score (DDS) of respondents and their socio demographic and economic characteristics which was disaggregated by household size, occupation of household head, income level and percentage of income spent on food. A greater proportion of respondents (66.7%) who had Medium DD Score had civil servants as their household head, 42.1% of respondents who had High DD Score were from households whose heads were traders, while 13.2% and 23.2% reported farming/fishing and no job/applicant respectively as occupations of their household heads. Less than half (43.9%) of respondents who had High DD Score in the income level earned <₦5000 while 5.3% of respondents who had High DD Score earned >₦20000 as income. The association between respondents' DD Score and their income level was however significant. About 34.5% of respondents who had High DD Score spent >50% of their income on food. While half (50%) of the respondents who had Medium DD Score spent 31 – 50% and >50% each of their income on food.

Table 4.3.3 DD score by Socio demographic and economic characteristics of respondents

Variables	Categories	Low DDS (%)	Medium DDS (%)	High DDS (%)	Total (%)	χ^2	p-value
Household size	<5 people	1(50.0)	6(31.6)	49(38.9)	56(38.1)	1.6	0.954
	5-8 people	1(50.0)	10(52.6)	52(41.3)	63(42.9)		
	9-12 people	0(0.0)	3(15.8)	23(18.3)	26(17.7)		
	>12 people	0(0.0)	0(0.0)	2(1.6)	2(1.4)		
Occupation of household head	Farming/fishing		0(0.0)	5(13.2)	5(12.2)	4.1	0.247
	Trading		0(0.0)	16(42.1)	16(39.0)		
	Civil servant		2(66.7)	8(21.1)	10(24.4)		
	No job/applicant		1(33.3)	9(23.7)	10(24.4)		
Income level (₦)	<5,000		0(0.0)	18(43.9)	18(43.9)	17.8	0.001*
	5,000-10,000		0(0.0)	7(18.4)	7(17.1)		
	11,000-20,000		2(66.7)	1(2.6)	3(7.3)		
	>20,000		0(0.0)	2(5.3)	2(4.9)		
	No income		1(33.3)	10(26.3)	11(26.8)		
Percentage of income spent on food	<10%		0(0.0)	8(27.6)	8(25.8)	1.4	0.696
	10-30%		0(0.0)	4(13.8)	4(12.9)		
	31-50%		1(50.0)	7(24.1)	8(25.8)		
	>50%		1(50.0)	10(34.5)	11(35.5)		

*$p < 0.05$

4.3.4 Respondents' Dietary Diversity by sex

More females (76.2% and 73.7%) than males (23.8% and 26.3%) had High DDS and Medium DDS respectively. Difference in the DD Score of both male and female respondents was however not significant.

Table 4.3.4 Dietary Diversity of respondents by sex

Variable	Categories	Low DDS (%)	Medium DDS (%)	High DDS (%)	Total (%)	χ^2	p-value
Sex	Male	0(0.0)	5(26.3)	30(23.8)	35(23.8)	0.7	0.708
	Female	2(100.0)	14(73.7)	96(76.2)	112(76.2)		

4.3.5 BMI and Dietary Diversity Score of respondents

Nearly all (94.7%) of the overweight respondents had High DDS. Among the respondents who had Normal BMI, only 15.1% had Medium Dietary Diversity Score while majority (84.9%) had High Dietary Diversity Score. 64.3% of the obese respondents had High DD Score and 35.7% of them had Medium DD Score. However, a significant association was observed.

Table 4.3.5 BMI and Dietary Diversity Score of respondents

BMI	Low DDS (%)	Medium DDS (%)	High DDS (%)	Total (%)	χ^2	p-value
Underweight	0(0.0)	0(0.0)	2(100.0)	2(100.0)	18.0	0.006*
Normal	0(0.0)	14(15.1)	79(84.9)	93(100.0)		
Overweight	2(5.3)	0(0.0)	36(94.7)	38(100.0)		
Obese	0(0.0)	5(35.7)	9(64.3)	14(100.0)		

*$p < 0.05$

4.4 Description of respondents' food systems

4.4.1 Respondents' food systems (Food production)

Table 4.4.1 describes respondents' responses to food systems (food production). The common staples produced by respondents were majorly cereals (93.5%), and roots/tubers (6.5%); Consumption of fruits and vegetables was a usual practice among 74.2% and 58.1% of respondents respectively. More than half (59.7%) did not rear any livestock, 33.9% reared mostly chicken and only 6.4% reared goat. Majority (59.7%) did experience hunger while 40.3% did not experience hunger/lean. Of the 37% of respondents that experienced hunger, 59.5% experienced it between May and August, 37.8% between January and April while 2.7% experienced hunger between September and December.

Different coping strategies used by respondents during scarcity/lack of food included reduced food frequency by 38.7%, buying less expensive food by 35.5%, buying food on credit by 30.6%, borrowing money by 17.7% and reduced food intake by 12.9% of respondents.

Table 4.4.1 Respondents' food systems (food production)

Variable	Category	Frequency	%
Common staples produced	Cereals	58	93.5
	Roots and tubers	4	6.5
Food production through farming	Yes	26	41.9
	No	36	58.1
Availability of fruits and vegetables all year	Yes	47	75.8
	No	15	24.2
Availability of vegetable garden	Yes	17	27.4
	No	45	72.6
Usual consumption of fruit	Yes	46	74.2
	No	16	25.8
Usual consumption of vegetable	Yes	36	58.1
	No	26	41.9
Commonly reared livestock	Goat	4	6.4
	Chicken	21	33.9
	None	37	59.7
Experience of lean/hunger	Yes	37	59.7
	No	25	40.3
Period of experience (n=37)	Jan-April	14	37.8
	May-August	22	59.5
	Sept-Dec	1	2.7
Limitation to food production	Weather	6	9.7
	Water	7	11.3
	Lack of access to land	33	53.2
	Labour	6	9.7
	Fertilizer	29	46.8
	Finance	29	46.8
Coping strategy: coping with food scarcity or lack of access to food	Buy food on credit	19	30.6
	Borrow money	11	17.7
	Reduce food frequency	24	38.7
	Reduce food intake	8	12.9
	Buy less expensive food	22	35.5

4.4.2 Proportion of consumed food that is produced

The chart in **Figure 5** shows the percentage of consumed food manufactured by respondents. Almost half (48.0%) of the respondents reported that none of the food they consumed was produced by them, 32.0% consumed about half of the food they produced while 20.0% of the respondents consumed all the food they produced.

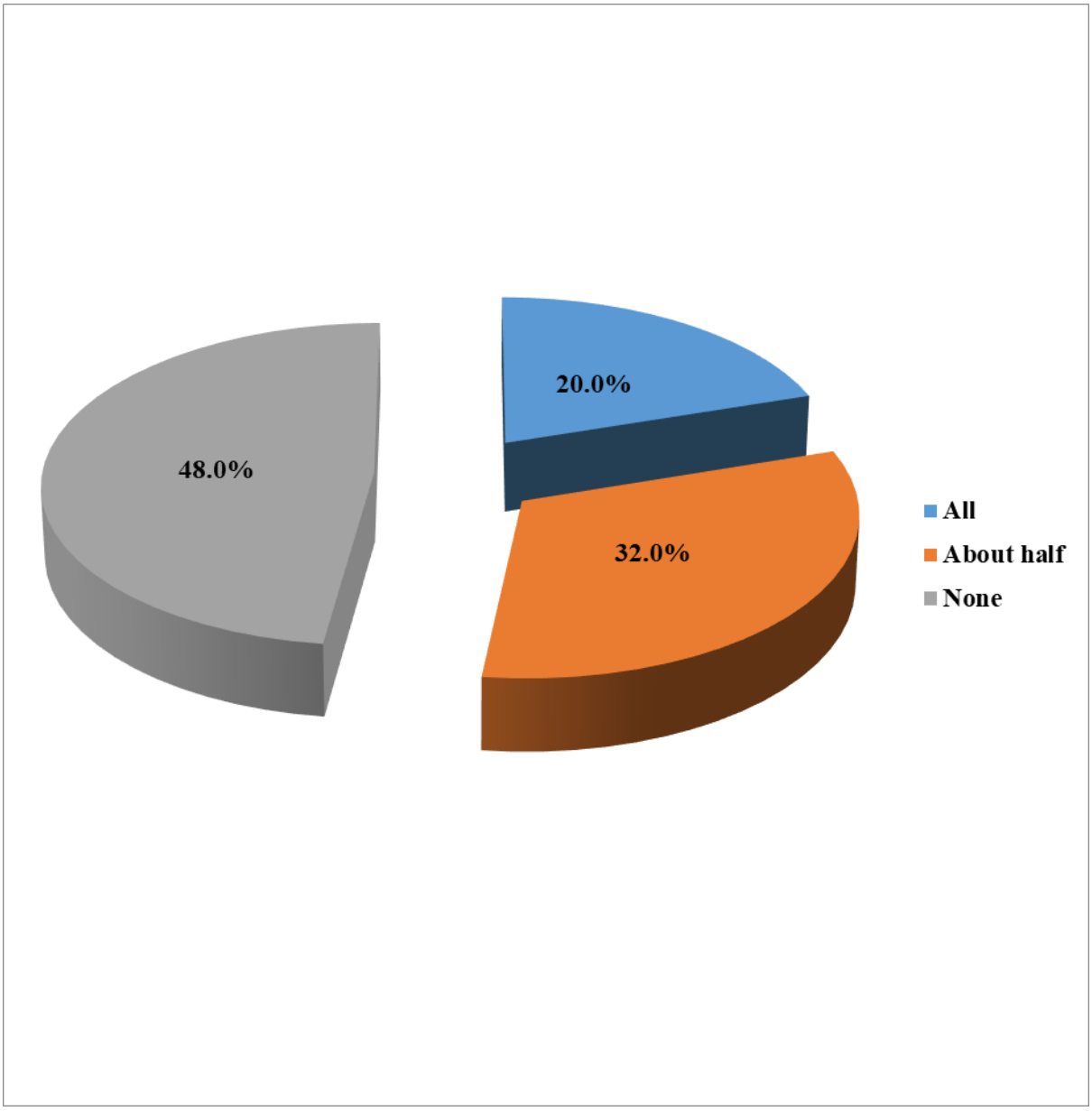

Figure 4.1: Proportion of food consumed that is produced

4.4.2 Description of respondents' food systems (Food accessibility/affordability)

The places where respondents purchased food included markets, retail stores and farms. Majority (88.7%) purchased food from the market compared to 3% and 4% who purchased from retail stores and farms respectively. About 58.1% experienced hindrances to market access while 41.9% did not. For some of such hindrances, 51.6% had financial problems or issues getting transportation fare; and 58.1% experienced problems of ill health.

About 48.4% of the respondents said there were special markets for staples while 51.6% debunked this statement. More respondents said there were special markets for fruits and vegetables; and a greater proportion (91.8%) said the food markets were daily markets.

Table 4.4.2 Description of respondents' food systems (Food accessibility/affordability)

Variable	Category	Frequency	Percentage
Places of purchasing food	Market	55	88.7
	Retail stores	3	4.8
	Farm	4	6.5
Hindrance to market access	Yes	36	58.1
	No	26	41.9
Problems encountered (n=36)	Financial/T-fare	32	51.6
	Ill Health	4	58.1
Special market for staples	Yes	30	48.4
	No	32	51.6
Special market for fruits and vegetables	Yes	35	56.5
	No	27	43.5
Intervals of market days	Daily	57	91.8
	Once a week	5	8.1

4.4.3 Description of respondents' food systems (Food consumption pattern)

The most widely consumed staple was rice among 71.0% of the respondents, 61.3% consumed beans while 50.0% consumed maize. And in contrast to this, the most poorly consumed staples were 'tuwo' (8.1%) and potatoes (3.2%). For the frequency of staple consumption majority (46.8%) consumed staples daily while a small proportion (6.5%) consumed 5-6 times weekly.

Among the fruits consumed by the respondents, oranges were mostly consumed by a greater proportion (61.3%), while only 3.2% and 8.1% of the respondents consumed apples and carrots. Ugwu was the most commonly consumed vegetable by 41.9% of respondents, but only 9.7% consumed okro. Most of the respondents (48.4%) consumed fruits and vegetables 1-2 times weekly while 22.6% of respondents consumed it daily.

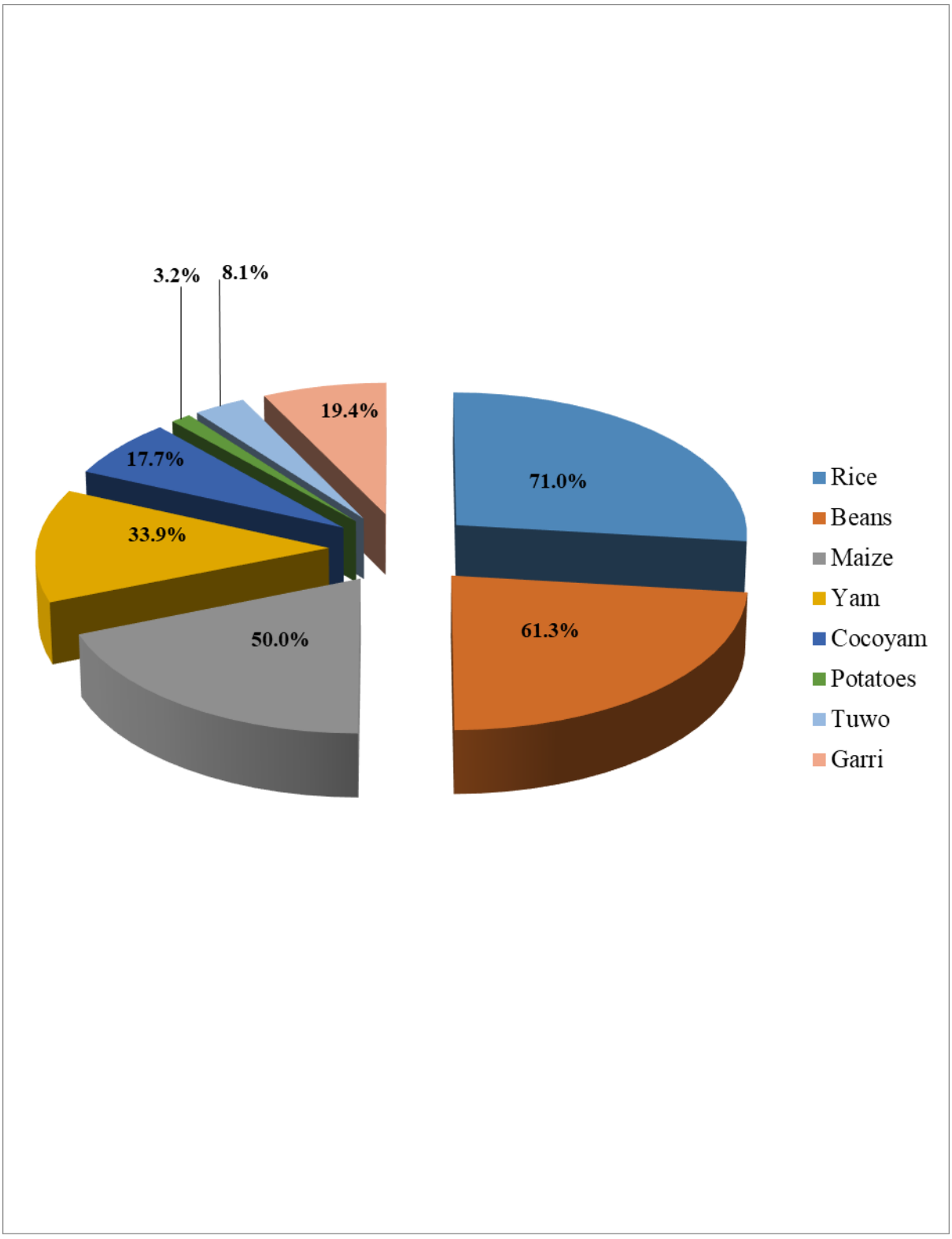

Figure 4.2: Commonly consumed staples

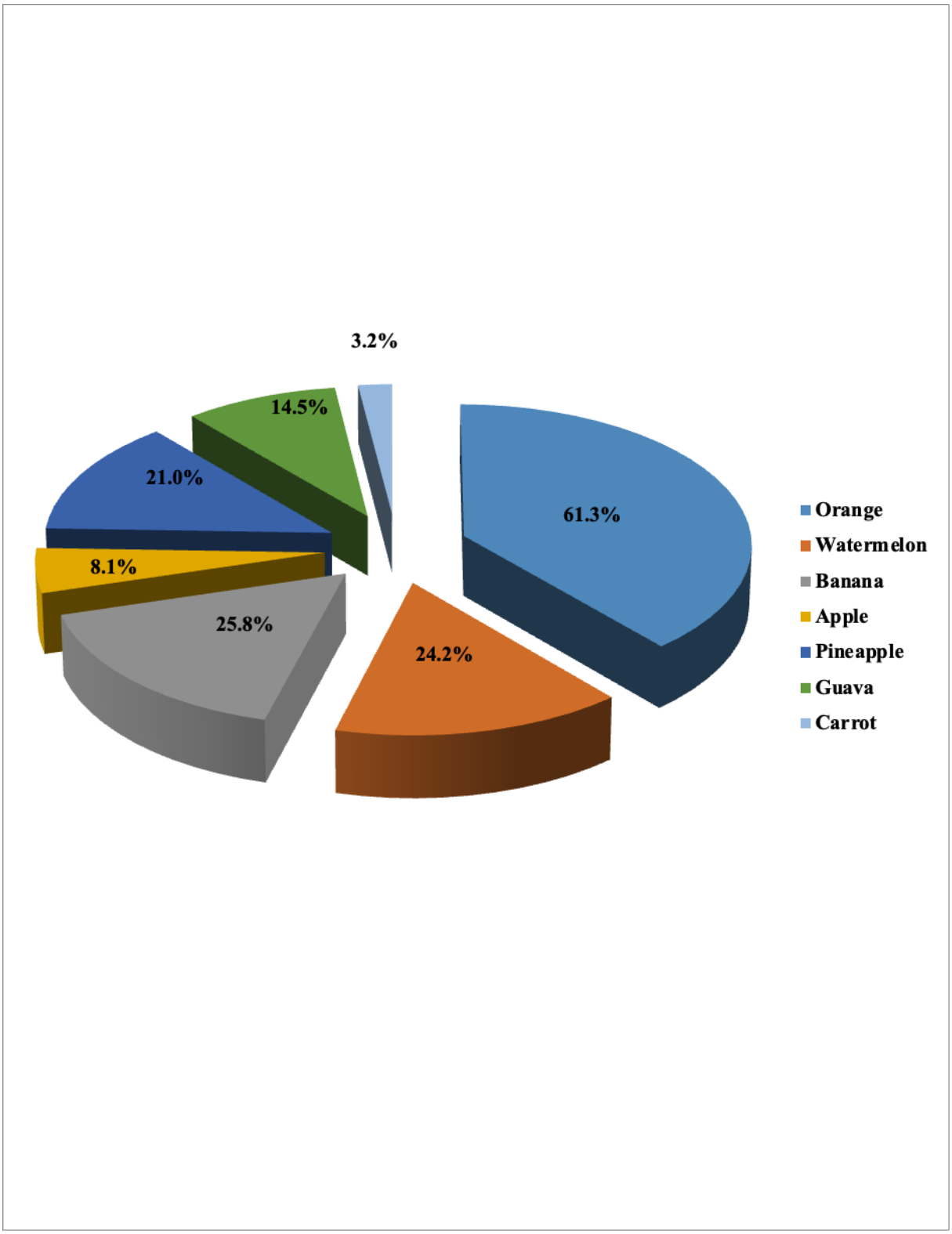

Figure 4.3: Commonly consumed fruits

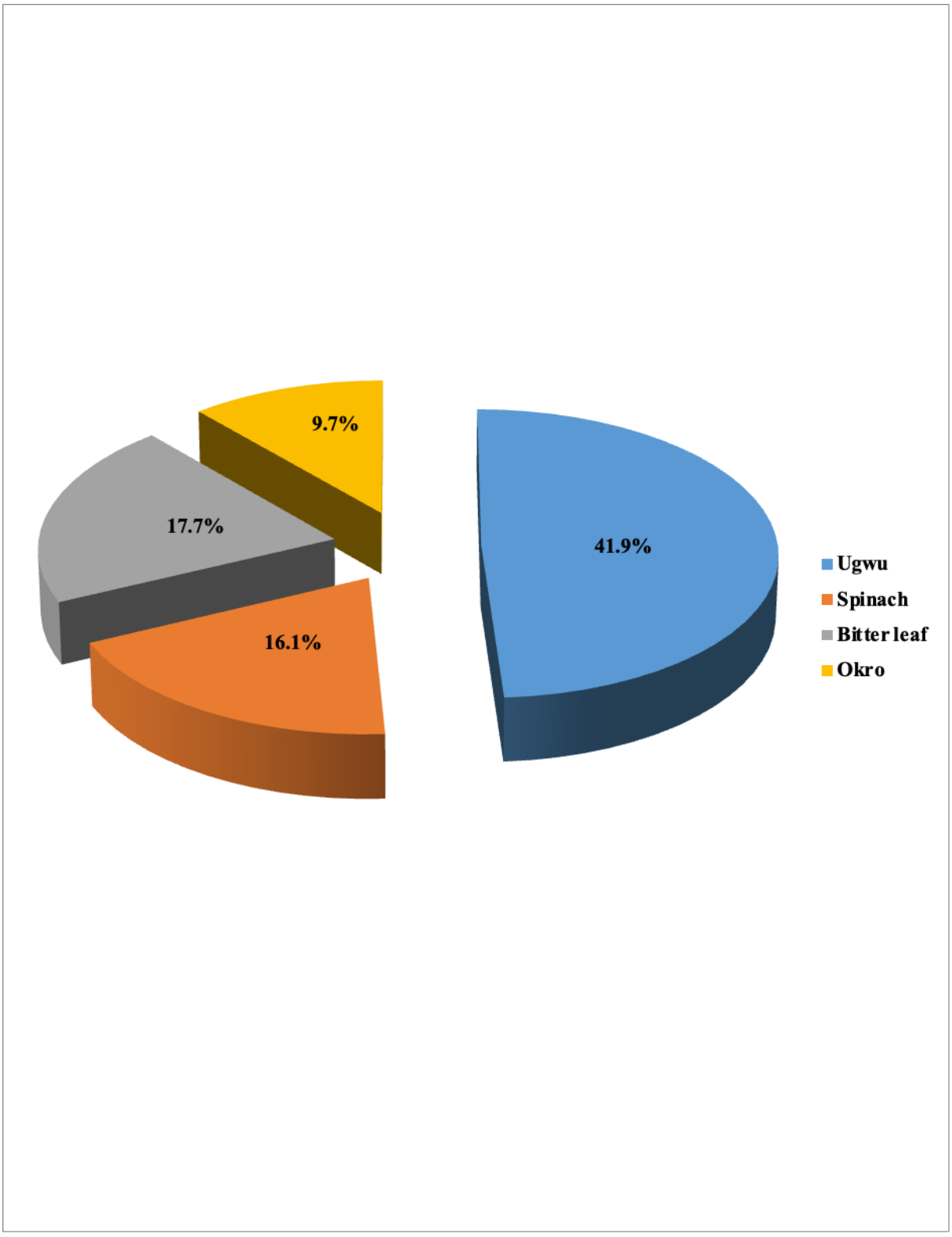

Figure 4.4: Commonly consumed vegetables

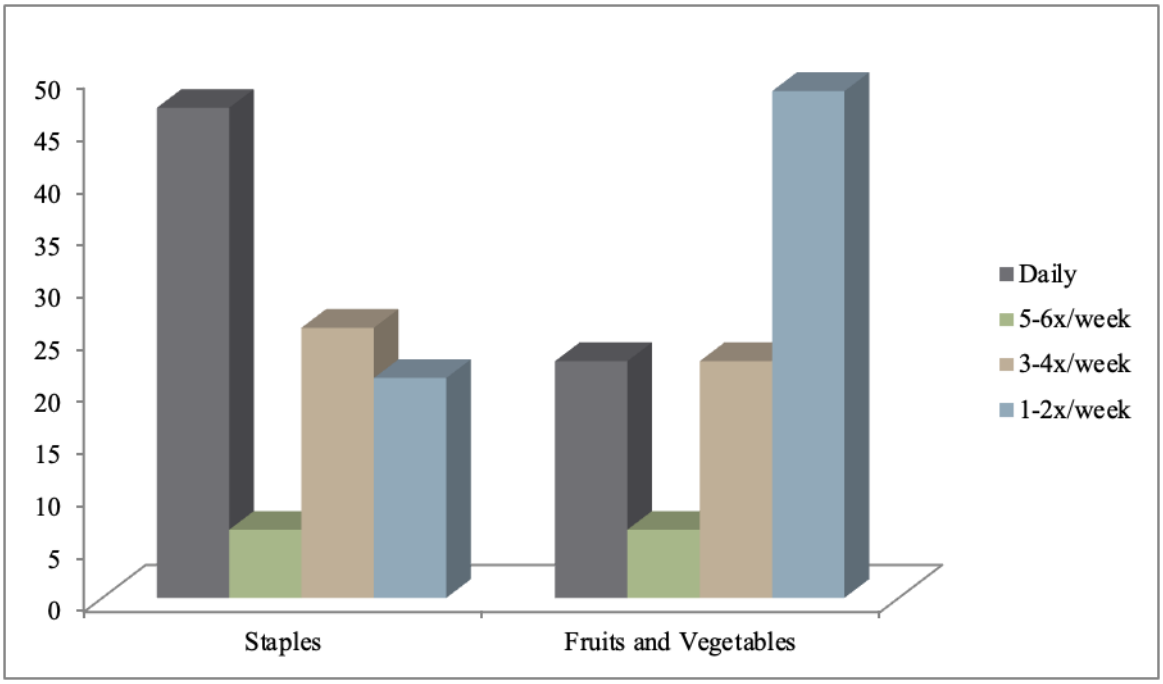

Figure 4.5: Frequency of consumption of staples, fruits and vegetables

4.4.5 Foods commonly consumed as breakfast, lunch and dinner

Figure 6 below shows the foods commonly consumed as breakfast. Majority (59.7%) were found to have consumed tea as breakfast, 43.5% consumed bread and 35.5% consumed pap; also 19.4% of respondents consumed bean cake (akara) as breakfast. Fewer respondents (4.8%, 6.5% and 9.7%) consumed egg, potatoes and bean pudding (moinmoin) respectively. Majority (33.9%) of the respondents who reported their food consumption in this study mostly consumed rice as lunch, presented in the chart in Figure 7. About 3.2% consumed yam, 24.2% consumed beans, 12.9% consumed tuwo and 9.7% had garri as lunch.

Figure 10 reveals that most (30.6%) of the respondents commonly consumed rice while fewer (3.2%) respondents commonly consumed semo and garri as dinner.

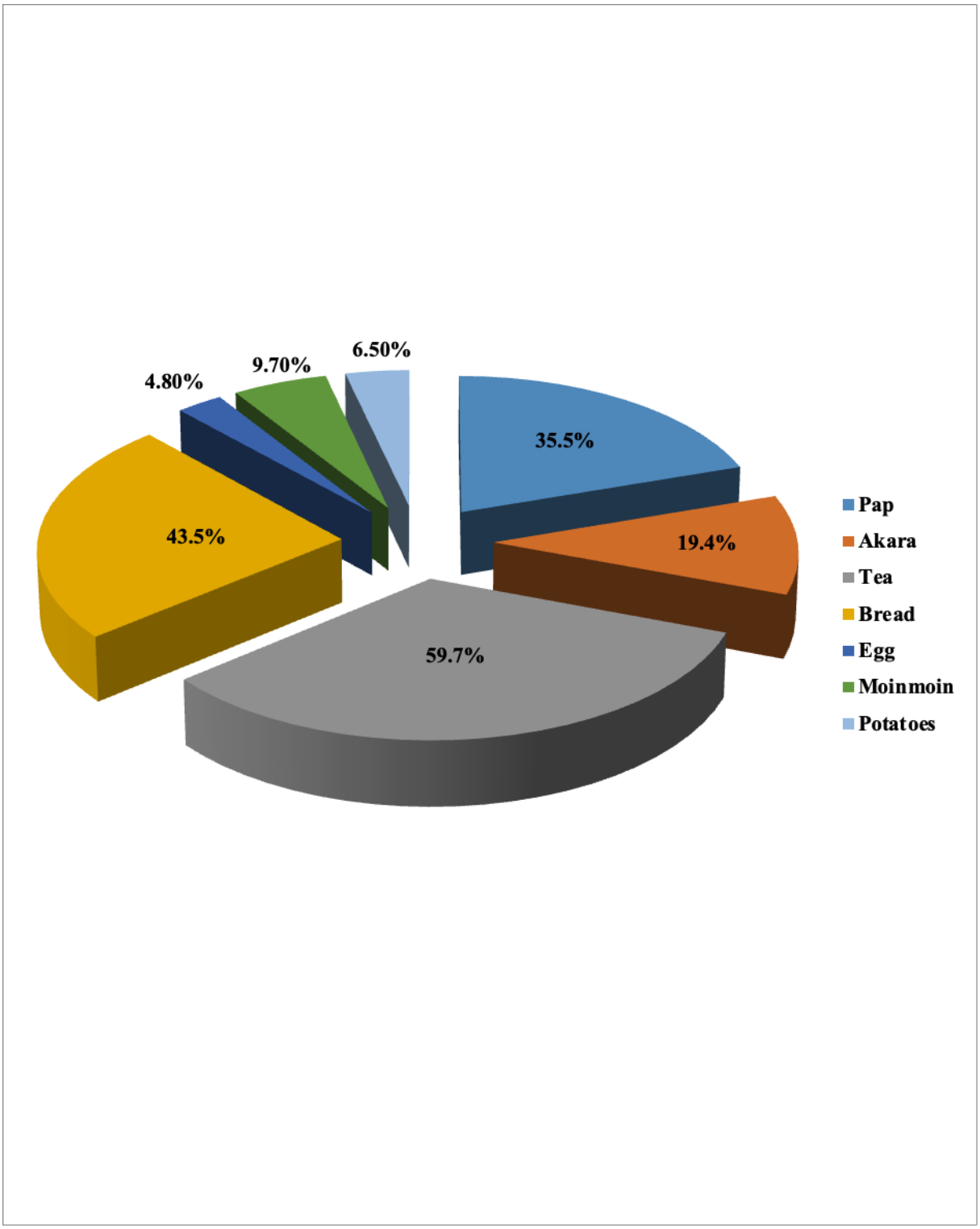

Figure 4.6: Foods commonly consumed as breakfast

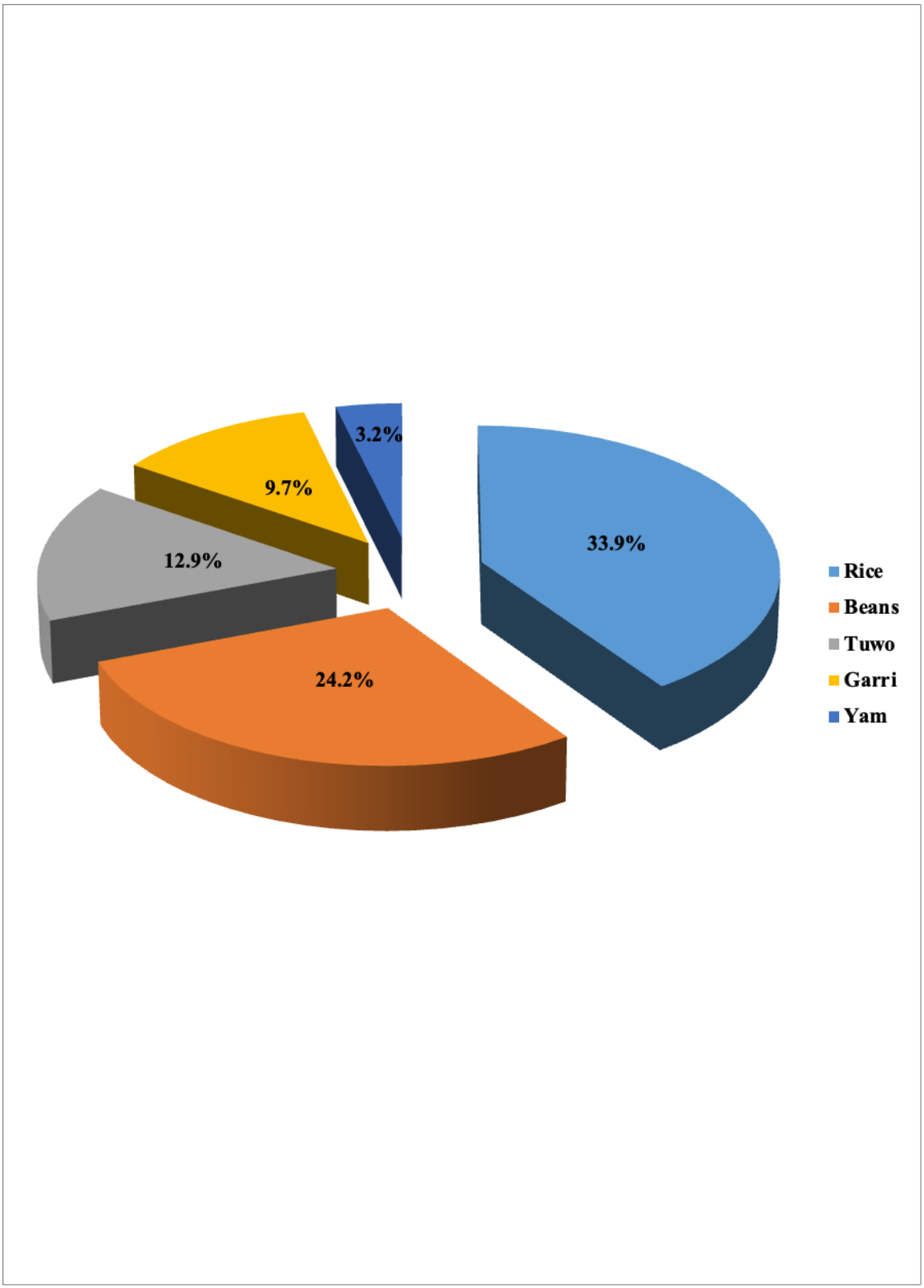

Figure 4.7: Foods commonly consumed as lunch

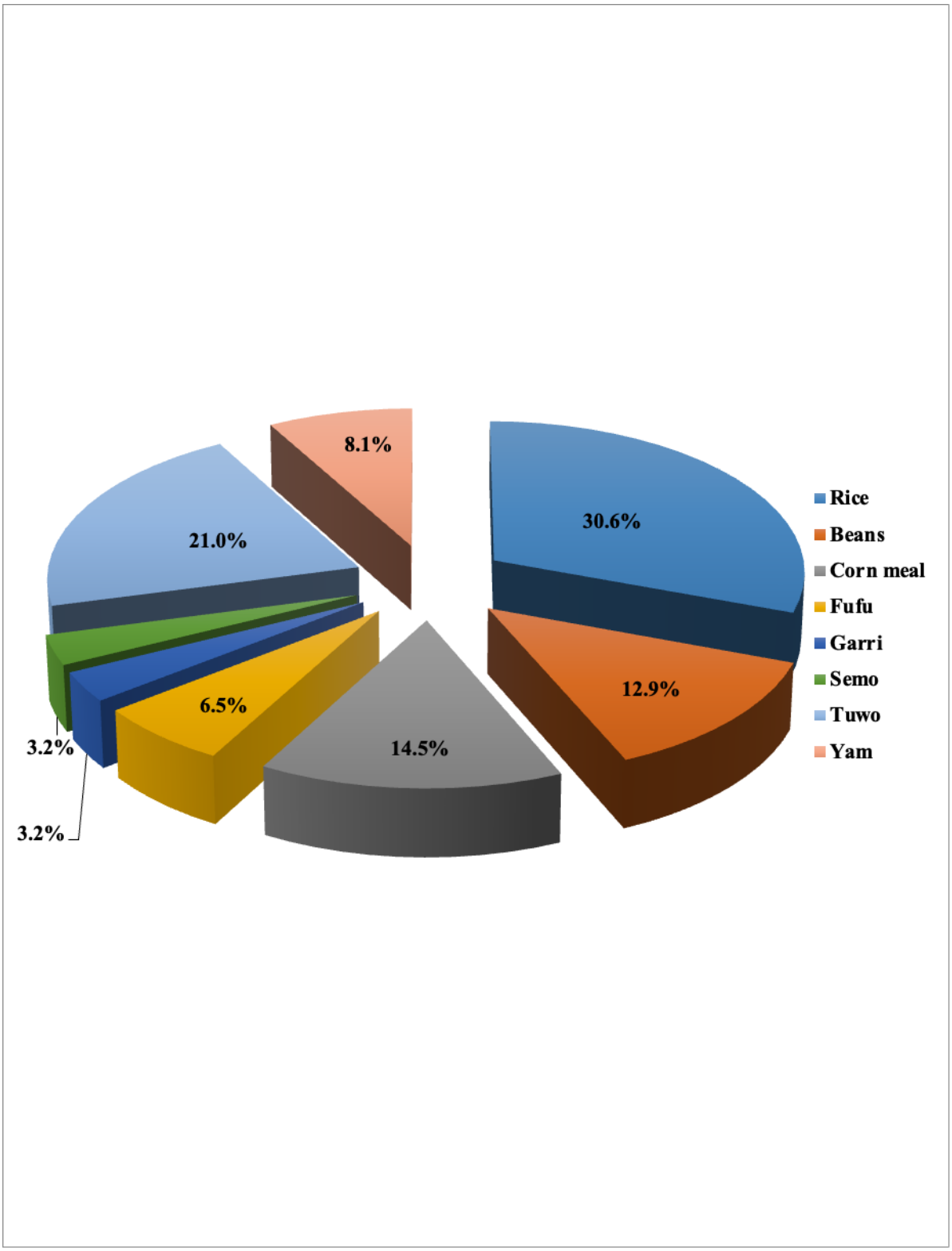

Figure 4.8: Foods commonly consumed as dinner

4.4.4 Description of factors related to respondents' food consumption

More than half of the respondents (53.2%) who participated in the food consumption survey reported that they were not eating alone, 44.8% usually ate with family/relatives, 41.4% with their children and only 13.8% usually ate with their spouse. Person responsible for preparation of respondents' food was self (64.5%), spouse (16.2%), children (14.5%) and relative (4.8%). Most of the respondents (98.4%) reported that they did like the taste of the food they consumed; half of the respondents experienced major change in dietary pattern since infected with HIV.

Frequency of daily food consumption was reported to be 3 times by 53.2% of respondents, 30.6% reported 2 times of daily food consumption and 16.2% consumed ≥4 times of daily food consumption. Meal skipping was reported by 54.8% of respondents while 42.9% reported lunch to be their usually skipped meal. Consumption of street food was reported by 59.7% of respondents and 79.0% did not have any forbidden food. A greater proportion of respondents (80.6%) reported usual intake of fruits and vegetables, only 8.0% reported frequent smoking or consumption of alcohol and 3.2% had difficulty in eating.

Table 4.4.4 Description of factors related to respondents' food consumption

Variable	Category	Frequency	Percentage
Eating alone	Yes	29	46.2
	No	33	53.2
People usually eating with (N=29)	Children	12	41.4
	Family/relative	13	44.8
	Spouse	4	13.8
Person responsible for food preparation	Self	40	64.5
	Children	9	14.5
	Spouse	10	16.2
	Relative	3	4.8
Like the taste of food consumed	Yes	61	98.4
	No	1	1.6
Major change in dietary pattern since infected	Yes	31	50.0
	No	31	50.0
Frequency of daily food consumption	2 times	19	30.6
	3 times	33	53.2
	≥4 times	10	16.2
Meal skipping	Yes	28	45.2
	No	34	54.8
Meal usually skipped	Breakfast	11	39.2
	Lunch	12	42.9
	Dinner	5	17.9
Consumption of street food	Yes	37	59.7
	No	25	40.3
Any forbidden food	Yes	13	21.0
	No	49	79.0
Usual intake of fruits and vegetables	Yes	50	80.6
	No	12	19.4
Frequent Smoking or consumption of alcohol	Yes	5	8.0
	No	57	92.0
Difficulty in eating	Yes	2	3.2
	No	60	96.8

4.4.8 Respondents' socio demographic characteristics and food systems

4.4.8a Respondents' sex by proportion of food produced that is consumed

Table 4.4.8a is a presentation of the association between respondents' sex and the proportion of food consumed that is produced. The results show that a greater proportion (61.5%) of respondents who were males did not produce any of the foods they consumed, 23.1% produced about half and only 15.4% produced all.

Among the female respondents, 46.9% did not produce any of the foods they consumed, 34.7% produced about half and 18.4% produced all the foods they consumed. On the total, half of the respondents that took part in the study did not produced any of the foods they consumed, 32.3% produced about half while 17.7% produced all the foods they consumed. And the association between sex of respondents and the proportion of foods consumed that is produced was not statistically significant ($\chi^2 = 0.9$, p-value = 0.631).

Table 4.4.8a Respondents' sex by proportion of food consumed that is produced

Sex	Proportion of food consumed that is produced				χ^2	p-value
	All (%)	About half (%)	None (%)	Total (%)		
Male	2(15.4)	3(23.1)	8(61.5)	13(100.0)		
Female	9(18.4)	17(34.7)	23(46.9)	49(100.0)	0.9	0.631
Total	11(17.7)	20(32.3)	31(50.0)	62(100.0)		

4.4.8b Respondents' sex by experience of lean or hungry season

Respondents in this study who agreed that there were lean or hungry seasons were more than half (59.7%) of which 61.2% were females and 53.8% males. Those who said there were neither lean nor hungry seasons were 40.3%, females consisted 38.8% and 46.2% were males. The association was however not significant ($\chi^2 = 0.2$, p-value = 0.630).

Table 4.4.8b Respondents' sex by experience of lean or hungry season

Sex	Experience of lean or hungry season			χ^2	p-value
	Yes (%)	No (%)	Total (%)		
Male	7(53.8)	6(46.2)	13(100.0)		
Female	30(61.2)	19(38.8)	49(100.0)	0.2	0.630
Total	37(59.7)	25(40.3)	62(100.0)		

4.4.8c Respondents' sex by change in dietary pattern since infected

The proportion of respondents who had experienced change in their dietary pattern since infected with HIV were 52.2% and of this were females (50.0%) and males (61.5%). Less than half (47.5%) of the respondents did not experience any change in dietary pattern. This comprised 50.0% females and 38.5% males, a difference that did not show any statistical significance ($\chi^2 = 0.5$, p-value = 0.462).

Table 4.4.8c Respondents' sex by change in dietary pattern since infected

Sex	change in dietary pattern since infected			χ^2	p-value
	Yes (%)	No (%)	Total (%)		
Male	8(61.5)	5(38.5)	13(100.0)		
Female	23(50.0)	23(50.0)	46(100.0)	0.5	0.462
Total	31(52.2)	28(47.5)	59(100.0)		

4.4.8d Respondents' sex by daily frequency of food consumption

More than half (53.2%) of respondents consumed food thrice daily, 30.6% consumed twice and 16.1% consumed food four times and above daily. A greater proportion of male respondents (61.5%) consumed food thrice daily compared to 51.0% female respondents. More females (32.7%) consumed food twice daily compared to 23.1% male respondents. No significant association was found (χ^2 =0.5, p-value = 0.768). More females (46.9%) were involved in food production compared to 23.1% of males. No significant association was found between food production and sex. Also, more males (61.5%) were given access to market to purchase food compared to females (57.1%). No significant relationship was observed between market accessibility and sex.

Table 4.4.8d Respondents' sex by daily frequency of food consumption

Sex	Daily frequency of food consumption				χ^2	p-value
	Twice (%)	Thrice (%)	Four times & above (%)	Total (%)		
Male	3(23.1)	8(61.5)	2(15.4)	13(100.0)		
Female	16(32.7)	25(51.0)	8(16.3)	49(100.0)	0.5	0.768
Total	19(30.6)	33(53.2)	10(16.1)	62(100.0)		

4.4.8e Respondents' sex by experience of clinical signs of HIV/AIDS in the last two weeks

The proportion of female respondents who had experienced one or more of the clinical signs of HIV/AIDS in the last two weeks preceding this study was 54.8%, a figure slightly higher than the male respondents (52.9%). But slightly higher proportion of male respondents (47.1%) did not experience any HIV/AIDS symptoms in the last two weeks as compared to female respondents (45.2%). The difference however was not significant ($\chi^2 = 0.1$, p-value = 0.810).

Table 4.4.8e Respondents' sex by experience of clinical signs of HIV/AIDS in the last two weeks

Sex	Experience of clinical signs of HIV/AIDS in the last two weeks			χ^2	p-value
	Yes (%)	No (%)	Total (%)		
Male	27(52.9)	24(47.1)	51(100.0)		
Female	102(54.8)	84(45.2)	186(100.0)	0.1	0.810
Total	129(54.4)	108(45.6)	237(100.0)		

4.4.8f Respondents' age by proportion of food consumed that is produced

Almost half (45.0%) of respondents aged 21 – 30 years reported that none of the food they consumed was produced by them, 35.0% consumed about half of the food they produced while 20.0% consumed all the food that they produced. Among respondents in the 31 – 40 years age category, 28.6% consumed all and half each of the foods that they produced, 42.9% reported that none of the foods they consumed was produced by them. Majority (83.3%) of the respondents who were in the ≥ 51 years age category did not consume any food that they produced, the association between the age of respondents and the proportion of foods consumed that they produced was however not significant.

Table 4.4.8f Respondents' age by proportion of food consumed that is produced

Age (years)	Proportion of food consumed that is produced				χ^2	p-value
	All (%)	About half (%)	None (%)	Total (%)		
21-30	4(20.0)	7(35.0)	9(45.0)	20(100.0)	7.3	0.503
31-40	6(28.6)	6(28.6)	9(42.9)	21(100.0)		
41-50	1(8.3)	4(33.3)	7(58.3)	12(100.0)		
≥51	0(0.0)	1(16.7)	5(83.3)	6(100.0)		
Non response	0(0.0)	2(66.7)	1(33.3)	3(100.0)		
Total	11(17.7)	20(32.3)	31(50.0)	62(100.0)		

4.5 Respondents' health condition

4.5.1 Description of respondents' health condition (CD4 cell count)

Table 4.5.1 below reveals the mean of the CD4 cell count of respondents as 250.6 ± 317.4 cells/µl, about 54.9% had lower CD4 cell count (1 – 199.99 cells/µl). Respondents who had CD4 cell count of 200 – 499 were 24.8% while 20.3% of respondents had CD4 cell count that was ≥ 500 cells/µl. The maximum CD4 cell count of respondents in this study was 1719.0 cells/µl and a minimum of 0.0 cells/µl.

4.5.2 Respondents' health condition (CD4 cell count) disaggregated by gender

Most of the respondents (74.1%) who had CD4 cell count ≥500 cells/µl were females and 25.9% were males. Similarly, more females (78.8%) had between 200 and 499 cell/µl of CD4 compared to fewer males (21.2%), also 79.1% female respondents had <200cells/µl more than the males (20.9%). There was a difference between the CD4 cell count of respondents and their gender, this difference was however not significant.

Table 4.5.1 Description of respondents' CD4 cell count

CD4 categories (cell/µl)	Frequency (%)	Mean	Min	Max
500 and above	108(20.3)	250.6±317.4	0.0	1719.0
200-499	132(24.8)			
0-199.99	292(54.9)			
Total	532(100.0)			

Table 4.5.2 Respondents' CD4 cell count disaggregated by gender

Variable	CD4 cell categories(cell/µl)			Total (%)	χ^2	p-value
Gender	**≥500 (%)**	**200-499 (%)**	**<200 (%)**			
Male	28(25.9)	28(21.2)	61(20.9)	117(22.0)	1.2	0.541
Female	80(74.1)	104(78.8)	231(79.1)	415(78.0)		
Total	108(100.0)	132(100.0)	292(100.0)	532(100.0)		
Mean	250.6±317.449					

4.5.3 Relationship between health condition (CD4 cell count) and BMI of respondents

Respondents who had ≥500 cells/µl of CD4 were mostly underweight (33.3%), those who had obese, overweight and normal BMI were 24.2%, 20.8% and 17.9% respectively. Among the category of respondents with CD4 cell count of 200–499 cells/µl, 37.0% were underweight, 26.0% were overweight and 24.2% were obese. There were however, more than half of the respondents (58.9%, 53.2% and 51.5%) having CD4 cell count between 0–199.99 cells/µl who had normal, overweight and obese BMI respectively. This relationship between CD4 cell count and BMI was however not significant.

Table 4.5.3 Relationship between CD4 cell count and BMI of respondents

BMI	CD4 cell count categories			Total (%)	χ^2	p-value
	500 and above (%)	200 – 499 (%)	0 – 199.99 (%)			
Underweight	9(33.3)	10(37.0)	8(26.9)	27(100.0)		
Normal	51(17.9)	66(23.2)	168(58.9)	285(100.0)		
Overweight	32(20.8)	40(26.0)	82(53.2)	154(100.0)	9.8	0.132
Obese	16(24.2)	16(24.2)	34(51.5)	66(100.0)		
Total	108(20.3)	132(24.8)	292(54.9)	100(100.0)		

4.5.4 Relationship between respondents' health condition (CD4 cell count) and Dietary Diversity Score

Table 4.5.4 shows the relationship between respondents' CD4 cell count and their Dietary Diversity Score. All the respondents who had medium Dietary Diversity Score had low CD4 cell count (0–199.99cells/µl), majority (96.8%) that had HDDS also had low CD4 cell count. Very few respondents (0.8%) with HDDS had ≥500 cells/µl of CD4 cell count. Similarly, only 2.4% of the respondents with HDDS had CD4 cell count between 200–499cells/µl, the reported difference between respondents' CD4 cell count and their Dietary Diversity Score was not significant.

Table 4.5.4 Relationship between respondents' health condition (CD4 cell count) and Dietary Diversity Score

Dietary Diversity Score	CD4 cell count in categories			Total (%)	χ^2	p-value
	500 and above (%)	200-499 (%)	0-199.99 (%)			
Lowest	0(0.0)	0(0.0)	2(100.0)	2(100.0)	0.7	0.953
Medium	0(0.0)	0(0.0)	19(100.0)	19(100.0)		
High	1(0.8)	3(2.4)	122(96.8)	126(100.0)		
Total	1(0.7)	3(2.0)	143(97.3)	147(100.0)		

4.5.5 Relationship between BMI, mean nutrient intake and CD4 cell count (cells/µl)

Average energy intake of respondents who had CD4 cell count between 200–499 cells/µl was 1739.8±928.2kcal, respondents with CD4 cell count (<200 cells/µl) had lower energy intake (439.5±929.8kcals). Protein intake of respondents having 200–499 cells/µl CD4 cell count was 59.5±36.4g, while those with CD4 cell count ≥500 was 66.6±38.4g. Respondents' zinc intake was 8.5±6.3mg for those with CD4 cell count of 200–499 cells/µl compared to 2.0±4.6mg and 8.7±4.9mg for respondents with <200 and ≥500 cells/µl. Similarly, iron intake was 15.1±9.2mg among respondents who had 200 – 499 cells/µl and lowest (3.5±7.5 mg) for respondents with <200 CD4 cell count. There was a relationship between mean intake of all the nutrients and CD4 cell count of respondents in this study and this was significant ($p<0.05$).

Table 4.5.5 Relationship between BMI, mean nutrient intake and CD4 cell count (cells/µl)

Variables	CD4 cell count (cells/µl)				f-test	p-value
	≥500	200-499	<200	Total		
Energy intake (kcal)	1931.9±864.2	1739.8±928.2	439.5±929.8	1065.±148.1	152.1	0.000*
Protein intake (g)	66.6±38.4	59.5±36.4	14.9±33.8	36.5±42.7	121.5	0.000*
Carbohydrate intake (g)	299.3±141.4	294.6±159.6	68.8±145.6	171.6±186.6	155.5	0.000*
Fat intake (g)	46.3±29.8	42.8±35.1	9.6±22.2	25.3±32.5	105.7	0.000*
Vitamin A intake (mcg)	20445.9±19933.9	16455.7±14198.3	4113.6±9856.9	10491.5±15310.6	74.2	0.000*
Vitamin C intake (mg)	62.4±122.8	47.6±112.0	14.2±80.0	32.2±100.3	11.6	0.000*
Folate intake (mcg)	269.7±223.3	246.3±228.4	54.2±138.3	145.6±209.0	81.1	0.000*
Vitamin B_{12} intake (mcg)	1.9±1.5	2.2±5.4	0.8±6.4	1.4±5.5	3.6	0.029*
Zinc intake (mg)	8.7±4.9	8.5±6.3	2.0±4.6	4.9±6.1	109.7	0.000*
Iron intake (mg)	15.8±7.9	15.1±9.2	3.5±7.5	8.9±10.0	144.7	0.000*
BMI (Kg/m^2)	24.9±5.9	24.4±4.9	24.9±4.4	24.8±4.8	0.6	0.553

*$p<0.05$

4.6 Safety Networks/Support Systems

4.6.1 Description of respondents' safety networks or support systems

In Table 4.6.1, respondents were asked about the existence of possible support groups that acts as support system or social safety nets for them and 52 respondents (83.9%) stated that they are aware of the existence of such support groups for HIV patients. About (82.3%) respondents indicated that they are members of some support groups while 17.7% do not belong to any support group. On asking about the main activities of the support groups, 39.2% respondents pointed to counselling and encouragement; 15.7% mentioned food and nutrition; 27.5% respondents said it is for the treatment of opportunistic infections.

Table 4.6.1 Description of respondents' safety networks and support systems

Variable	Category	Frequency	Percentage
Knowledge of any support group	Yes	52	83.9
	No	10	16.1
Belong to any support group	Yes	51	82.3
	No	11	17.7
Activities of the support group	Counselling and encouragement	20	39.2
	Food and Nutrition aid	8	15.7
	Drug aid	1	1.9
	Prayer support	8	15.7
	Treatment for opportunistic infection	14	27.5

4.6.2 Description of respondents' benefits from support groups

Further analysis on the benefits of the support groups, Table 4.6.2 reveals that a good proportion (49.8%) of respondents joined a support group for the purpose of receiving counselling and encouragement. About 16.1% stated that it was for the purpose of financial empowerment while 6.5% mentioned food and nutrition aid as their purpose for joining a support group. On asking whether the respondents ever benefited from the support groups, 51(82.3%) responded affirmatively.

The report in Table 4.6.2 shows that upon further probing about the types of benefits received in the support group, half (50%) of the respondents pointed to counselling and psychological/psychosocial support. Of importance are the 33 respondents (53.2%) that claimed food and nutritional aid as a major benefit gained in the group. It was also reported that some support groups give food ration to their members. In terms of rating the impact of the benefits received, 26 respondents (51%) stated that the impact was moderate while 15 respondents (29.4%) reported that the impact was high.

Table 4.6.2 Description of respondents' benefits from support groups

Variable	Category	Frequency	Percentage
Reason for joining the group	Counselling and encouragement	29	46.8
	Food and Nutrition aid	4	6.5
	Drug aid	5	8.1
	Financial empowerment	10	16.1
Ever benefitted from the support group	Yes	51	82.3
	No	11	17.7
Benefit gained in the group	Financial empowerment	5	8.1
	Counselling and psychological/psychosocial support	31	50.0
	Food and nutritional aid	33	53.2
	Medical	11	17.7
Sponsor of support group(N=51)	CRS (NGO)	31	60.8
	DACA/NACA/JACA	12	23.5
	Hospital/Govt.	8	15.7
Impact of Benefit from support groups(N=51)	High	15	29.4
	Moderate	26	51.0
	Low	10	19.6
Benefit m*et al*l major needs (N=51)	Yes	9	17.6
	No	42	82.4

4.6.3 Description of the needs of respondents

About 59.7% revealed food and nutrition support to be their important needs, 41.9% said financial support 37.1% said counselling and psychosocial support, 35.5% said medical support (drugs) and 25.8% reported capacity empowerment while 11.3% said material support was the important need of PLHIV. Almost half (41.2%) of the respondents said support group/NGO and government each was a means of meeting the earlier stated needs of PLHIV, 17.6% of respondents said capacity building (job creation) was a means of meeting the needs of PLHIV.

Sources of care and support received by PLHIV was mostly by relatives (32.3%), 11.3% each by children, friends and local government; 19.4% by federal government and 6.5% by state government.

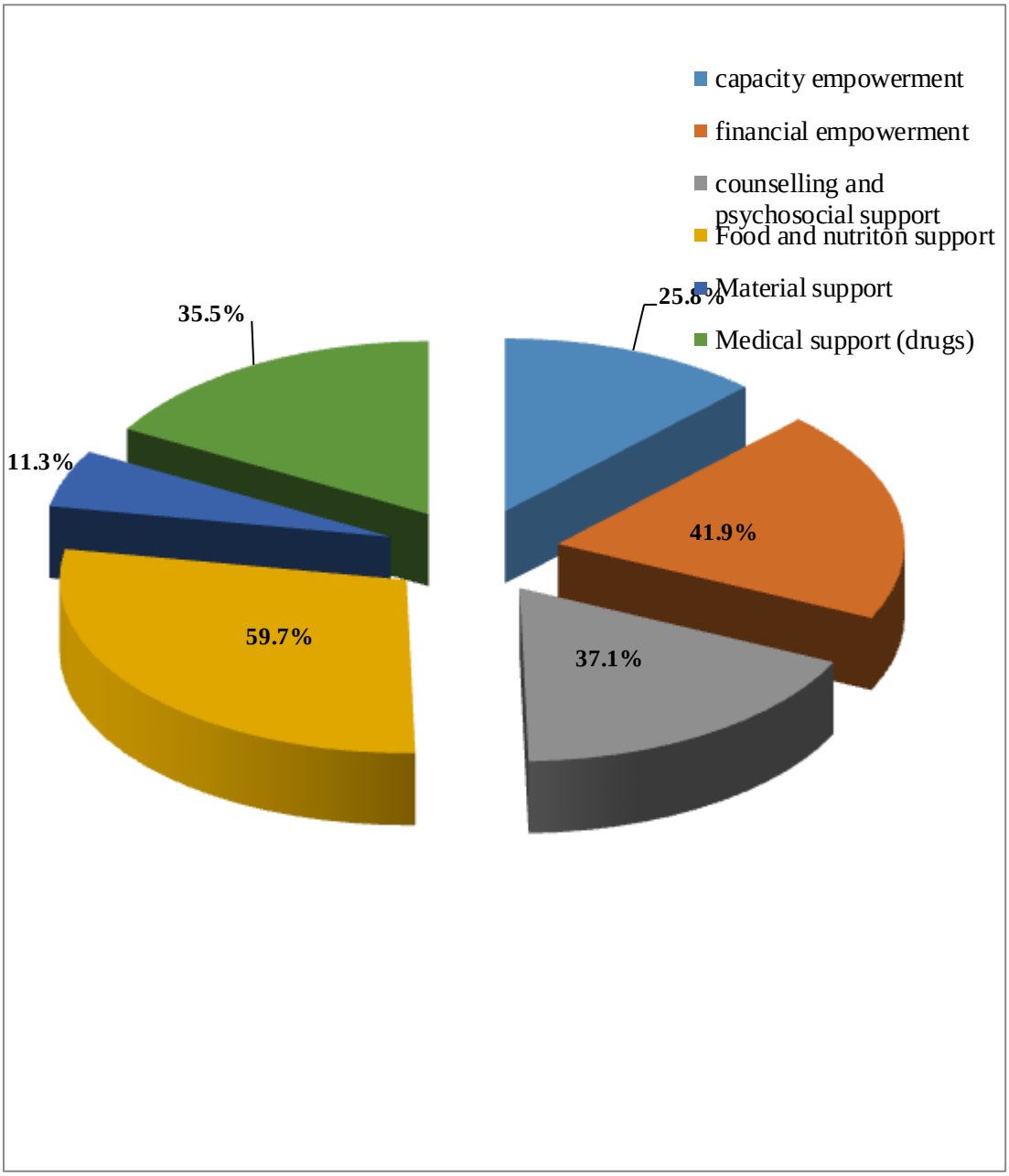

Figure 4.9: Important needs of PLWHA

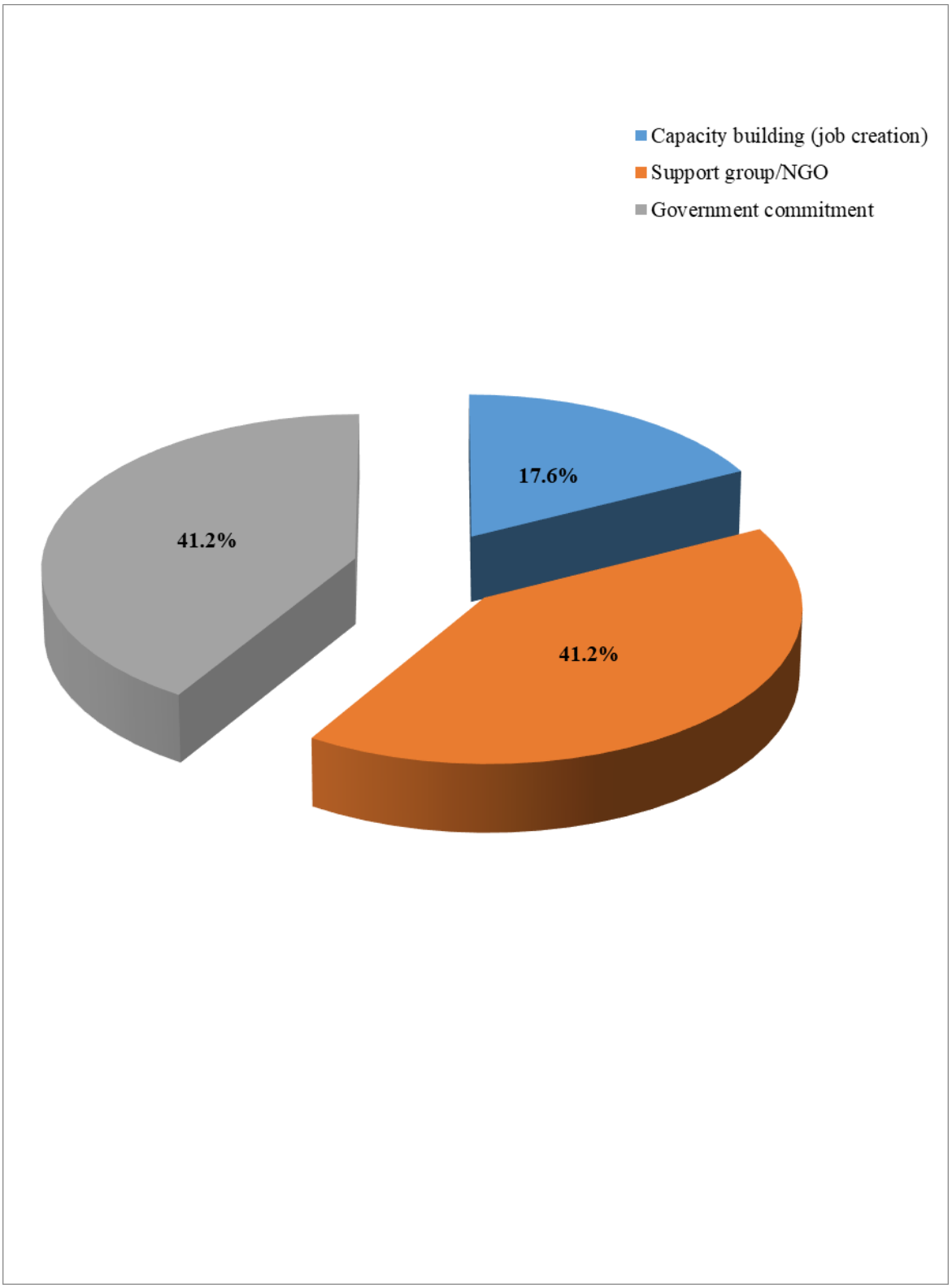

Figure 4.10: Means of meeting the needs

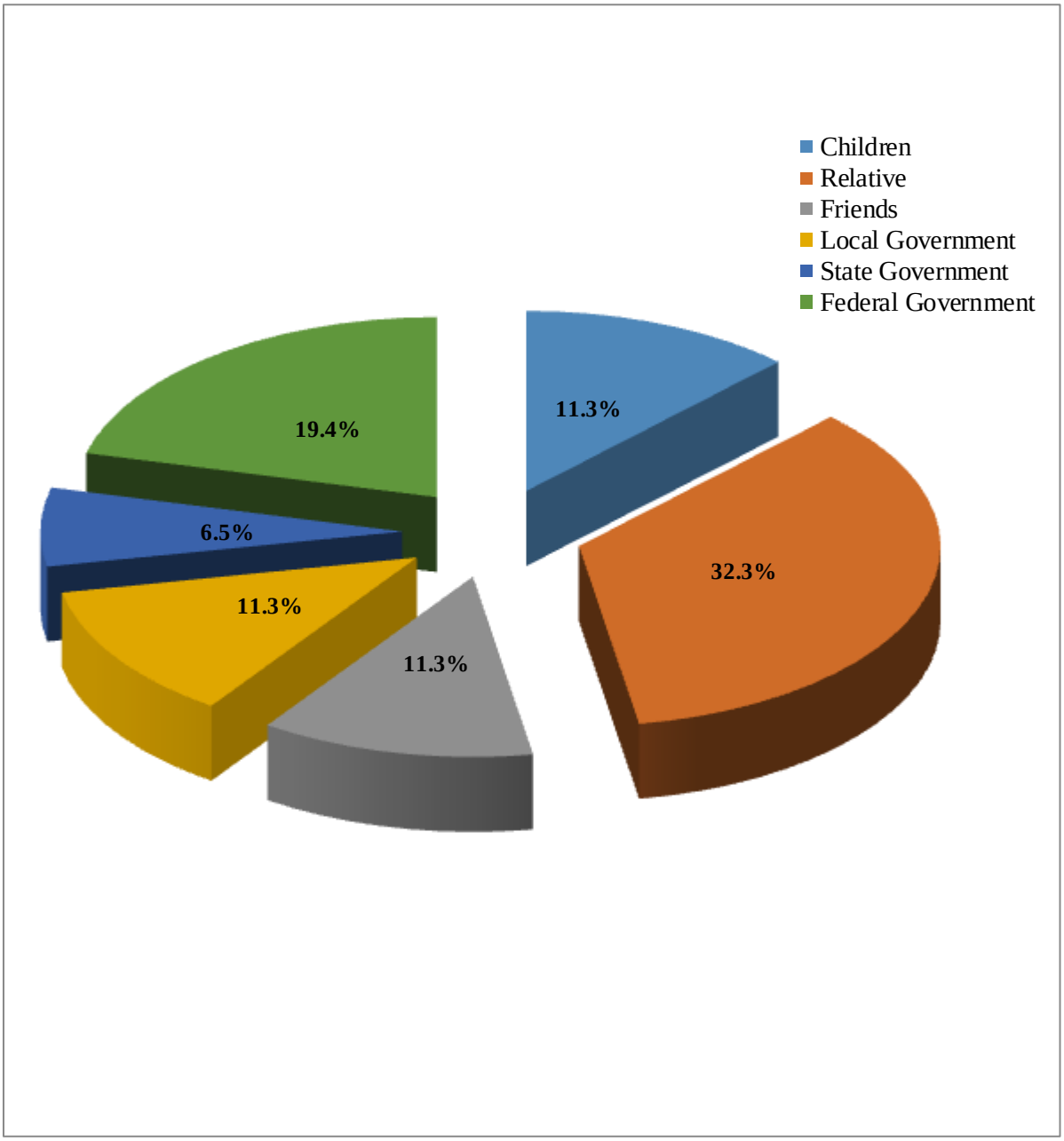

Figure 4.11: Sources of care and support received

4.6.4 Various support and assistance received

There were various support and assistance reported to have been received by respondents in this study. Food aid was received by more than half (58.1%) of respondents, 45.2% received care and support, 37.1% received drugs and supplement against, 35.5% received ARV while only 17.7% received cash assistance among respondents in this study.

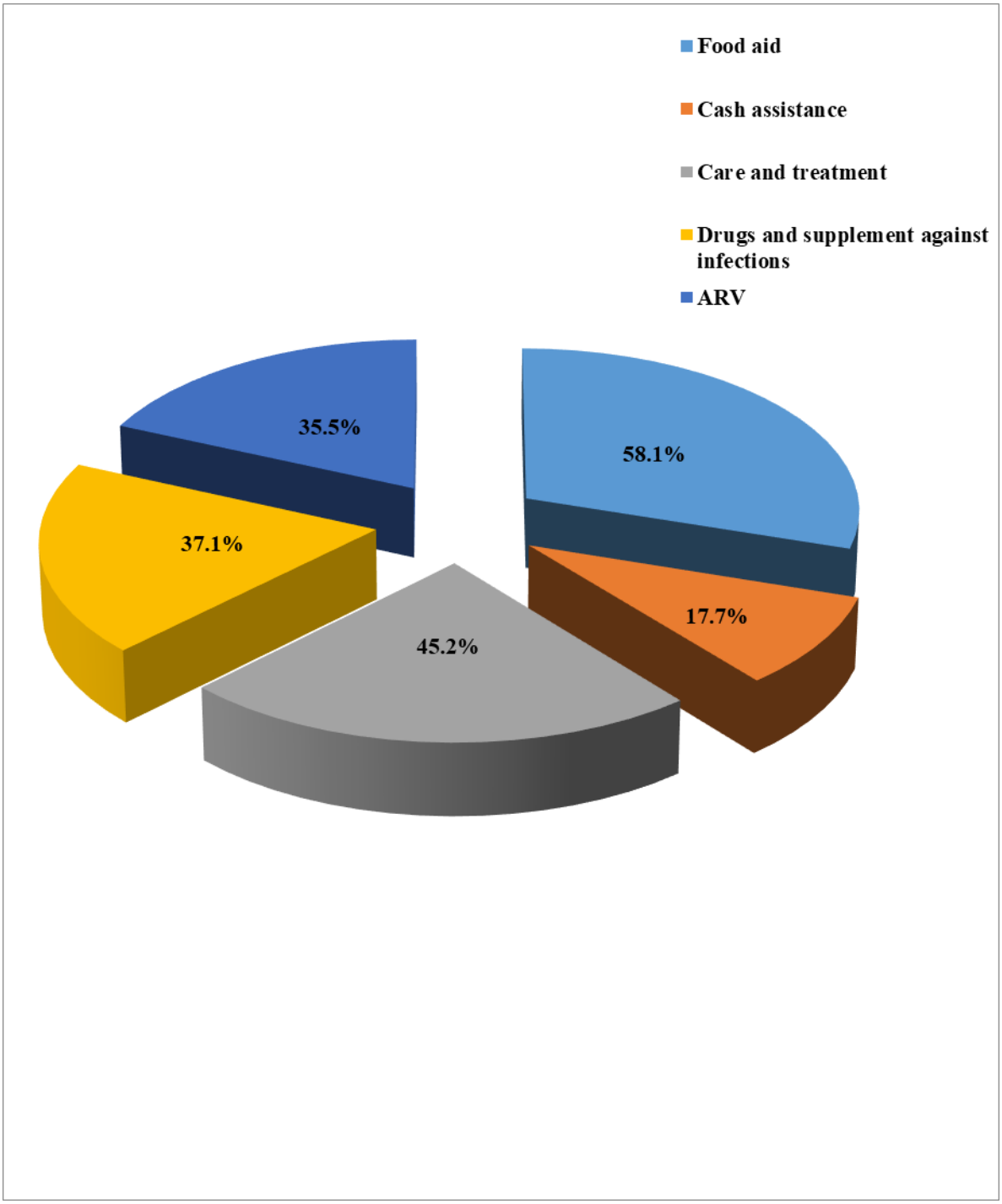

Figure 4.12: Various support and assistance received

4.6.5 Association between respondents' safety net and BMI

Majority of the respondents (80.0%) who received financial empowerment had normal BMI compared to 20.0% who had overweight BMI. Among the respondents who received counselling and psychosocial support, 64.5% had normal BMI, while 25.8% had overweight BMI and 6.5% were obese. Most of the respondents who received food and nutritional support, 63.6% had normal BMI compared to fewer respondents (6.1%) who had underweight BMI. Most of the respondents (63.6%) who received medical support had normal BMI compared to 18.2% who had overweight and obese BMI each.

Table 4.6.5 Association between respondents' safety net and BMI

Safety net variables	Category	BMI				Total (%)	χ^2	P value
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)			
Financial empowerment	No	6(2.5)	147(61.2)	65(27.1)	22(9.2)	240(100.0)	1.0	0.812
	Yes	0(0.0)	4(80.0)	1(20.0)	0(0.0)	5(100.0)		
Counselling/Psychological support	No	5(2.3)	131(61.2)	58(27.1)	20(9.3)	214(100.0)	0.4	0.939
	Yes	1(3.2)	20(64.5)	8(25.8)	2(6.5)	31(100.0)		
Food and nutritional support	No	4(1.9)	130(61.3)	60(28.3)	18(8.5)	212(100.0)	3.6	0.313
	Yes	2(6.1)	21(63.6)	6(18.2)	4(12.1)	33(100.0)		
Medical support	No	6(2.6)	144(61.5)	64(27.4)	20(8.5)	234(100.0)	1.7	0.636
	Yes	0(0.0)	7(63.6)	2(18.2)	2(18.2)	11(100.0)		

4.6.6 Respondents' safety net and dietary diversity score

All the respondents (100.0%) who received medical support had high dietary diversity score and most (90.5%) of the respondents who received food and nutritional support had high dietary diversity score compared to fewer respondents (9.5%) who had medium dietary diversity score. Among the respondents who received counselling/psychological support, majority (91.3%) had HDDS whereas 8.7% had MDDS. However, all respondents (100.0%) who received financial empowerment compared to 85.3% who did not receive financial empowerment had HDDS and there was no significant association was observed.

Table 4.6.6 Respondents' safety net and Dietary Diversity score

Safety net variables	Category	Dietary Diversity Score			Total (%)	χ^2	P value
		Low (%)	Medium (%)	High (%)			
Financial empowerment	No	2(1.4)	19(13.3)	122(85.3)	143(100.0)	0.7	0.710
	Yes	0(0.0)	0(0.0)	4(100.0)	4(100.0)		
Counselling/Psychological support	No	2(1.6)	17(13.7)	105(84.7)	124(100.0)	0.8	0.655
	Yes	0(0.0)	2(8.7)	21(91.3)	23(100.0)		
Food and nutritional support	No	2(1.6)	17(13.5)	107(84.9)	126(100.0)	0.6	0.734
	Yes	0(0.0)	2(9.5)	19(90.5)	21(100.0)		
Medical support	No	2(1.4)	19(13.4)	121(85.2)	142(100.0)	0.9	0.650
	Yes	0(0.0)	0(0.0)	5(100.0)	5(100.0)		

4.7 REPORT ON THE FOCUS GROUP DISCUSSION OF THE STUDY SUBJECTS (PLWHAs)

Focus group discussions were conducted on three groups of seven participants each, drawn from across eleven support groups of PLWHAs in Kaduna city on food availability, nutritional status and nutrition problem of PLWHAs. Some of the support groups, who permitted their names to be printed included Archdiocesan Catholic Action Committee (DACA), K and O Foundation, Life Health Foundation, Life of God, Queen of Apostle, Divine Help, Lights of Hope, Gold wheel, Alaweda, St. Matthew, St Michael's, Life and Hope Foundation, and Faith commission.

The discussion was grouped into four themes which is crucial to the research focus, these were: Food production/availability; Food access; knowledge of nutrition and HIV among PLWHAs:

A. FOOD PRODUCTION/AVAILABILITY AMONG PLWHAs

Food provides necessary nutrients needed for survival, growth and maintenance of the body for daily activities.

1. Farming and livestock rearing practices and constrains among PLWHA

A key informant interview (KII) session with stakeholders involved in caring for PLWHA revealed that farming/livestock rearing among this group was low. Participants reported that the major reason was due to *lack of capacity and resources* for food production (home garden and livestock rearing) and it was due to lack of funds (money) for farming, land issue and physical ability to undergo strenuous activities. Some reported that their ''body is not strong enough to farm''. One of the participants said *"Because we don't have the power and land to farm, so it is not easy for us to produce our own foods."*

Furthermore, the focus group discussion participants also buttressed this point in the same vein with the key in-depth interview participants agreeing to the fact that low level of farming practices among PLWHAs was due to lack of capital and other resources. Although a woman among the participants reported that she had **started** keeping birds (chicken) for almost a year, for her own consumption after participating in a seminar educating them on the need to consume more chicken than beef.

However, respondents said that the main constraint to rearing of livestock was the issue of space in their house. Majority lived in rented house and could not keep birds or do home garden without the approval of their landlords and most landlords would not allow tenants to carry out such activities around them.

Other contributing factors to low/lack of farming practices as reported included: land, money and nearness to home. Majority of the participants reported that purchasing land for farming was quite expensive (*a plot of land in the bush is about ₦250,000*). Another issue pointed out during the discussion was the case of Fulani's herds (cows) destroying farm crops without compensation or relieve materials. Also getting labourers to work on the farm was another challenge they pointed out because of money. *It requires a lot of money to get people to work on the farm right from bush clearing and planting to harvesting of crops. They need to get labourers (Karu) to* work on the farmland.

2. Addressing Food and Nutrition Challenges of PLWHAs

According to PLWHAs, they reported that DACA and the Catholic Church had been supporting PLWHAs with food, drugs and nutrition provisions. They further solicited for the support of other organisations to emulate the goodwill of DACA and the Catholic Church in caring for PLWHAs. They stressed that the Catholic *Church took care of both Muslims and Christians and one of them stated that "so far you are positive you will receive care from them".*

Likewise, they requested that the money that was released to PLWHAs during the World AIDS Day (2007) be distributed accordingly. Respondents from Gold Wheel Support Group also corroborated the fact that HEKAN and individual donors supported them with food and other items. Services received from Catholic Relief Services included counselling on good nutrition, health, hygiene, drugs and food. At least a full measure of *3 mudu (kongos) of rice and 3 mudu (kongos) of beans* was given to them on monthly basis whenever they attended monthly meeting. The monthly food supplies did go a long way in meeting their food needs monthly because they had to buy few items to support what had already been given to them.

Members of the group requested for education so as to enhance their knowledge on farming and livestock rearing practices which included proper orientation through various supporting groups and conferences. Also, they said they

need someone to show them how to carry out the activities to avoid wastage of resources.

3. Vegetable farming among PLWHAs despite all constraints

A certain support group reported that they started planting vegetables for personal consumption after the training programme they had participated in some time ago and since then, they've been happy because of the yields. Though the only way they used was basin/bucket method and using this method for planting vegetables made an individual have just enough to cater for his/her family. They explained that they filled basin with sand, manure and water and set it aside in their home for planting.

Also, majority of the respondents had contrary opinion to the use of basin and bucket because of the issue of landlords and other domesticated animals in the community that may eat up the vegetables planted. It was further agreed that the best solution for them to get vegetables and other food items was to buy from the market. One of the respondents had this to say, "*If you have money, you will get whatever you want in the market".* Another respondent also supported the above argument with the issue of their health saying that farming was not easy for them.

B. ACCESS TO FOOD AMONG PLWHAs AND CONSTRAINTS

1. Purchasing power and food availability among PLWHAs

Majority reported that food is readily available in the market but getting what you need is the main issue. A respondent said that *"small money cannot buy all the food she needs at home".* Poor income level among PLWHAs was identified as the major constraint to accessing good food items due to high rate of joblessness among them. All the participants said that food items were expensive currently because of the increment in government workers' salary. "*Market women thought everybody coming to market are government officials or civil servants, so they hike prices of commodities. Therefore, the little money PLWHAs have can only buy them few food items which may not be enough to meet the food and nutrient needs of their household",* they submitted.

A respondent from Gold Wheel Support Group reported that earning an income as a PLHIV was difficult because of stigmatisation and discrimination. She further

stressed that her customers, while she was selling foods, birds and farm produce, deserted her when they got wind of her status and this has made life difficult for her. The respondents continued by saying that many of their group members lacked jobs and no concrete income to take care of their needs like food and drugs. These they said had resulted in either *0:0:1, 1:0:1 or 1:1:0* meal pattern for the poor among PLWHAs.

Another respondent (a man) also buttressed this point by saying *"I ration my food daily so that others can get their share, I reduced my daily eating pattern to twice instead of four times daily, though, it was a difficult thing because the drugs we take daily requires us to consume a large portion of food daily. But, due to our present predicament, we have to stick with the little we have. As a matter of fact, I had to attach myself to a block industry where I get little wage as income to purchase food items".*

In addition, another group leader of PLWHAs from the Catholic Relief Services reported that health, finance and food had been the major challenge of PLWHAs. Basically, the main issue was lack of money to purchase adequate food to cater for their nutritional needs and build their immune system. Also, she said there were limited funds to cater for all PLWHAs in the area (Kaduna) and that only few could be reached. Majority of PLWHAs reported that access to adequate food had been difficult for them because they didn't have jobs and earning an income was quite difficult for them. They further said that their counsellor (Aunty Julie) had been training them on soap making, beads making and petty trading. They believed that adequate nutrition among PLWHAs could only be achieved if they had a personal source of income plus proper information and enlightenment on how to care for themselves. These, they concluded, could be achieved through the right choice of food groups/types that will boost their immune system and reduce the occurrence of illness.

Another issue raised was that they wanted to be empowered through nutrition education and enlightenment on how to meet their daily needs. They clamoured for change of the perception of Nigeria government about PLWHAs as beggars or people without homes and those without a future. They believed they could make things happen if given the opportunity and resources to become useful and make money. "*Earning income will give us opportunity to buy food and care for our own nutrition and personal needs",* they retorted.

2. Stigmatisation Issue

Majority of the respondents who participated in the study reported that they experienced one form of stigmatisation/discrimination or the other from the public which included their family members, colleagues at work, community members, friends, government health workers and associates. They enjoyed free relationships mainly among themselves, with few sponsors/donors like DACA, Catholic Church, HEKAN. Stigmatisation/discrimination, they said, had been limiting their participation in normal daily activities with other people in the community.

They also said it restricted their involvement in farming for commercial purpose because people will neither reckon with them nor buy their goods/produce because of the mentality that they have of people who are HIV positive. Many complained about how they lost their jobs, houses, family members, friends and other things simply because they are HIV positive.

Stigmatisation due to HIV/AIDS affected almost all the PLWHAs and had reduced their physical and mental productivity in the community. They were also being denied the right to certain necessities of life and were left to hope for survival. This issue (stigmatisation), not the disease (HIV/AIDS), had claimed the lives of many PLWHAs because many could not stand the shame or stress they were subjected to before getting food or drugs.

3. Source of Assistance -NGOs

The respondents mentioned that DACA had been very supportive to PLWHAs. They usually distribute treated mosquito net, water guard, water drums and *"whenever problem arises, they attend to us speedily".* Also, drugs from DACA, Catholic Relief Services, HEKAN, and International donors like AINS relief. *"They also give us transportation money whenever we go for meetings. DACA also provides food and supplements, financial assistance for our children's education, psychosocial and legal assistance from DACA lawyer in case anyone is molested. But we need more from other donors and the community".*

4. Family Members

Majority of the respondents recalled that they enjoyed little or no help from their family members. They explained further that most of their family members neglected them and didn't care for their needs and wants which are very essential to

man's existence and keep changing overtime. For their wellbeing, they relied mainly on help that came from outside i.e. friends, neighbours etc. However, one of them said he gets moral support from his uncle who calls him often to know how he is doing but he doesn't support him financially. Also, they added that they suffered discrimination and stigmatisation from their family members.

C. KNOWLEDGE OF PLWHAS ON THE RELATIONSHIP BETWEEN FOOD, NUTRITION AND DRUGS

1. Nutrition

One of the respondents said, *"The food we are taking is more important than drugs, food and supplements add value to life. We believe if there were drugs and no food, one can't be happy".* She continued, *"I know people who are positive and are living fine without drugs for the past 10 years just because they were eating good food. HIV doesn't kill people without drugs, it kills people without access to good food and nutrition, and those that decide not to take drugs at all".* All the respondents agreed that food is very important to their existence and management of HIV/AIDS because good food gives nutrients needed for energy and power whereas drugs only fight the virus and doesn't supply the body with needed energy. Another fact is that a balanced diet is very crucial in the management of HIV/AIDs. *Eating varieties from different food groups is good because it will help the drugs to function properly in the body. "As our doctor would say, EAT BEFORE YOU TAKE DRUGS, food comes first".*

Majority of PLWHAs reported that the drugs they take makes them to eat a lot and the drug can only work fast in the body with the type of food they eat and proper eating habit. Furthermore, PLWHAs stressed on the importance of *good foods to HIV/AIDS management, it was said that they needed more food than drugs, especially good nutrition (adequate diet), good psychology and exercise*.

A respondent buttressed the fact by saying that *nutrition played a positive role in stopping the virus' advancement in the body*. "*Without good nutrition, PLWHAs cannot live"* she submits. They further requested for more nutrition education, counselling and training for PLWHAs. Another respondent reported that good nutrition makes them look healthier, strong, fat and good looking and robust. They listed foods such as eba and egusi soup, banana, pineapple, watermelon, pounded yam,

and chicken, oranges, vegetables etc as foods they needed to take often so as to meet up with their daily dietary requirement for healthy living.

Another respondent explained his CD4 count had improved greatly since he started eating good food and applying the nutrition knowledge gained during meetings. He said initially, his CD4 count was 63 and overtime it had increased to 263, others in the group supported this statement by saying that of the 175 members in their group, only 60 were on ARV while others were practicing good nutrition and hygiene system and their health was improving.

2. Benefits of the project on the nutritional status of PLWHAs

Respondents reported that the improvement in their nutritional status/health was as a result of nutrition education and health counselling they participated in during workshops, seminars and meetings. They expatiated on the importance of these information on their balanced diet choice and wellbeing. Also, they agreed that the information helped in reducing infections and illness amongst them and that DACA officials provided regular support for them whenever there was need. One of the respondents had this to say, *"There's improvement because some of us didn't know that our local food is good and nutritious to the body. The workshop opened our eyes and we are now making proper use of our local foods like vegetables and this has greatly improved the health condition and immunity of our members".*

D. HEALTH PROBLEM/CHALLENGES THAT AFFECT PLWHAs

People living with HIV/AIDS (PLWHAs) reported their most health problems to be tuberculosis, malaria and hunger typically because they manage to feed *"from hand to mouth"*. The most common being malaria and typhoid because it affected their viral load count.

Another challenge was the drug regimen. They said it was very strict to adhere to and most of the time, they had issues with *drug adherence because it's not easy and the body reacts to the drugs***.** A respondent further explained on the drug issue that sometimes *drug reaction occurs,* and most of their *doctors don't have adequate knowledge of the drug been prescribed to them,* they don't know *how to counsel patients* on how to use the drugs, possible reactions or interactions as regards to the

drugs. And when it occurs the pharmacist/doctors don't give them audience/listen to them when they complained. Instead, they prescribed another drug for them.

A respondent had this to say: "*For instance, during my own case, I had rashes all over my body (lips, necks and rest of the body) as a result of the drugs I used and when I complained at the hospital, they just told me to take vitamin C. How will vitamin C take care of my issue"?*

According to the leader of the Catholic Relief Service group, *"the most common sicknesses among PLWHAs were malaria, rashes and recurrent fever and cough and clinics like St Gerald hospital takes care of them".* Another respondent from St. Matthews and St. Michael, Kazawa, reported that episodes of *malaria and diarrhoea* occurred often among her support group members.

In summary, PLWHAs are prone to sicknesses like malaria, typhoid, diarrhoea, fever, cough and rashes (as result of drug interaction) which affect their viral load count. Also, response to treatment from health professionals was inadequate especially from doctors with poor skills in management and treatment of HIV patients. To cap it up, PLWHAs solicited for medical practitioners with experience in counselling and treatment of HIV positive patients and provision of free drugs to them with ease and not having to struggle or go through stress before getting the drugs at hospitals.

E. CRUCIAL/PERTINENT NEEDS OF HIV/AIDS PATIENTS

Needs and wants are very essential to man's existence and keep changing overtime. PLWHAs reported that their crucial needs were *food, nutrition and empowerment programme* followed by counselling. Although they often received free drugs (ARV) from designated health centres, sometimes, when they complained of headaches at the hospital, the doctors usually asked them to buy the drugs outside. However, their priority is *food and good nutrition, not drug.*

They required that government should provide them educational support to enable their children acquire basic education. They all said that they were being stigmatised and this caused them pain and emotional distress, even at the hospital, they lament on the poor treatment they received from health workers. *"It takes time for us to get free drugs at hospital and even the drugs and supplies were often not enough to reach all of us",* a respondent lamented. "*Therefore, we need to be part of the team*

responsible for taking care of PLWHAs so that we can monitor whatever the government gives us", they submit.

However, the uttermost need of PLWHAs was empowerment such as *jobs and skills acquisition* that can make them *generate income* to cater for their own needs. They requested that to be part of the staff of Federal and State parastatals, *skills acquisition, support and employment would enable them to generate personal income* without depending on a group of donors or an individual. According to the support group caring for PLWHAs, the people needed more of assistance like good food, money, jobs, and community health programmes. Also, there was need for a media *enlightenment programme* to educate the general population on the issues/problem facing PLWHAs in the country. Likewise, they pleaded that donor agencies should come to their aid especially in the area of empowerment and job placement so that they can live up to their responsibilities without begging for food or money from people.

F. SUPPORT GROUPS

1. Activities at Various Support Groups among PLWHAs in Kaduna State

PLWHAs who were members of St. Matthew support group, Lights of Hope support group, Youth Initiative group, Alaweda support, Life and Hope Foundation, Faith Commission etc. all reported that at their various meetings, they discuss issues bothering them such as health, nutrition, love life, and others. They encouraged each other, paid visits to their members and distributed gifts when a member gave birth. They also paid condolence visits when a member die. They participated in exercise to keep fit physically and trained each other.

2. PLWHAs Nutritional Status Assessment in Various Support Groups

The Catholic Relief Services said they can rate the access to food/nutrition and health services of PLWHAs as 50% and 95% respectively effective. Tools for assessment of PLWHAs used in the centres are questionnaire, digital count result and clerking method. According to them, these tools showed if someone was on good nutrition or not. Weight and height were used for children assessment.

4.8 DISCUSSION

Assessing the food system, nutritional status and safety nets of people living with HIV/AIDS patient is crucial to the management of HIV/AIDS pandemic. There was a preponderance of female respondents over male in this study. In Sub-Saharan Africa, according to the Joint United Nations Program on HIV/AIDS report (2019), women are infected with the virus at a higher rate than men. Majority of the virus-infected respondents were in their financially active and productive years, according to the findings of this study. This matches recent research by Gedle *et al* (2015) and Mitiku *et al* (2016), which found that HIV/AIDS affects the most engaged and productive members of rural communities. Majority of PLWHA are married, according to the findings of this study. Similarly, Feleke, Yemanebrhane and Gebretsadik (2017) revealed that there were more married people who were infected than singles.

On the contrary, Singles were more infected than married people, according to studies by Ofonime (2012) in Cross Rivers State and Nwugo and Abiodun (2017) in Imo State. In this study, a substantial percentage of respondents were from households with 5-8 individuals. Because the household is quite large, there may be challenges of food availability which leads to decrease in food intake, and malnutrition over time. Similarly, Nwugo and Abiodun (2017) found that the typical household size for most families is between 5-8 people.

OND was the highest educational level reached by the majority of the respondents. Various surveys show that the majority of rural people have at least a high school education (Mofolorusho, Fatiregun and Osagbemi (2013); Feleke, Yemanebrhane and Gebretsadik (2017)). Education is vital for information dissemination. Hence, knowledge on the implication of adequate nutrition in the management of the diseases is expected to be high. The occupations of the respondents in this study were mostly trading and only a few were into agriculture practice (farming and livestock rearing). Consistent with this finding is a study conducted in Uganda by Suubi (2009) where most affected families falls within ages 21-30 years and as such agricultural practices is hampered due to loss of active household members. This may be due to lack of physical ability to undergo strenuous activities arising from the ailment, lack of resources (Marlink *et al*., 2008; Jian, 2008) and stigmatization.

Moreover, the fact that majority of the respondents lived in rented apartment also restricted their involvement in agricultural practices, hence, leading to poor practices as observed in this study. However, study's results is in sharp contrast with report by Poudel *et al* (2017) where majority of the study participants practiced agriculture as their main occupation. Most of the respondents in this study earn below 5,000 naira per month. This probably would affect the amount spent on food. A larger percentage of respondents in this research spent more than half of their income on food. Sholeye, Animasahun, and Salako (2017) observed similar findings for households in Southwest Nigeria, where almost half of PLHIV spent between half and three quarters of their household income on food. Studies by Agatha *et al* (2010) and Kibret (2018), on the other hand, found that impacted households spent a lesser proportion of their income on food. This shows that health spending erodes food spending, especially in low-income households with limited resources. Malnutrition was less common than over-nutrition in this study. Majority of the respondents, however, had a normal BMI. Interestingly, Nakakawa *et al* (2020) found a substantial number of PLHIV with normal BMI in a research conducted in Uganda. Benzekri *et al*. (2015), on the contrary, found a significant proportion of malnourished HIV/AIDS patients. In comparison to other studies (Andrade *et al*., 2012; Ritte & Kessy, 2014; Gedle *et al*., 2015; Takarinda *et al*., 2017) and in Nigeria, the prevalence of malnutrition in our study was comparatively low (Folasire, Folasire & Sanusi, 2015). The disparities in malnutrition prevalence observed across the country may reflect the occurrence of distinct socioeconomic patterns, reflected by the various ethnic groups. Furthermore, this current study revealed that more females were underweight. This finding is in agreement with Friis (2005) who opined that women are more biologically, socially and emotionally vulnerable to malnutrition.

Coronavirus (COVID-19) outbreak has led to disruption of food systems of PLHIV with consequence on their food and nutrition security (FAO, 2020). Diets affected by poor food systems (food availability, food accessibility and food affordability) results in a more severe form of malnutrition (Turner *et al*., 2018). The impact of this pandemic (COVID-19) is being felt as a result of high food prices, less purchasing power, poor access to food items, all of which affects the food and nutrition security of PLHIV (IFPRI, 2020). A report by the Global Alliance for Improved Nutrition revealed that practically all food items in Nigeria have increased in price.

Availability of nutrient-dense foods, as well as fortified food products is affected as manufacturers find it more difficult to produce foods in bulk and unable to move products from factories (GAIN, 2020). Quality diet is a means to achieving good nutritional status, and it is achieved by consuming foods from various food groups while taking individual nutrient requirements into account.

However, an inadequate intake of energy, protein, iron, zinc and vitamin C was observed. The findings of this study are congruent with those of Onyango *et al* (2012), who revealed reduced calorie and other nutrient intake among HIV+ patients in Kenya. This could be because they eat a lot of carbohydrate-rich foods like grains and tubers, which contain very little of these nutrients (Sanusi, 2010). The lack of protein consumption seen in this study could be linked to their financial situation. Furthermore, male respondents had a higher nutrient intake than females except for folate, Vitamin B12 and zinc. This supports a study conducted in Tanzania by Kinabo *et al* (2016) and contrasts with studies conducted by Onyango *et al* (2012), which found that more females had higher intake of most nutrients than males.

Generally, no single meal includes all of the essential nutrients; a varied diet is required to achieve a well-balanced diet. This means that diverse diets are expected to provide dietary adequacy, and that people who diversity their meals are more likely to be healthy. Large proportion of respondents across all age groups in this present study consumed foods from majorly cereals, tubers/roots, vegetables and fats and oil. Previous research in Tanzania (Kinabo *et al*., 2016), Nigeria (Nwugo and Abiodun, 2017), and Ethiopia (Kinabo *et al*., 2017) found similar results (Jebessa *et al*., 2019). Micronutrients are often deficient in starchy staple diets, hence dietary diversification is suggested to ensure that the body receives the necessary micronutrients (Jayawardena *et al*., 2013). Protein-based foods have a low consumption rate, which could be due to their high cost (Cornelsen *et al*., 2016; Wong *et al*., 2018).

Dietary diversity is a qualitative assessment of a person's food consumption that indicates their access to a wide range of foods and may also be used as a proxy for nutrient adequacy (Ruel, 2003; Swindale & Bilinsky, 2006; Faber, Schwabe & Drimie, 2009). COVID-19 has major health and dietary consequences for HIV/AIDS patients. The COVID-19 pandemic has restricted PLHIV access to a diverse diet as a result of increases in food prices, disruptions in food supply, poor purchasing power, and job loss, among other factors (IFPRI, 2020; GAIN, 2020). Most study's respondent had

MDDS, implying that the diets of majority of households were consumed from 4-5 food groups. This study revealed a lesser percentage of respondents with low dietary diversity when compared to reports from a study in Ethiopia (Tiyou *et al*., 2012). Kinabo *et al*. (2016) in Tanzania and Kinabo *et al*. (2016) in Ethiopia (Weldegebreal *et al*., 2018) found similar results, and contrary to a study conducted in Nigeria, where a large population had low dietary diversity (Nwugo and Abiodun, 2017).

The majority of respondents who spent more than half of their money on food had both HDDS and MDDS, according to this study. A study by Nakakawa *et al* (2020) found a high DDS in places with the largest percentage of income spent on food, which was in line with this finding. In this study, low prevalence of malnutrition among PLHIV was found to be linked to a high dietary diversity score. Furthermore, a strong link between wealth and dietary diversification was discovered in this study. This finding backed up Tefera's research (2014) and Taye's research (2019).

Food commonly produced by study participants are majorly cereals. The findings corroborate with that of Kinabo *et al* (2016) where cereals were part of the commonly produced crops. A lesser proportion of study participants produce vegetables. Pienaar and colleagues found similar results (2017). Consumption of fruits and vegetables was also reported by the respondents in this survey. On average, a substantial percentage of respondents ate vegetables 1-2 times per week and staples on a daily basis. A similar pattern was observed in a study in which almost 70% of the population assessed consumed vegetables, but the frequency of intake was unsatisfactory (Kinabo *et al*., 2016). This study found a low frequency of fruit consumption, which was ascribed to traditional eating habits in which many households do not consider fruits to be part of the meal. Among the list of fruits consumed, oranges were the most commonly consumed fruits while apples were on the list of consumed fruits.

Similarly, a study that assessed food consumption pattern and nutritional status of PLHIV in Cross River state showed that orange was one of the most consumed fruits while apple was among the least consumed fruits (Mgbekem *et al*., 2015). This perhaps might be due to seasonal variation of fruits as well as the price of fruits. More so, majority of the study participants consumed foods they did not produce. This could be attributed to their less involvement in agricultural practices.

Food access, defined as the ability to buy/secure foods at any given time, does not guarantee that recommended foods will be consumed (Masa & Chowa, 2018). When considering an individual's nutrient requirements in a family, both amount and quality of food are equally significant. HIV/AIDS affects households' ability to obtain food in the quantities and quality essential for a healthy lifestyle (Muller, 2004). The majority of the study participants bought their food from the market, albeit most of them had difficulty getting to the market due to financial restrictions (lack of money) and poor health.

In this study, majority of the respondents encountered difficulties in accessing foods. This poor access to food is attributed to poor level of income, high rate of joblessness and high prices placed on food commodities. Periods of hunger was experienced by majority of the respondent. Piennar *et al*. (2017) also found that the surveyed participants had experienced periods of food scarcity and hunger. Also, it was observed that more females than male experience the lean/hunger season. This finding backs up the reality that women have a harder time getting access to resources like land, loans, and agricultural commodities than men (FAO, 2010). Females, in particular, are less likely to be employed and, as a result, do not have the financial means to purchase food.

Coping strategies reported in this study were reduced food frequency, buying of less expensive foods, buying of foods on credit, borrowing of money and reduced food intake. Among the aforementioned, reduced food frequency was mostly practiced by the study participants. Several studies reported similar coping strategies (selling personal assets, skipping meals, and parents depriving themselves to feed children, reduction in portion sizes of food, borrowing money or food from families, neighbours or relatives) among PLHIV (Habicht, & Beaudry, 1999; Hamelin *et al*., 1999; Pienaar *et al*., 2017).

Frequency of meal consumption in this study, majority of the respondents consumed food three times daily. Consistent with the study's findings are surveys carried out in Ethiopia which found that majority of the study participants consume food three times daily (Weldegebreal *et al*., 2018) and in contrast to a study in Uganda (Bukusuba *et al*., 2010) where a lesser proportion of surveyed population consumed three or more meals per day.

Meal skipping, especially lunch was a common practice by most respondents as opposed to the observation made by Weldegebreal *et al* (2018) where lunch meal was majorly observed by the respondents. It was also observed in this study that more males than females consumed food thrice daily. In this study, a substantial percentage of respondents said they do not smoke nor drink alcohol. This study's findings are similar to those of Taye *et al* (2019), who found that PLHIV have low levels of smoking and alcohol usage. HIV/AIDS affected the dietary pattern of most of the respondents in this study. This may be attributed to opportunistic infections and antiretroviral treatment.

The CD4 cell count is a reliable predictor of HIV disease progression and the key hematologic measure of how well the immune system is operating (Paton *et al*., 2006). The loss of immune system response to any infections results from the progressive atrophy of CD4 cells, and the virus develops to a final stage of AIDS, which could result in death if not appropriately handled (Venter, Gericke & Bekker, 2009). Lesser proportion of the respondents in this study had a high CD4 cell count (500cells/µl). This agrees with Mitiku *et al* (2016) and Thapa *et al* (2015) research in Northwest Ethiopia and Nepal but differs from that of Gedle *et al* (2015)'s study in Southern Ethiopia, which found 72% of surveyed populations had CD4 cell counts equal to or over 500cell/µl. No significant relationship was observed in this study between BMI and CD4 cell count. However, multiple studies have found a link between CD4 cell count and respondents' BMI (Cornell *et al*., 2012; Takarinda *et al*., 2017).

Respondents with a low mean nutrient consumption (energy, protein, iron, fat, and Vitamin C) had a low CD4 cell count (200cell/µl), whereas those with a high mean nutrient intake (energy, protein, iron, fat, and vitamin C) had a high CD4 cell count (500cell/µl). This finding corresponds with the known fact that adequate nutrient intake is necessary for the improvement of CD4 cell (Castleman, Seumo-Fosso & Cogill, 2003).

HIV/AIDS support groups provide platforms for implementing targeted nutrition programs and suggested practices to improve people's quality of life (Gillett & Parr, 2011; Kim *et al*., 2012). The majority of respondents were aware of support systems and were members of some support groups. Majority of the respondents that received financial, medical, food and nutrition aid as well as psychosocial and

counselling support had normal BMI. More so, all the respondents that received financial aid, food and nutrition as well as micronutrient supplement had high dietary diversity score which is a predictor for diet quality.

Cash distribution or food vouchers, according to the Food and Agricultural Organization (2011), offer beneficiaries with additional resources to purchase food and other products, perhaps contributes to optimal caloric intake and diet quality. Some of the activities of support groups reported in this study were counselling and encouragement; treatment of opportunistic infections; food and nutrition aid, drug aid and prayer support. The most widely engaged activity was counselling and encouragement. These activities are essential for the management and retrogression of the virus.

According to the findings of this study, the majority of PLHIV support groups founded in Kaduna state were faith-based. According to Piennar *et al*. (2017), the social and moral support offered by church engagement has the ability to help PLHIV with both their physical (food aid) and emotional needs. Large proportion of respondents in this study rated the impact of the support groups to be moderate. Moses *et al* (2015) found that support groups have a fair influence on mortality, morbidity, retention in care, and quality of life, but a poor impact on HIV transmission.

Needs are very essential to man's existence and keep changing overtime. Some of the major needs of PLHIV in this present study were food and nutrition and empowerment programme (skill acquisition). Food is important because the ART drug requires food intake while empowerment programme provides PLHIV the necessary skills to generate income in order to cater for themselves. According to Moradi *et al* (2014) and Mitiku *et al* (2016), the studied population complains about a lack of nutritional support, which is a critical necessity. NGOs (DACA and CRS) provided monthly food assistance to those living with HIV/AIDS. Majority of the respondents in this study reported little or no support received from family members. This is in agreement with a study that reported poor social and emotional support received from family members (Massaoudi & Farhadi, 2005) which often times could lead to depression (Murphy, 2002). Majority of the respondents who received one form of support or the other had a normal BMI while all the respondents that received food and nutrition support had HDDS.

Stigmatization is a set of negative beliefs that a society or group of people have about something e.g., HIV/AIDS. Stigmatization/discrimination arises from and strengthens unsatisfactory social relationships (Minke *et al*., 2006). Majority in this study experienced one form of stigmatization or the other from the public. This restricted their involvement in farming activities for commercial purpose, reduced their physical and mental productivity in the communities. Also, these denied them access to basic necessities of life and opportunities to earn income. According to Moradi *et al*. (2014), stigma causes disparities in HIV/AIDS patients' ability to access and acquire various levels of health services.

Some of the health challenges encountered by respondents in this study were tuberculosis, malaria, rashes, recurrent fever, cough and diarrhoea. These illness impacts on the viral load counts and adherence to ART negatively. Drug regimen was also observed to be a challenge among respondents in this study.

Adequate knowledge on the relationship between food, nutrition and drugs was observed among respondents. They were all of the opinion that food is important to their existence and management of HIV/AIDS. Study report by Anand and Puri (2013) revealed that nutritional knowledge among PLHIV was moderate. Furthermore, majority who practiced good nutrition made positive advancement in their health.

4.9 Test of Hypotheses

Hypothesis 1

A demographic characteristic does not have significant association with the nutritional status of PLWHA and food system. This hypothesis was tested using chi-square. The analysis indicated a significant ($p<0.05$) association between age of respondent and BMI. The income of PLWHA does not have significant ($p>0.05$) association with BMI.

The null hypothesis is therefore accepted.

Hypothesis 2

The dietary intake of PLWHA does not have significant association with the nutritional status. This hypothesis was tested using chi-square. The analysis revealed

that a significant ($p<00.5$) association was found between dietary intake and BMI. There the null hypothesis is rejected while the alternative is accepted.

Hypothesis 3

Available and accessible safety nets do not have significant association with nutritional status of PLWHA. The hypothesis was tested using chi-square. The analysis indicated that no significant ($p>0.05$) association was observed between safety nets with BMI and dietary diversity score of PLWHA. Therefore, the null hypothesis is accepted while the alternative hypothesis is rejected.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

HIV/AIDS has become increasingly linked to malnutrition and household food insecurity, necessitating the inclusion of food and livelihood security as a critical component of HIV/AIDS prevention. However, these mechanisms are being weakened following dwindling resources among other factors. Data on food systems, existing nutrition status, and/or appropriateness of HIV/AIDS patients' diets is crucial in identifying risk factors for developing nutritional problems and provide evidence for designing nutritional care and support interventions. Hence this study was designed to assess food system, safety nets and nutritional status of PLWHA in Kaduna State, Nigeria.

This descriptive cross-sectional and mixed-methods approach involved samplings of 532 PLWHA across 14 support groups in the city of Kaduna. Three key informant interviews and focus group discussion sessions were conducted among support group leaders and male/female members, respectively using structured guides. Structured Interviewer-administered questionnaire was used to gather information on demographic characteristics, CD4 cell count, safety net types, food systems and dietary intake of people living with HIV/AIDS. Respondents' anthropometric measurements were assessed to determine the BMI and categorised using WHO standards. A 24-hour dietary recall was conducted to assess dietary intake and analysed using adapted Total Dietary Assessment (TDA) software and dietary diversity according to the FAO standard. Qualitative data were analysed thematically. Quantitative data were analysed using descriptive statistics, and Chi-square tests at $\alpha_{0.05}$.

Respondents' mean age was 38.1±9.7 years, 78.0% were females and 44.9% were married. About 20.0%, 25.0% and 55.0% had CD4 cell count (cells/µl) of ≥500, 200-499 and <200, respectively. There was decreasing participation of PLWHA in food production following poor productive capacity. Respondents showed understanding of the link between nutrition and treatment outcomes and acknowledged that poor income was a constraint to food access. Safety net types included counselling (39.2%), treatment for opportunistic infections (27.5%), food and nutrition aid (15.7%), prayer (15.7%), and drug aid (1.9%). Majorly produced staple was cereals

(93.7%) while 40.3% raised livestock/poultry. More than half (58.1%) of the respondents experienced hindrances to market access. Rice (71.0%), beans (61.3%) and maize (50.0%); orange (61.3%), banana (25.8%) and watermelon (24.2%); and pumpkin leaves (*ugwu*) (41.9%) and okro (9.7%) constituted the widely consumed staples, fruits, and leafy vegetables. Intakes of energy, protein, vitamin A, zinc and iron intake were 1065.1±148.1Kcal, 50.3±42.7g, 10491.5±1510.6mcg, 6.7±6.1mg and 8.9±7.5mg, respectively. Mean dietary diversity was 4.8±1.12, reflecting a poor-quality diet. Prevalence of underweight, overweight and obesity was 5.1%, 28.9% and 12.4%, respectively. Body Mass Index was significantly associated with age, dietary diversity, income, and intakes of energy, protein and zinc. Amidst respondents with normal BMI, 80.0% had received financial empowerment, 64.5% received counselling/psychosocial support and 63.6% had food support.

Food and nutrition support impacted positively on the dietary diversity score of PLWHA. To reduce the impact of HIV/AIDS on PLWHA, proper evidence-based food and nutrition interventions, as well as empowerment programs, are critical.

5.2 Conclusion

Overweight and Obesity are emerging public health problems amidst PLHIV/AIDS. Respondents' occupation and level of income did not have significant relationship with BMI. Greater percentage of respondents had an inadequate nutrient intake apart from Vitamin A. Respondents' BMI was significantly associated with nutrient adequacy. Mean nutrient intake was observed to be higher in males than females except for folate, vitamin B_{12} and zinc. Low iron intake in women's diets was a cause for concern, as it puts them at risk of iron deficiency anaemia, which is difficult to manage in the context of HIV. More so, a large percentage of respondents consume foods thrice daily.

Poor dietary diversity was observed among the PLWHAs. Dietary diversity is therefore a key concept that should be promoted in the management of HIV/AIDS. More than half of the respondents experienced change in dietary pattern after being infected with the virus. Half of the respondents did not produce foods to consume. Poor involvement in food production among PLWHA was as a result of illness, stigmatization and poor access to farm inputs. Common staples produced by respondents were majorly cereals and roots/tubers. This reflected in the type of food

consumed as majority consumed cereals (especially rice). And majority experienced hunger seasons. The major coping strategies exploited by the respondents were reduced food frequency and buying of less expensive foods. In addition, more than half of the respondents said they had difficulty getting meals, with financial constraints being one of the key contributors.

Quite a large number of respondents had a low CD4 cell count. More females than males had a higher CD4 cell count. Dietary diversity score, BMI, and CD4 cell count were found to have no significant association. The association between mean nutritional consumption and CD4 cell count, on the other hand, was found to be significant.

This study highlighted the fact that a number of established support groups across the city of Kaduna, most of them faith-based, were known to be strong social safety networks for PLHIV, offering hope, and other forms of support to the subjects. Most respondents in this study belong to one form of support group. Benefits obtained from support group were observed as insufficient by a large proportion. Financial empowerment was rated as the least activity by which respondents' benefit from. The safety network of respondents had no significant relationship with their dietary variety score.

The major needs of PLHIV were food and nutrition and empowerment programme. Food and nutrition support impacted positively on the dietary diversity score of PLHA. To reduce the impact of HIV/AIDS on PLHA, proper evidence-based food and nutrition interventions, as well as empowerment programs, are critical.

5.3 RECOMMENDATIONS

5.3.1 Recommendations for Programme

- Innovative nutrition intervention designs (products and services) by the nutrition community (scientists, field program experts, product developers etc.) should be advanced to address food access challenges, encourage dietary diversification and consumption of locally available micronutrient-rich food sources among others. This will serve to promote good nutrition and health outcomes for people living with HIV/AIDS in Nigeria.

- Relevant government agencies and institutions need to focus high impact investments of farm inputs, machinery, knowledge and skills in agronomic and livestock sciences to cooperatives of people living with HIV/AIDS to promote sustainable agriculture and strengthen resilience of PLHA. This will impact the food systems of PLHA and thus contribute to food and nutrition security at the household and community levels. Moreover, food production and marketing by this vulnerable group will help generate income and thus strengthen their productive and economic viability.
- More targeted media enlightenment programmes are needed to address the continuing challenge of discrimination and stigmatization and as well as to promote measures for stopping new HIV infections.
- New nutrition marketing and communication innovations are needed to leverage high impact communication tools and channels, such as social media, mobile communication platforms etc. to positively shape healthy food values, choices and lifestyle for the Nigerian population, especially for PLWHA.

5.3.2 Recommendation for Policy

- Given the no-mention of the need to promote food and nutrition interventions for vulnerable population groups such as people living with HIV/AIDS as part of the strategic interventions of the National HIV and AIDS Strategic Plan of 2017-2021, the nutrition community need to intensely advocate for a review of all current national policy and plans to include addressing the food systems, food and nutrition security of vulnerable groups like people living with HIV/AIDS.
- Against the backdrop of the continuing stigmatization and discrimination against people living with HIV/AIDS, there need to be a review and strengthening of current policies and/or laws to address continued stigmatization/discrimination of PLWHA in the community, workplaces and hospitals as this will be crucial for creating a supportive environment for HIV+ individuals to work, generate income and feel included in the Nigerian society.
- Given the poor consumption of micronutrient rich local food sources, there is need for a radical national promotion of dietary diversification with special focus on locally available, easy-to-access micronutrient rich foods for vulnerable population groups of people living with HIV/AIDS.

- The Nigerian nutrition community, including the Nutrition Society of Nigeria should assist to champion advocacy for a policy establish the State of Food and Nutrition Situation of PLHWA in Nigeria and this could be implemented bi-annually by Government with support from its Development partners.
- Government of Nigeria should adopt a policy framework that is primed for addressing the needs of vulnerable population groups like people living with HIV/AIDS during and post COVID-19 pandemic.

5.4 Contributions to Knowledge

The findings of this study can be used to inform policies, programs, and research aimed at improving and maintaining the nutritional status and food systems of vulnerable populations, including HIV-positive people. Some of the findings include:

1. The majority of HIV/AIDS afflicted respondents were females, indicating a threat to food systems and inadequate nutrient intake by families, according to the findings of this study. Affected households primarily consisted of people aged 21 to 30 years, and as a result, agricultural activities have been affected as a result of the loss of active household members.
2. Large proportions of HIV-positive persons' diets were deficient in macronutrients and micronutrients, affecting their nutritional and health status. More so the financial capacity of PLHIV impacts negatively their nutrient adequacy level.
3. Key practices critical to addressing food and nutritional challenge of PLHIV that deserves utmost attention includes good dietary diversity, knowledge of farming and livestock rearing practices alongside proper orientation through various support groups.
4. A major challenge encountered by PLHIV/AIDS is lack of fund to purchase adequate food to cater for their nutritional needs and build their immune system. Also earning an income was quite difficult for PLHIV due to the high level of stigmatization/discrimination.
5. Sustainable food systems in terms of food accessibility and affordability have been identified in this study as one of the major drivers of diversified diets, optimal nutritional and health status of HIV/AIDS positive individuals.

5.5 Suggestions for Future Research

- More periodic action research is required to provide better understanding of how HIV/AIDS, is further disrupting food systems, food and nutrition security of PLWHA. This is important for policy and resilience strengthening of sustainable food systems of PLWHA.
- Longitudinal surveys directed at better understanding the long-term impact of food systems disruption and food security impact of the triple crises of HIV, COVID-19 pandemic and climate change across the population is important for public health planning, research, policy and programmes.
- The growing interest and increasing evidence of the health impact of climate change, also highlights the need to start studying the intersectionality of nutrition and climate change across the population, with sections focused on vulnerable groups (e.g. PLWHA). This important for mitigation and adaption policies and investments.

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APPENDIX 1

ASSESSMENT OF FOOD SYSTEMS, NUTRITIONAL STATUS AND SAFETY-NETS OF PEOPLE LIVING WITH HIV/AIDS IN KADUNA STATE

This study will enable us gain practical insights into the situation of PLWHAs and can provide information to propel policy makers, Government and other stakeholders to undertake interventions to mitigate HIV/AIDS impact in Nigeria. Your responses will be appreciated and will be treated with utmost confidentiality.

Thank you.

Questionnaire No: **Name of Support Group:**

Date of Interview: **Place of Interview:**

Time of interview: **Name of Interviewer:**

SECTION I: DEMOGRAPHIC CHARACTERISTICS

1. Total number of people in your household…….

a. Number of Male(s) [ ] Female(s) [ ]

Age	No of Males	No of Females	Number Infected (if you know)	
			Males	Females
0-4				
5-17				
18-35				
36-45				
45 and above				

b. Sex of Respondent: Male [ ]Female [ ] c. Age in years……

d. Marital Status: Married [ ] Single [ ] Divorced [ ] Separated [ ]

Widow/widower [ ] Single parent [ ]

e. Type of Household: Monogamous [ ] polygamous [ ]

f. Sex of Household Head: Male [ ] Female [ ]

g. Are you the Household Head: Yes [ ] No [ ]

h. Highest Educational qualification: No formal education [ ] Primary sch. [ ]

Modern Sch. [ ] Secondary Sch. [ ] OND [ ] HND [ ] B.Sc [ ]

SECTION 2: SOCIOECONOMICS CHARACTERISTICS

Sn	**Characteristics**	**Options**	**Code (Enter code)**
1	Primary or main occupation of the Household head	Farming/Fishing (1) Trading (2) Civil servants (3) Crafts/Artisans (4) Private salaried (5) No Job/Applicant (6) Others (specify) (9)	
2	What is your major source of energy For cooking	Kerosene (1) Charcoal (2) Sawdust stove (3) Gas cooker (4) Firewood (5) Electricity (6)	
3	What is your major source of water For drinking and cooking	Public tap/pipe Borne water (1) Well (2) Borehole (3) River/Streams/Lake (4) Rainwater (5)	
4	Type of water treatment before use	Add Alum (1) Boil (2)	

		Chemical (e.g. Water Guard) (3) No Treatment (4) Other (specify) (9)		
5	Method of Refuse Disposal	Bush and Rivers (1) Refuse Dumps (2) City Service (3) Other (specify) (9)		
6	House Ownership and Type	Owner (1) Rented (2) Family House (3) Other (9)	Self-contained (1) Rooming (face-to Face) (2) Flat (3) Others (9)	
7	Level of Income per month	Less than N5,000 (1) N5,000-N10,000 (2) N11,000-N15,000 (3) N16,000-N20,000 (4) N21,000-N25,000 (5) N26,000-N30,000 (6) N31,000-N35,000 (7) N36, 000 and above (8) No income (9)		
8	What percentage of your total household income is spent on food every	Less than 10% (1) 10% -20% (2) 21%- 30% (3) 31%- 40% (4) 41%-50% (5)		

		51%-60% (6) More than 60% (7) Others (specify) (9)	

SECTION 3: HEALTH AND HYGIENE PRACTICES

Sn	Characteristics	Options	Code
1a	Where do you seek health Services	General Hospital (1) Private clinic (2) Home/self-treatment (3) Others (specify) (9)	
1b	Who pays for the treatment?	Myself (1) Husband/wife (2) Children/Family members (3) Friends (4) Others (5)	
2	Any health problem in the last two Weeks (disease or any infections)	Yes (1) No (2)	
3	If yes, what are they?	Malaria (1) Diarrhoea (2)s Sore mouth/ throat (3) Tuberculosis (4) Other infections (specify) (9)	
4	How many loose or watery/mucoid stools have you had in the last 24 hours?	1 stool (1) 2 stools (2) 3 stools (3) More than 3 (4)	

		None (9)	
5	Have you experienced any of these clinical signs in the last 2 weeks (tick) ● Diarrhea and vomiting ( ) ● Fever (temperature) ( ) ● Mouth and throat sores ( ) ● Oral thrush ( ) ● Muscle wasting ( ) ● Fatigue and lethargy ( ) ● Skin rashes ( ) ● Edema ( ) ● Pallor (palm or eye) ( ) ● Other		
6	Do you boil your water for drinking?	Yes (1) No (2)	
7	If yes, how often	Every time (1) Sometimes (2) When asked to (3) Others (specify) (9)	
8	If no, why don't you boil water?	No enough fuel/energy (1) Since I drink unboiled water outside (2) Don't have the strength (3) Others (specify) (9)	
9	Location of toilet	Inside the house (1) Outside the house (2) A distance away (3) No toilet (4)	
10	How do you preserve food you are not eating immediately	In the open (without covers) (1) In the open (but covered) (2)	

		Cupboard (3) Warm it and keep (4) Fridge/Freezer (5) Others (specify) (9)	
11	How often do you wash your hands in a day	More than 7 times/day (1) 5-7 times/day (2) 3-5 times/day (3) 1-3 times/day (4) Don't remember to wash (5) Others (specify) (9)	

SECTION 4: TWENTY FOUR-HOUR DIETARY RECALL

I would like you to tell me everything you ate and drank (foods and fluids) from the time you woke up yesterday till this morning, including what you ate and drank at home and away.

Item No (a)	Food/Drink Addition (b)	Description of food or Drink (use volume, size or price) (c)	Place taken (d)	Time (e)	Amount (how much did you actually eat or drink?) (f)	Wt. equiv. (g)

1. Was food intake usual? Y ( ) N ( ) 1b. If no how was it unusual?.....

1c. Are you using supplements/ medications? Yes/No 2. Was it a feast day Y ( ) N ( )

3. was there sickness (Y/N), if yes: what kind of sickness/illness……
……

4. Did sickness affect appetite (decrease or increase)?

SECTION 5: FOOD SYSTEMS ANALYSIS

FOOD PRODUCTION

1. What staple food crops are produced in this area? (a) Cereals [ ], (b) Roots [ ], (c) Tubers [ ]

1b. Do you produce any food by farming Y ( ) N ( )

2. What proportion of the food crops consumed is produced? (a) All [ ], (b) Most [ ],

(c)About half [ ], (d) less than a quarter [ ], (e) None [ ].

3. What fruits and vegetable do you produce (grow?)

4. What fruits and vegetable do you purchase from the market?.....

5. Are fruits and vegetables available throughout the year? Yes [ ], No [ ].

5b. Do you have any vegetable garden in your house? Yes [ ], No [ ]

5c. If no, why…….

……

6. What livestock do you keep? (a) Goat [ ], (b) Sheep [ ], (c) Goat and Sheep [ ], (d) Chicken [ ], (e) others (specify)…….

7. What are the limitations to food production in this area? (a) Weather [ ], (b) Water [ ] (c) Access to land [ ], (d) Labour [ ], (e) Fertilizer [ ], (f) processing and preparation [ ] (g) Finance [ ], (h) Others (specify)

8. Is there a lean period or hungry season? Yes [ ], No [ ]. When is this [i.e. month(s)?]

9. How do people cope with food scarcity? (a) Borrow Foodstuffs [ ], (b) Barter (exchange for food)[ ] (c) Buy food on credit [ ], (d) Borrow money [ ], (e) Reduce number of meals eaten per day [ ] (f) Reduce the portion/amount of food eaten [ ], (g) Buy less expensive foods [ ],

(h) others (specify)……

FOOD MARKETING/ACCESS

10. Where do you purchase your food from? (a) Markets [ ], (b) Roadside [ ], (c) Retail stores [ ] (d) Farms [ ], (e) others (specify).

11. How far are the markets from your house? (Specify distance)

12. Do you have any problem(s) going to these markets of buying foods? Yes [ ], No [ ]

13. What are the problems you encounter in going to buy food?……...

……

14. Are there special markets for staple foods (cereal, tubers, roots etc)? Yes [ ], No [ ].

15. Are there special markets for fruits and vegetables? Yes [ ], No [ ].

16. List the varieties of foods sold in the market…….

…….

17. What time intervals do these markets hold? (a) Daily [ ], (b) Weekly [ ], (c) twice weekly [ ] (d)Once-a week [ ], Monthly [ ].

18. What are the market prices of some of your food items? Name as many and put the price……..

…….

……..

FOOD CONSUMPTION PATTERNS

19. What are the common staples you consume?.....

……

20. How often do you eat these staples? (a) Daily [ ], (b) 5-6 times weekly [ ]

(c) 3-4 times weekly [ ], (d) 1-2 times weekly [ ], (e) Monthly[ ], (f) others (specify).

21. What type of food do you normally take during these meals?

(a) Breakfast ……..
(b) Lunch…….
(c) Dinner……

22. Do you eat alone most of the times? Yes [ ] No [ ]

23. Who do you eat with…….

24. When did you become infected…….

25. Has your dietary pattern changed since then? Yes [ ] No [ ], If Yes, how …….

……

26. How many times do you eat in a day? (a) Once [ ], (b) Twice [ ], (c) Thrice [ ]

(d) Four times [ ], (e) more than four times [ ].

27. Who cooks/prepares the food?.....

28. Do you like the taste of the foods you eat? Yes [ ], No [ ].

29. Do you also buy food to eat from outside (street)? Yes [ ], No [ ].

30a. Are there foods forbidden for you to eat? Yes [ ] No [ ].If Yes, what foods ……

……...

30b. What are reasons?.....

31. Are there meals you skip? Yes [ ] No [ ]. If Yes, which meal and why……

…….

32. Do you normally take fruits and vegetables? Yes [ ] No [ ]. If yes, name them…….

……..

33. How often do you take these fruits and vegetables? (a) Daily [ ], (b) 5-6 times weekly [ ]

(c) 3-4 times weekly [ ], (d) 1-2 times weekly [ ].

29. Do you take any alcohol or smoke cigarettes? Yes [ ] No [ ].

30. Do you have any difficulty in eating food or swallowing fluids? Yes[ ] No [ ].If yes, what type of problem is it……

SECTION 6: ASSESSMENT OF SAFETY NETWORKS/SUPPORT SYSTEMS

1a. Do you know anything about support groups? Yes [ ], No [ ]

1b.Do you belong to any support group? Yes [ ] No [ ]

2a. When did you join and what are your activities?.....

…….

…….

2b. If no, what prevented you from joining one?.....

……

3. What do you hope to gain by joining the group?.....

…….

4. Have you benefited from the support group? Yes [ ] No [ ]

5. What are the benefits you have achieved or gained in the group?.....

……..

…….

5b. Who sponsors your support group?.....

6. Rate the impact of these benefits on your welfare? (a) High (b)▪ Moderate (c)▪ low ▪ (d) no impact ▪

7. Do these benefits meet all your needs? Yes [ ] No [ ]

8. If No, what other needs do you think have not been met?.....

……..

9. Can you write out the important needs of people living with HIV/AIDS……

……..

10. Can you arrange the needs in order of importance (most important ones first)…….

……

11. How do you think these needs can be met?.....

……..

12. Do you receive any help from the following? (a) Your children Yes [ ] No [ ],

(b) Relatives Yes [ ] No [ ], (c) Friends Yes [ ] No [ ], Religious Organization Yes [ ] No [ ]

(e) Non Governmental Organizations (local or International) Yes [ ] No [ ], (f) LGA Yes [ ] No [ ],

(g)State Govt. Yes [ ] No [ ], (h) Federal Govt. Yes [ ] No [ ].

13. Do you receive any assistance? Yes[ ], No [ ]. 13b Who gives the assistance to you…….

14. What kind of assistance do you receive? (a) Food [ ], (b) Cash [ ], (c) Care and treatment [ ]

(d)Drugs and nutritional supplements for opportunistic infections [ ], (e) ARV [ ],

(f) Others (specify)……

15. Is the assistance enough? Yes [ ], No [ ]

16. Do you eat at support group meetings? Yes [ ], No [ ]. 16b. What kind of food do you eat?..... 16c. Do you like the food? Yes [ ], No [ ]

Section 7. ANTHROPOMETRIC MEASUREMENTS

INDICES	**RESPONDENT**
Age (years)	
Sex	
Weight (kg)	
Height (m)	
BMI (kg/m2)	
MUAC (cm)	
Skinfold Thicknesses	
Biceps (mm)	
Triceps(mm)	
Subscapular (mm)	
Suprailliac (mm)	

APPENDIX 2

ASSESSMENT OF FOOD SYSTEMS, NUTRITIONAL STATUS AND SAFETY-NETS OF PEOPLE LIVING WITH HIV/AIDS IN KADUNA STATE

Questionnaire No: Name of Support Group:

Date of Interview: Place of Interview:

Time of interview: Name of Interviewer:

Are you on ARV: Yes ( ) No ( )

What was your last CD4 Count ---------- and when was it taken----------

SECTION I: DEMOGRAPHIC CHARACTERISTICS

1. Total number of people in your household…….

a. Number of Male(s) [ ] Female(s) [ ]

Age	No of Males	No of Females	Number Infected (if you know)	
			Males	Females
0-4				
5-17				
18-35				
36-45				
45 and above				

b. Sex of Respondent: Male [ ]Female [ ] c. Age in years……

d. Marital Status: Married [ ] Single [ ] Divorced [ ] Separated [ ]

Widow/widower [ ] Single parent [ ]

e. Type of Household: Monogamous [ ] polygamous [ ]

f. Sex of Household Head: Male [ ] Female [ ]

g. Are you the Household Head: Yes [ ] No [ ]

h. Highest Educational qualification: No formal education [ ] Primary sch. [ ]

Modern Sch. [ ] Secondary Sch. [ ] OND [ ] HND [ ] B.Sc [ ]

SECTION 2: HEALTH AND HYGIENE PRACTICES

Sn	Characteristics	Options	Code
1	Any health problem in the last one month (disease or any infections)	Yes (1) No (2)	
3	If yes, what are they?	Malaria (1) Diarrhoea (2)s Sore mouth/ throat (3) Tuberculosis (4) Other infections (specify) (9)	
4	How many loose or watery/mucoid stools have you had in the last 24 hours?	1 stool (1) 2 stools (2) 3 stools (3) More than 3 (4) None (9)	
5	Have you experienced any of these clinical signs in the last 2 weeks (tick) ● Diarrhea and vomiting ( ) ● Fever (temperature) ( ) ● Mouth and throat sores ( ) ● Oral thrush ( ) ● Muscle wasting ( ) ● Fatigue and lethargy ( ) ● Skin rashes ( ) ● Edema ( ) ● Pallor (palm or eye) ( ) ● Other		

SECTION 3: FOOD FREQUENCY QUESTIONNAIRE

You have been provided with a list of food items in the table below. Please indicate by ticking the information applicable to you in terms of frequency of consumption.

Food groups	Everyday	2-3 times/ day	Once/week	2-3 times/ week	2-3 times/ month
Cereals and Grains.					
Rice					
Maize					
Pap (Ogi/Eko)					
Sorghum					
Bread					
Millet					
Tuwo					
Semovita					
Legumes and Nuts					
Beans					
Groundnut					
Akara					
Moinmoin					
Melon					
Dukanut (Ogbono/Apon)					
Cashew nut					
Roots and Tubers					
Yam					
Potatoes					
Garri					
Amala					
Pounded yam					
Yam porridge					

Fats and Oils					
Palm oil					
Vegetable oil					
Butter					
Margarine					
Mayonnaise					
Maishanu					
Animal Products					
Meat					
Chicken					
Fish					
Egg					
Milk and products					
Fruits and Vegetables					
Ugwu					
Spinach (Green)					
Bitter leaves					
Effirin					
Water leaves					
Okro					
Orange					
Paw paw					
Pineapple					
Banana					
Tomato					
Mango					
Apple					

Carrot					
Plantain					
Garden egg					
Pepper					
Onions					
Condiments/Spices/Herbs					
Locust beans					
Garlic					
Ginger					
Curry					

Section 4. ANTHROPOMETRIC MEASUREMENTS

INDICES	**RESPONDENT**
Age (years)	
Sex	
Weight (kg)	
Height (m)	
BMI (kg/m2)	
MUAC (cm)	
Skinfold Thicknesses	
Biceps (mm)	
Triceps(mm)	
Subscapular (mm)	
Suprailliac (mm)	

SECTION 5: TWENTY FOUR-HOUR DIETARY RECALL

I would like you to tell me everything you ate and drank (foods and fluids) from the time you woke up yesterday till this morning, including what you ate and drank at home and away.

Item No (a)	Food/Drink Addition (b)	Description of food or Drink (use volume, size or price) (c)	Place taken (d)	Time (e)	Amount (how much did you actually eat or drink?) (f)	Wt. equiv. (g)

1. Was food intake usual? Y ( ) N ( ) 1b. If no how was it unusual?.....

1c. Are you using supplements/ medications? Yes/No 2. Was it a feast day Y ( ) N ( )

3. was there sickness (Y/N), if yes: what kind of sickness/illness……
……

4. Did sickness affect appetite (decrease or increase)?

APPENDIX 3

ASSESSMENT OF FOOD SYSTEMS, NUTRITIONAL STATUS AND SAFETY-NETS OF PEOPLE LIVING WITH HIV/AIDS IN KADUNA STATE

Questionnaire No: Name of Support Group:

Date of Interview: Place of Interview:

Time of interview: Name of Interviewer:

Were you in the last month meeting: Yes ( ) No ( )

Did you start the meeting with us in August this year Yes ( ) No ( )

When were you infected (month and year)……..

Is your spouse (husband or wife) infected with HIV? Yes ( ) No ( ) when (month/year)……

Do you have any child who is infected with HIV? Yes ( ) No ( ). How many_____

Are you on ARV: Yes ( ) No ( )

What was your last CD4 Count ---------- and when was it taken (month/year)----------

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SECTION I: DEMOGRAPHIC CHARACTERISTICS

1. Total number of people in your household…….

a. Number of Male(s) [ ] Female(s) [ ]

Age	**No of Males**	**No of Females**	**Number Infected (if you know)**	
			Males	**Females**
0-4				
5-17				
18-35				
36-45				
45 and above				

b. Sex of Respondent: Male [ ]Female [ ] c. Age in years……

d. Marital Status: Married [ ] Single [ ] Divorced [ ] Separated [ ]

Widow/widower [ ] Single parent [ ]

e. Type of Household: Monogamous [ ] polygamous [ ]

f. Sex of Household Head: Male [ ] Female [ ]

g. Are you the Household Head: Yes [ ] No [ ]

h. Highest Educational qualification: No formal education [ ] Primary sch. [ ]

Modern Sch. [ ] Secondary Sch. [ ] OND [ ] HND [ ] B.Sc [ ]

i. Tribe……. J. Religion……

SECTION 2: HEALTH AND HYGIENE PRACTICES

Sn	Characteristics	Options	Code
1	Any health problem in the last 2-3 Weeks or any infections)	Yes (1) No (2)	
3	If yes, what are they?	Malaria (1) Diarrhoea (2)s Sore mouth/ throat (3) Tuberculosis (4) Other infections (specify) (9)	
4	How many loose or watery/mucoid stools have you had in the last 24 hours?	1 stool (1) 2 stools (2) 3 stools (3) More than 3 (4) None (9)	
5	Have you experienced any of these clinical signs in the last 2 weeks (tick) ● Diarrhea and vomiting ( ) ● Fever (temperature) ( ) ● Mouth and throat sores ( ) ● Oral thrush ( )		

	• Muscle wasting ( ) • Fatigue and lethargy ( ) • Skin rashes ( ) • Edema ( ) • Pallor (palm or eye) ( ) • Other		

SECTION 3: FOOD FREQUENCY QUESTIONNAIRE

You have been provided with a list of food items in the table below. Please indicate by ticking the information applicable to you in terms of frequency of consumption.

Food groups	Everyday	2-3 times/ day	Once/week	2-3 times/ week	2-3 times/ month
Cereals and Grains.					
Rice					
Maize					
Pap (Ogi/Eko)					
Sorghum					
Bread					
Millet					
Tuwo					
Semovita					
Legumes and Nuts					
Beans					
Groundnut					
Akara					
Moinmoin					
Melon					
Dukanut (Ogbono/Apon)					
Cashew nut					
Roots and Tubers					
Yam					

Potatoes					
Garri					
Amala					
Pounded yam					
Yam porridge					
Fats and Oils					
Palm oil					
Vegetable oil					
Butter					
Margarine					
Mayonnaise					
Maishanu					
Animal Products					
Meat					
Chicken					
Fish					
Egg					
Milk and products					
Fruits and Vegetables					
Ugwu					
Spinach (Green)					
Bitter leaves					
Effirin					
Water leaves					
Okro					
Orange					
Paw paw					

Pineapple					
Banana					
Tomato					
Mango					
Apple					
Carrot					
Plantain					
Garden egg					
Pepper					
Onions					
Condiments/Spices/Herbs					
Locust beans					
Garlic					
Ginger					
Curry					

Section 4. ANTHROPOMETRIC MEASUREMENTS

INDICES	**RESPONDENT**
Age (years)	
Sex	
Weight (kg)	
Height (m)	
BMI (kg/m2)	
MUAC (cm)	

SECTION 5: TWENTY FOUR-HOUR DIETARY RECALL

I would like you to tell me everything you ate and drank (foods and fluids) from the time you woke up yesterday till this morning, including what you ate and drank at home and away.

Item No (a)	**Food/Drink Addition (b)**	**Description of food or Drink (use volume, size or price) (c)**	**Place taken (d)**	**Time (e)**	**Amount (how much did you actually eat or drink?) (f)**	**Wt. equiv. (g)**

1. Was food intake usual? Y ( ) N ( ) 1b. If no how was it unusual?.....

1c. Are you using supplements/ medications? Yes/No 2. Was it a feast day Y ( ) N ( )

3. was there sickness (Y/N), if yes: what kind of sickness/illness……
……

4. Did sickness affect appetite (decrease or increase)?