THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

NUTRITIONAL STATUS, DIETARY PATTERNS AND LIFESTYLE RISK FACTORS OF MENTAL HEALTH PATIENTS ADMITTED TO HOSPITAL IN LUSAKA, ZAMBIA

BY

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A Dissertation Submitted to the School of Agricultural Sciences in Partial Fulfillment of the Requirements of the Degree of Master of Science in Human Nutrition

Feb, 2023

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DECLARATION

I declare that this research project report represents my own work and that it has not been previously submitted for a degree to any other university.

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DEDICATION

I dedicate this dissertation to my late mother and father, Mary and Henry Zulu and my late sister, Memory Zulu. May their souls continue resting in peace.

ACKNOWLDEGEMENTS

I thank God for his guidance throughout my academic journey. To Him I give all the glory.

I would like to convey my sincere gratitude to my supervisors: Dr. K. Audain and Dr. M. Mukuma without whom this report would not have been a success, for their helpful guidance including comments, changes and suggestion at every stage of this thesis.

Special thanks goes to my family and friends for their love and support during this period. Especially, my aunt and uncle, Magdalene Mulenga and Eddie Mulenga for their love, support, prayers and encouragement throughout this journey.

ABSTRACT

Mental disorders are a public health problem affecting millions of people worldwide. There is convincing evidence from mechanistic studies demonstrating association between nutrition and mental health status. The latter can also be influenced by other factors apart from dietary factors. The composition and function of the human brain rely on the availability of nutrients, including vitamins, minerals, lipids, and proteins. There is paucity of data on nutritional status, dietary patterns as well as other lifestyle factors on mental health in low income countries. This study aimed to assess lifestyle risk factors, dietary patterns and nutritional status of mental health patients admitted to the Chainama Hills Mental Facility in Lusaka, Zambia. A mixed-methods approach was adopted, and the target population included 44 conveniently sampled nonviolent adults. Four key informant interviews were conducted with caregivers (psychiatry nurses, doctors, nutritionists, and chefs). Anthropometric measurements including weight, height, and mid-upper arm circumference (MUAC) were performed, and patient information was collected from caregivers and hospital files. Data from a food frequency questionnaire (FFQ) were used to assess the dietary patterns as well as dietary inflammation index (DII) of mental health patients. Sixty four percent (63.6%) of the study participants were males. Most participants (59.1%) were from high-density population areas. The mean ± SD age of the participants was 33.3 ± 10.4 years. None of the participants participated in physical exercise. More than half of the patients (54.5%) consumed alcohol and only 20.5% had a history of smoking. The dietary patterns were generally characterized by consumption of mostly plant based foods and meat, the latter was also found to have pro-inflammatory potential due to a high DII score (score of +2). Regarding nutritional status, 9.1% of patients were underweight, and 61.4% were normal i.e. body mass index (BMI) of $<18.5 kg/m^2$ and $18.5\text{-}24.95 kg/m^2$. It was also reported that psychotropic drugs contributed to weight gain. Approximately two fifth (38.7%) of the hospital admissions were related to alcohol use disorder (AUD) and substance use disorder (SUD). Unfortunately associations could not be established due to exposures (diet and physical activity) that did not vary across patients and small sample size. Generally patients consume a fairly healthy and balanced diet, however there is need to improve on diversity of the animal sourced foods to reduce the pro-inflammatory potential of patients' diets. There is also a need to monitor the nutritional status of patients, especially those who may be at risk of malnutrition owing to their mental health condition. Finally, physical exercise should be considered for mental health patients.

Key words: *Mental health, nutritional status, dietary pattern, dietary inflammation index, lifestyle activities.*

LIST OF ABBREVIATIONS

AUD Alcohol Use Disorders

BMI Body Mass Index

CRP Creatinine Reactive Protective

DII Dietary Inflammation Index

HoD Head of Department

IDSS Individual Dietary Diversity Score

MoH Ministry of Health

MUAC Mid-Upper Arm Circumference

NCDs Non-Communicable Diseases

OCD Obsessive Compulsive Disorder

SPSS Statistical Package for Social Sciences

STEPS WHO Stepwise approach to Surveillance

SUD Substance Use Disorder

UNZABREC University of Zambia Biomedical Research Ethics Committee

WHO World Health Organization

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OPERATIONAL DEFINITIONS

Mental health: a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community (WHO, 2020)

Dietary inflammatory index: Dietary Inflammatory Index (DII) is a literature-based dietary score that was established to measure the potential impact of a diet on the inflammatory status; a low DII score indicates the anti-inflammatory potential of the diet while a high DII score indicates pro-inflammatory potential on the diet (Shivappa et al. 2014).

Dietary pattern: this is a dietary habitual pattern which reflects someone's food consumption over a period of either 7 days, 2 weeks, one month or 12 months (Gibson, 2005).

Nutritional status: The condition of the body as a result of the intake, absorption and use of nutrients and the influence of disease factors (Gibson, 2005).

Physical activity: physical activity as any bodily movement produced by skeletal muscles that results in energy expenditure, whereas exercise is considered "a subclass of physical activity defined as planned, structured, and repetitive bodily movement done to improve or maintain one or more components of fitness (Tsintsifa ,Faxantidis, et al., 2006).

CHAPTER ONE

Introduction

According to the World Health Organization (WHO), mental disorders are regarded as a global health burden that should no longer be ignored (WHO, Mental Health Action Plan 2013–2020, 2013). WHO (2020) defines mental health as "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community". This state of well-being gets disturbed in one in every four individuals during some period of life (Glabska et al, 2020).

Common mental disorders that affect people at global level includes; major depression, anxiety, schizophrenia, bipolar disorder, Obsessive-Compulsive Disorder (OCD) and for the latter the incidence ranges approximately between 26% in America to 4% in China (Bailey, 2015). Globally, it is estimated that 4.4% people suffer from depression and 3.6 % from anxiety disorders (WHO, 2017). This translates to 322 million and 264 million people respectively. Recent evidence suggests that despite a substantial increase in the use of psychotropics and wider availability of psychotherapies, the population burden of depression is on the rise (Jorm et al, 2017). In 2019, worldwide 15% of years lost to disability was attributed to mental health (Murray et al, 2019). Patients who suffer from persistent mental disorders normally have up to 20 years reduction in life expectancy when compared with controls, besides controlling for the risk suicide and accidents (Teasdale et al, 2017). Additionally, worldwide, it is reported that nearly 10-15% mothers experience clinical depression after childbirth (Atuhaire et al, 2021) and about 18.4% in Africa (Adeyemo et al, 2020). In low and middle-income countries, about 0.5% of the national health budget is spent on mental health regardless of the fact that mental health affects 80% of the global population (Vigo et al, 2016).

This global outlook of mental disorders is also observed in Zambia, where up to 20% of the population have varying degrees of mental disorders (Munakampe, 2020). Common mental disorders in Zambia include alcohol use disorder, bipolar, schizophrenia and organic brain syndromes (Sharpe et al. 2021; Mayeya et al. 2004). The estimate are based on hospital statistics and does not include those that do not seek medical care for mental illnesses from health facilities. Well known causes of mental health disorders include poverty, use and dependency on alcohol

and other psychotic substances as well as stressful families (Anakwenze & Zuberi, 2013). More people affected by mental health disorders live in high density areas where stigma is a significant barrier to mental health service utilization (Lungu, 2015). Furthermore, only 15% of the affected population are able to access the mental health facilities for medical attention (Munakampe, 2020).

Additionally, it has been established that some medication for mental health are associated with nutritional status of individuals. Psychotropic medications may influence weight gain, especially those for treatment of depression (Dent et al, 2012). Firth et al (2019) demonstrated that mental health patients on psychotropic medications normally report an increase in appetite, cravings for sweet foods and drinks but a decrease in satiety is also observed and further indicated that the depressed population is at a higher risk of premature death due to adverse health effects from medic as well as unhealthy food choices (Firth, et al., 2019).

It is important to understand that there are modifiable behavioural risk factors for mental health that may prevent premature deaths. These modifiable behavioural risk factors include smoking behaviours such as smoking heaviness (daily or weekly cigarette use) and tobacco dependence (MRes et al, 2017), harmful alcohol use (Ning et al, 2020), lack of physical exercise and unhealthy diets high in fats, salt and sugary foods. Many studies have reported positive associations in which anxiety and depression are related to greater subsequent alcohol use (Ning et al., 2020: Delfabbro et al., 2016: Essau et al., 2014). Tsintsifa et al., (2006) defines physical activity as any bodily movement produced by skeletal muscles that results in energy expenditure, whereas exercise is considered "a subclass of physical activity defined as planned, structured, and repetitive bodily movement done to improve or maintain one or more components of fitness. Growing evidence has shown that lack of physical activity is linked to mental health disorders (Harvey et al, 2010: Lucas et al, 2011: Pasco et al, 2011), while exercise indicated to be effective in treatment studies (Stathopoulous et al, 2006). Several studies have shown a relationship between nutrition and mental health (Batiaanssen et al. 2019; Marx et al. 2017; Conner et al. 2017), indicating the potential of diet in preventing or treating mental health disorders. These findings support the idea that nutrients may play a role in preventing or treating mental health disorders. In particular, consuming fish that is high in omega-3 fatty acids has been shown to reduce depressive symptoms by modifying inflammation (Kanauchi et al, 2019). Additionally, increasing the consumption of fruits and vegetables may also improve mood disorders (Adan et al, 2019).

The structure, composition and normal function of the brain are reliant on the availability of appropriate nutrients, which include vitamins and minerals, lipids and amino acids (Castro et al, 2018). In addition, endogenous gut hormones, gut microbiota neurotransmitters, and the neuropeptides are affected directly by the composition of the diet (Sandhu et al, 2017). Hence it is logical that dietary intake and dietary quality may have an impact on brain function, thereby making diet a modifiable factor to target mental health as well as cognitive performance (Dinan et al, 2018).

Problem statement

The Ministry of Health (MoH) has recognized mental health disorders as a neglected non-communicable disease in Zambia. Mental health has often proved difficult to estimate because of under reporting as well as lack of national surveys with validated measures to determine the burden of the disease (MOH, 2017). According to the non-communicable diseases-Stepwise approach to surveillance (NCDs-STEPS) survey conducted by MoH and WHO (2017), 7.8% of the Zambian population admitted to have attempted suicide. Among this population, young people (18-29 years) had a higher attempt, 8.6% compared to the elderly (60-64 years) 6.5%. Determinants of mental wellbeing are multifaceted, including diet, nutritional status and socio-economic status (Gnanapragasam et al, 2021). The WHO recommends consumption of at least 5 portions of fruits and vegetables per day to reduce the risk of NCDs (WHO, 2015). However, the NCD-STEPS survey showed that the consumption of fruits on average was 2.1 days out of 7 days and 90% of the adult population consumed less than 5 servings of vegetables.

Despite the determining factors for mental health being complex, evidence indicates that poor dietary habits exacerbate mood disorders and this is common among adolescents and young adults (Zamroziewicz et al, 2017). Poor dietary habits especially those high in sugar and low wholegrain have been reported to be associated with increased inflammation which has depressive pathogenesis (Tolkien et al, 2019).

The role of physical activity in mental health has been well researched and recent studies show that it can help in prevention and management of mental illness disorders (Schuch et al, 2019; Lederman et al, 2019) . Unfortunately, these recommendations have been poorly recognized as evidenced by the NCD-STEPS survey that revealed that more women (45.5%) than men (23.9%),

do not meet the recommended levels of physical activity as per WHO guidelines that stipulate that adults (18-64 years) should at least have 150 minutes of moderate to intensive physical activity per week or 75minutes of intensive activity per week. Evidence linking diet, nutrition and physical exercise to mental health has evolved, yet the Zambian mental health systems appears to not prioritize the latter to optimize mental health (Ngungu & Beezhold, 2009: Mwape et al., 2012: Munakampe, 2020). In Zambia, health facilities have units providing treatment for mental health disorders, the facilities with inpatient units also provide food to mental health patients. Mental health facilities may be the primary source of nutrition for most patients. The general society or relatives are also a source of food in mental health facilities. Taken together, nutrition is currently not part of the routine treatment and management of mental health patients. This may partly be due to lack of local empirical evidence on the critical role that nutrition and physical activity play on mental health status. The present study, therefore, aims to cover the evidence gap on the associations between nutritional status, diet, lifestyle risk factors and mental health in Zambia.

Justification

According to the Lancet Psychiatry Commission, individuals with mental health disorders, regardless of socioeconomic status have significantly higher rates of obesity, diabetes and metabolic syndrome with up to 2-fold increase in the risk for cardiovascular and metabolic diseases compared to the general population (Firth et al., 2019). Furthermore, modifiable lifestyle factors such as sedentary behavior, inadequate diet and smoking, are associated with physical comorbidities in people with mental disorders (Firth et al. 2019).

Existing data on diet and mental health are largely from high-income countries. There is a paucity of evidence on nutritional status, dietary practices and mental health status in Zambia and indeed Sub-Sahara Africa. A similar study on mental health and nutrition in Zambia only addressed undernutrition and socio-demographic profile in relation to mental health at Chainama Hills hospital (Makamo, 2017). This study did not address dietary patterns as well as lifestyle risk factors of mental health patients. Considering the public health importance of mental health it is paramount that evidence is generated to facilitate development of appropriate interventions to prevent and manage mental health disorders. The current study was designed to establish the nutritional status, dietary patterns and modifiable lifestyle factors of mental health patients. The

current evidence gap in the area of nutrition and mental health needs to be closed in order to ensure that the vision 2030 of the government of the Republic of Zambia is achieved.

The current study will also contribute towards the evidence base on dietary patterns and mental health. The findings can contribute towards policy advocacy on food and nutrition security for individuals in institutional facilities. Furthermore, information generated from this study will be published and shared with various stakeholders such as, Chainama Hills hospital, academia, government ministries and development partners as well as policy makers primarily dealing with mental health issues.

Aim: The aim of this study was to assess the nutritional status, dietary patterns and lifestyle risk factors of mental health patients admitted to hospital in Lusaka, Zambia.

Objectives:

i. To assess dietary intake of mental health patients admitted to hospital in Lusaka
ii. To determine the dietary inflammation index of mental health patients' diet admitted to hospital
iii. To determine the nutritional status of mental health patients admitted to hospital
iv. To investigate lifestyle risk factors of mental health patients admitted to hospital
v. To explore associations between mental health, dietary patterns, nutritional status as well as lifestyle risk factors

Research questions:

- What are the common dietary patterns among mental health patients admitted to hospital in Lusaka?
- Do patients consume low or high inflammatory diets?
- What is the anthropometric status of mental health patients admitted to hospital in Lusaka, in terms of factors such as body mass index (BMI),
- What lifestyle risk factors are prevalent among mental health patients admitted to hospital in Lusaka?

- How do dietary patterns, nutritional status, and lifestyle risk factors relate to mental health outcomes among patients admitted to hospital in Lusaka?

Conceptual framework for the determinants of mental health.

The current study is based on the premise that mental health is determined by a myriad of factors operating in complex ways. Figure 1 is a conceptual framework demonstrating linkages between and among variables which potentially influence mental health. The major determinants of mental health have been further explored under the literature review section. The proximal factors that influence mental health include physical activity, what a person eats and other lifestyle factors. Distal factors may broadly include, various factors from environmental, social and biological determinants.

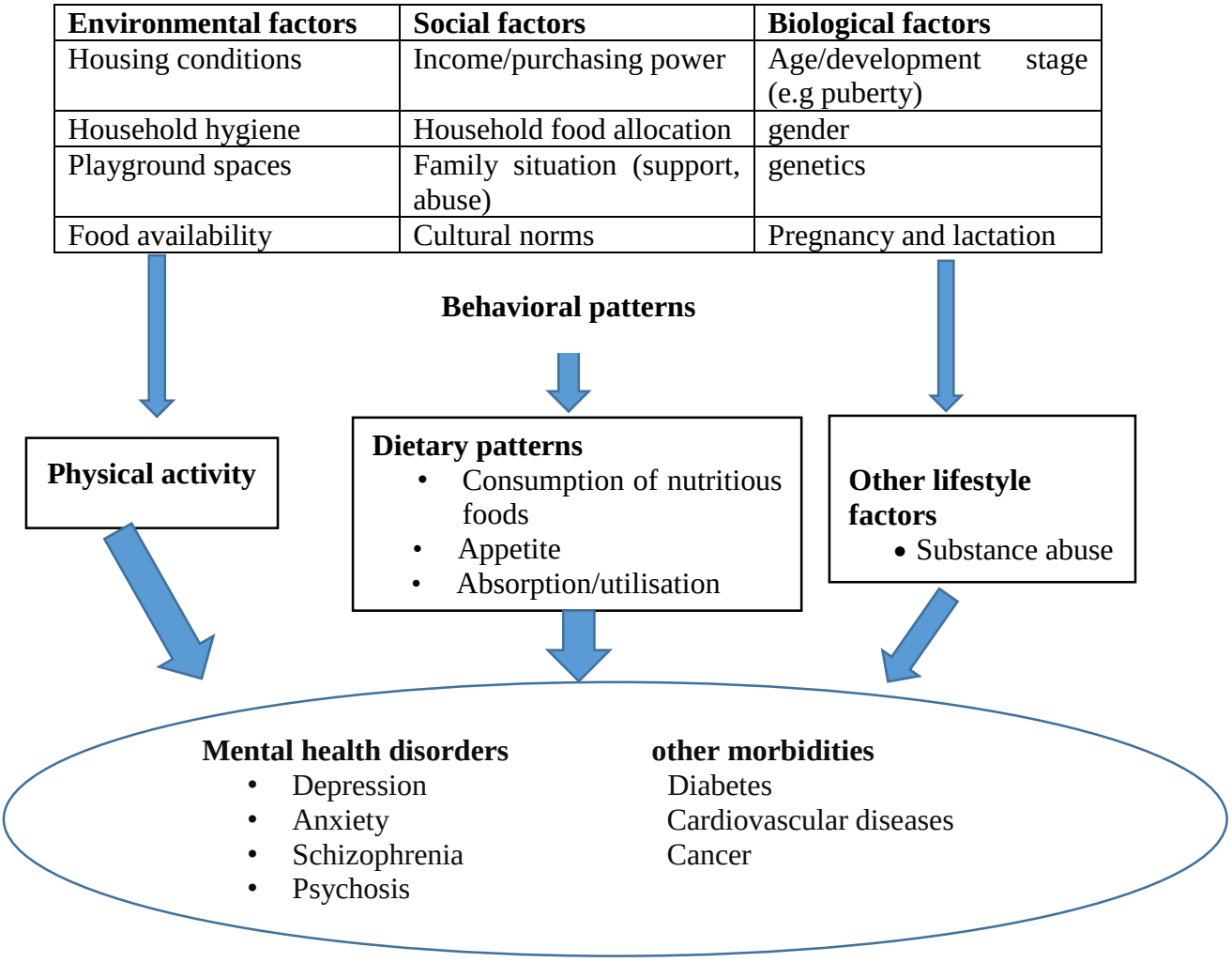


Figure 1: Theoretical framework on the determinants of mental health outcomes

CHAPTER TWO

Literature review

This section presents literature on environmental factors, social factors, and biological factors that may lead to mental health disorders. It also presents information on how lifestyle risk factors such as physical activity and diet can influence mental health. Literature was searched on various online data and publications databases, using the following words and phrases without restricting on publication period: mental health; mental health and nutrition; mental health disorders and nutrition, mental health determinants, mental health in Zambia; diet and mental health and prevalence of mental health.

Environmental factors

Environmental risk factors are defined as serious disturbances of community functioning that surpass the ability of the community to cope by use of its own resources (Staupe-Delgado, 2019). These factors include disasters triggered by displacement (e.g. war, political violence), natural hazards (e.g. earthquakes), armed conflict, industrial events (e.g. chemical spills), and climate change (eg, droughts or flooding) (lund et al., 2018). Complex emergencies (such as mass displacement, war and armed conflicts) as well as human trafficking are linked to an increased prevalence of mental health disorders, which is likely to remain high for years after displacement as an outcome of war (Lund et al 2018). Harsh housing conditions, reduced availability of food, violence before, during, and after forced migration are also risk factors for mental health, including loss of social status and difficulties with the language barriers and culture of the new setting.(Hynie, 2018). In Zambia, environmental factors that contribute to mental health disorders include poor living conditions in rural areas (Munakampe, 2020). Houses in rural areas are usually overcrowded due to little resources and are in close proximity with drinking sprees where age restriction is limited and alcohol is cheap especially strong spirits. Hence, alcohol and substance abuse are high. Climate changes, such as episodic drought, can change natural landscapes, disrupt food production and water resources and change agricultural conditions (Hayes et al 2018). It can also rigger a rise in food insecurity, financial and relationship stress, post-traumatic stress disorder, depression, anxiety, risks of violence, substance abuse and suicidal ideation. It has also been reported that adults who had educational attainment and a higher socioeconomic status before

being displaced, but a reduced socioeconomic status in their new locations, have an increased risk for developing mental health disorders.(Patel et al., 2018). Brooks et al (2020), suggests that social support, training, experience, perceived competence and effective coping strategies as protective measures for mental health in the context of environmental risk factors.

Social factors

The social factors of mental health incorporates education, income, food insecurity, family and peer relationships, social networks, and culture (Lund et al 2018). Lower levels of education and literacy have been reported to be strongly associated with development of dementia, while higher education levels is believed to affect the brain by increasing vascularisation, generating cognitive reserve and resilience against dementia (Franzen et al., 2020).

Poverty is often linked to increased prevalence of adult common mental health disorders, such as anxiety and depressive disorders, in low-income, middle-income, and high-income countries (Gautham et al., 2020). In Zambia, among the social factors that contribute to mental health disorders include; stressful family relationships, stigma and poverty (Munakampe, 2020). It is reported that the effects of poverty on mental health are more pronounced among women during the perinatal period and adolescents (Gelaye et al., 2016). Unemployment, reduced economic status, and diminished wealth are associated with suicidal behavior and suicidal ideation in low-income and middle-income countries (lund et al 2018). Insufficient housing as well as overcrowding due to low income, are also associated with increased risk of common mental health disorders in adults (Patel et al., 2018). Food insecurity has been constantly associated with increased risk of adult common mental health disorders in low and middle-income countries (Ridley et al., 2020). Additionally, inadequate nutrition in households has been consistently reported to be associated with poor motor, cognitive and social-emotional development in children (Ridley et al., 2020).

In terms of family relationships, intimate partner abuse during pregnancy is strongly associated with increased risk of depression, post-traumatic stress disorder and anxiety for women in the postnatal period (Yu et al., 2019: Shah et al., 2021). Accumulative data shows that lack of support and empathy from a partner, low emotional and practical support from family members, and being unmarried also increases the risk of common mental health disorders and suicidal thoughts among

women (Ssewamala et al., 2018: Van den Bergh et al., 2020). Loneliness, isolation and family separation are salient determinants of mental health as they predict depression among adults (Lund et al 2018).

Identity and shared meaning associated with culture has proven to be protective of mental health (Patel et al 2018). It has been reported that cultural identity loss for example, through forced migration has been related to affecting mental health negatively (Wylie et al., 2018). Studies have reported that, negative experiences in the social environment, such as bullying and discrimination are associated with increased depression, stress or childhood internalising symptoms associated with social isolation and reduced self-esteem (Cokley et al., 2017: Arango et al., 2018).

Biological factors

The female gender is related to an increased risk of depression at different stages in life, beginning from childhood, in many different settings (Salk et al., 2017). Consistent studies have reported that the same female preponderance is also observed to be associated with anxiety, eating disorders and Alzheimer's disease (Le et al., 2017: Tian-Ci Quek et al., 2019). Equally, the male gender has been observed to be associated with an increased risk of substance use disorders (Lund et al., 2018: Becker et al., 2017). The male gender also have an increased risk of childhood developmental and behavioral disorders, such as attention deficit hyperactivity disorder, autism spectrum disorder and early-onset schizophrenia (Bale & Epperson, 2015: Robson et al., 2020). In Zambia, more males than the female gender have been reported to abuse alcohol and other substances e.g. tobacco, marijuana and nicotine. Furthermore, some responses to fetal stress seem to be gender specific, for example the risk of developing schizophrenia (Carlezon et al., 2019). Chan et al (2016) also established a higher prevalence of self-harm among adolescent girls compared to adolescent boys, who were associated with an increased probability of dying by suicide in a varied populations (Bradvik, 2018). Inherited genetic differences have an important role in suicide, as established by the study of twins, in which the monozygotic twins' concordance for the suicide was significantly higher than in dizygotic twin pairs, being respectively 24.1% and 2.8% (Mullins et al., 2019). Orsolini et al (2020), further suggests that fulfilled suicide and suicide attempts show familial

accumulation, with heritability approximations between 30% and 55% of suicidal behavior and an increased risk of up to two-fold.

Physical exercise

Whilst physical exercise is commonly known to prevent various non-communicable diseases, such as type 2 diabetes and cardiovascular disease, studies have also indicated its positive impact on mental health disorders, particularly depressive and affect disorders (Kvam et al., 2016; Gordon et al., 2018). Previous studies found that physical exercise can generate several mechanisms and physiological changes and in the body, which may reduce stress levels and protect against the negative health effects of stress, as well as improve moods (Gerber et al., 2017: Mikkelsen et al., 2017). Physical activity is also important in the maintenance of the mitochondrial function and biogenesis, however prolonged physical inactivity has been suggested to be fundamental in developing pathophysiology of mental health disorders (Bansal & Kuhad, 2016). Additionally, physical exercise has been associated with functioning of brain neurotransmitters which include dopamine, noradrenaline and serotonin, suggesting that physical exercise may act equivalently as the selective serotonin reuptake inhibitor antidepressants (Mikkelsen et al., 2017). Furthermore, physical exercise is central in proper functioning and maintenance of the hypothalamic-pituitary-adrenal (HPA) axis, and numerous studies have demonstrated a dysfunction of the HPA axis in mental health patients (Schuch et al., 2019). Accumulative literature suggesting that physical activity may have a comparable therapeutic effect on mental health, as to that of psychotherapy (Kvam et al., 2016: Gordon et al., 2018: Chen at al., 2020). There are potential mechanisms that might help explain the association between physical inactivity and poor mental health, which include consequences of health behaviors such as alcohol use, overweight and obesity as well sleep problems and these have been linked to both physical exercise and mental health in young adulthood (Rosenthal et al., 2018: Braganca & Dinis, 2018).

Mental health nutrition

Brain function and diet

The brain is an organ with great nutrient and metabolic demands. It is contains 60% fat, and has high concentrations of cholesterol as well as polyunsaturated fatty acids such as Omega-3s

(LaChance & Ramsey, 2015). The pathophysiology of mental illness requires the production of monoamine neurotransmitters such as serotonin, norepinephrine, and dopamine and this is dependent on sufficient building blocks of amino acids, and mineral dependent co-factors. The B vitamins are important for the methylation cycle which produces a co-factor essential for synthesis of monoamine neurotransmitters (Miller, 2008). The methylation cycle helps to reduce homocystiene levels which are associated with depression and cardiovascular diseases. Part of the neuronal cell membrane is formed by the omega 3 fatty acids and they also influence many important processes in the central nervous system. These processes include neurogenesis, neurotransmission, neuronal survival and gene expression. The omega fatty acids also have anti-inflammatory properties and act as anti-oxidants (Mischoulon & Freeman, 2013). It is recommended to strike a balance on the consumption of omega 3 fatty acids and omega 6 fatty acids. Foods that contain omega 6 fatty acids include vegetable oils such as soy oil, corn oil and the cooking fat often used in restaurants while omega 3 fatty acids are found in fish, sea food and grass fed beef. Studies have reported that omega 3 fatty acids are effective for treating depressive bipolar and depressive disorders (Lachance & Ramsey, 2015: Jacka, 2017: Offor et al., 2021). Additionally, an elevation in omega 6 to omega 3 fatty acids ratio has been reported to be linked to depressive disorders. The short chain omega 3 and omega 6 fatty acids require the same enzymes to convert them to their biological active long chain fatty acids, therefore, high omega 6 may interfere with conversion of omega 3 to its active long chain fatty acid.

Among the nutrient dense foods one can consider for brain health is fish and sea food. This food category contains high omega-3 fatty acids and B vitamins. Furthermore, greens such as spinach, green beans, legumes and kale are excellent sources of B vitamins as well as fiber. According to Glabska et al. (2020), consuming higher amounts of fruits and vegetables has been linked to improved mental health and well-being; allowing individuals to better cope with the normal stresses of life and function more productively. Nutrition and diet are not only important for metabolic processes, but also have a significant impact on mood disorders as well as mental health status (Conner et al., 2017: Fresan et al., 2019: Emerson & Carbet, 2019). Many studies support that deficiency of essential nutrients and some vitamins lead to cognitive impairments (Giannunizio et al., 2018: Gaudio et al., 2016). Vitamin D plays an important role in neurotransmission, neuroprotection, antioxidant processes, immunity modulation, inflammatory response as well as in normal brain development and functioning, proliferation, and differentiation

(Karci & Celik 2020: Cannell & Grant 2013: Eyles et al., 2013). Lack of Vitamin D can be linked to many neuropsychiatric illnesses, including major depressive disorder, autism, Obsessive Compulsive Disorder (OCD) and schizophrenia (Chiang et al., 2016: Wang et al., 2016). Vitamin D deficiency may add to OCD etiology by (i) affecting the synthesis of catecholamines and the pathway of serotonin and synthesis, (ii) depriving the neuroprotective impact (Offor et al., 2021). A study by Brouwer-Brolsma et al (2015) revealed that higher vitamin D serum levels in adults aged 65 years and above, were associated with better working memory performance and improved attention. Vitamin D has also been reported to help the brain functions and nervous system like impulsive behaviors, known to be of significant in the diagnosis and treatment of patients with Eating Disorders (Todisco et al., 2020). Vitamin B_3 (niacin) deficiency causes pellagra and dementia while vitamin B_{12} deficiency causes poor memory, depression, lethargy as well as fatigue. Additionally, vitamin B_1 (thiamine) deficiency causes beriberi with numbness as central nervous system as side effects and vitamin B9 (folic acid) deficiency results in utero neurodevelopmental defects and is associated with depression in adults (Enderami et al., 2018).

Mental health and inflammation

Inflammation may play an important role in facilitating the association between diet and mental health (Galland, 2010). High fibre diets and fermented foods have been reported to help with regulation of the gut microbiome and reduce inflammation and stress on the brain (Aslam et al., 2018: Batiaanssen et al., 2019). Many studies support the pathogenic role of neuroinflammation in mental illness (Najjar et al., 2013; Lucas et al., 2014; Faria et al., 2014: Tolkien et al., 2019). A well-known inflammation biomarker is C-reactive protein (CRP). Many studies reported that elevated concentrations of CRP are linked to an increased risk of cancer and other chronic diseases (Guo et al, 2013). Lucas et al., (2014) used data from food frequency questionnaires and inflammation biomarker CRP to derive an inflammatory dietary pattern. His study revealed that participants who consumed a consistent inflammatory dietary pattern had a significant increased risk of developing depression after confounding factors were adjusted. He concluded that a diet high in sugar sweetened soft drinks, red meat, refined grains and margarine but low in green leafy vegetables, yellow vegetables, coffee and olive oil was associated to inflammation. Dietary components are important factors that affect an individual's inflammatory status (Smidowicz & Regula, 2015). Therefore, to understand the potential role of a diet on inflammatory status, a

comprehensive index is required. The DII is a literature-based dietary score that was established to measure the potential impact of a diet on the inflammatory status; a low DII score indicates the anti-inflammatory potential of the diet while a high DII score indicates pro-inflammatory potential on the diet (Shivappa et al, 2014).

Mental health and gut microbiome

Another aspect bordering the link between diet and mental health is the microbiome. The gut microbiome has been reported to play significant role in stress response and mental disorders like depression and anxiety (Butler et al, 2019). The pathogenesis of mental disorder associated with the microbiome is through translocation of bacteria through gut permeability (Kelly et al, 2016). Stress, depression and anxiety may increase the gut barrier permeability, leading to a leaky gut which allows bacteria to move into circulation resulting in the inflammatory response (Kiecolt-Glaser et al, 2015). Healthy gut microbiome is important in the regulation of serotonin metabolism because about 90% of serotonin receptors are found in the gut (O'Mahony et al, 2015). Fermented foods such as yogurt are rich in probiotics which are good for the gut bacteria while on the other hand, prebiotics contained in non-digestible fibre stimulates growth of the probiotics (LaChance & Ramsey, 2015). Both prebiotics and probiotics have been reported to reduce anxiety and mood disorders by several studies (Takada et al., 2016: Ng et al., 2018: McKean et al., 2017). Various parts of Africa use traditionally fermented alcoholic drinks from fruits and cereals, fermented foods which include maize, millet, sorghum, cassava and animal proteins, mostly fermented milk (Diaz et al, 2019). These traditional probiotics have the ability to synthesis healthy compounds like anti-oxidants as well as antimicrobials because they contain live microorganisms (Tamang et al, 2016). The western processed foods have been reported to change the microbiome which contributes to gut inflammation and mental disorders (Zinocker & Lindseth, 2018). Foods high in refined sugars and saturated fatty acids have a significant negative effect on the brain proteins. The brain protein are important because they protect the brain from oxidative stress and stimulate growth of new brain cells (Offor et al, 2021). A recent study reported that food high in saturated fats and sugar may cause an increased risk for hyperactivity disorder compared to vegetables and fruits (Del-Ponte et al, 2019).

Mental health and oxidative stress

Oxidative stress is also implicated in many chronic diseases and appear to be important to mental health (Moylan, Berk, & Dean, 2014). Populations with Schizophrenia have increased oxidative stress and decreased brain glutathione levels as well as disordered glutamate metabolism (Dean, van den Buuse, & Bush, 2009). A similar study reported higher levels of oxidative stress markers observed, as well as lower levels of antioxidants, such as vitamin C, vitamin E, coenzyme Q10 and glutathione, when compared with healthy control group (Moylan, Berk, & Dean, 2014). Additionally, a meta-analysis of 115 studies revealed a decreased antioxidant capacity in depressed patients during acute episodes (Liu, Zhong, & Liao, 2015). With the abundance of antioxidant compounds present in foods such as vegetables and fruits, this is a pathway that could be modified by diet.

Research has established a synergistic relationship between dietary patterns and mental health. Unhealthy eating habits are correlated with mental health disorders, and conversely, individuals with mental health disorders are likely to exhibit poor nutritional status. (Hotzy et al, 2022). The relationship between mental health and nutritional factors is therefore, demonstrating what is called reverse causality, in which case one is both an outcome and the risk factor or exposure of the other. Therefore, the relationship between mental health and nutrition or dietary factors deserve special attention in order to ensure appropriate and effective interventions are designed and implemented. People who suffer from mental health disorders usually suffer from poor physical health and a decreased life expectancy compared to the general population (Walker et al., 2015: Lawrence et al., 2013).

Mental Health Disorders

Depression

Worldwide, depression is among the most common mental disorders, with approximately 265 million people of all ages suffer from depression (Lim, Tam, Lu, Ho, & Zhang). Depression is a primary cause of disability globally and is a leading contributor to the overall global burden of disease (Charlson, et al., 2019). Apart from sedentary behavior, obesity is an outcome of the many variables among patients with depression, which includes unhealthy diets that are high in fats,

carbohydrates and calories (Teasdale et al, 2017). Populations with depression are at higher risk of having a sedentary lifestyle. According to two recent meta-analyses, it was reported that depression patients were involved in less light, moderate and vigorous physical activities compared to their corresponding controls (Vancampfort et al., 2018; Stubbs et al., 2018)

Schizophrenia and Psychosis

Patients with schizophrenia and psychosis usually have poor dietary patterns compared to the general population. Several studies have reported that schizophrenia patients have a decreased intake of healthy, nutritious foods such as fruits and vegetables with an above-average caloric intake from a diet rich in saturated fats and sugars (Phillips et al., 2018; Shivappa et al., 2018). Research indicates that predictors of poor dietary patterns may be different in people with psychosis compared to the general population. Psychosis-specific aspects such as depression and effects of antipsychotic drugs (weight gain and increased fatigue), negative side effects may contribute to poor diet and its relationship to obesity, signifying that programs designed to improve dietary practices may not apply to those with psychosis (Nasrallah, 2003). However, substance use and low socio-economic status (low income, low education, and unemployment) may create potential barriers towards healthy eating in individuals with psychosis (Hahn, Rigby, & Galletly, 2014) and in the general community (Barosh, Frie, & Engelhardt, 2014).

Nutritional status and mental health

People with mental health disorders face many barriers to obtaining good nutrition, such as medication effects on appetite, sedentariness or agitation, reduced motivation levels, social isolation, financial restrictions and cognitive impairments (Teasdale, 2017). Most of these barriers result into weight gain (Hanox et al., 2021). Additionally, previous studies have shown that people with mental health disorders have on average a higher caloric intake and a lower diet quality (e.g., higher intake of sweets, red and processed meats, refined grains and, along with a lower intake of whole grains, fruits and vegetables) compared to the general population (Teasdale et al., 2017: Firth et al., 2019). However, mental health care givers may overlook aspects of malnutrition in their mental health patients because such aspects are often masked by the patients' overweight status (de van der Schueren & Jager-Wittenaar, 2022). Malnutrition is commonly defined as a state

of imbalanced nutrition, ranging from undernutrition to overnutrition due to a diet that is inappropriate for the individuals' needs (Risch et al, 2022).

Studies have found that both being underweight and obese have a significant impact on mental health, whereas other studies have demonstrated that mental health symptoms are associated with being either underweight or obese (kim et al., 2014: Hotzy et al., 2022). Much evidence shows that nutritional status is important during illness recovery, leading to reduced hospital stays, readmission rates, lower mortality and, and reduced healthcare costs (Kaegi-Braun et al, 2021). Body weight and height are used to calculate BMI, which is commonly used to assess nutritional status in adults (Reber et al, 2019). BMI is an indicative tool for malnutrition with an individual being considered underweight when BMI is < 18.5 kg/m^2 (WHO, 1995). Undernutrition affects the recovery and function of almost all body organs (Kaegi-Braun et al, 2021). On the other hand, BMI is also used to detect obesity (WHO, 1995). Obesity (BMI ≥ 30 kg/m^2) signifies a threat that increases the risk of many non-communicable diseases such as diabetes, cardiovascular diseases, cancer, kidney disease, mental health disorders, as well as musculoskeletal, respiratory, reproductive and dermatological disorders (Luo et al., 2018). It is reported that problems associated with nutritional status in adults are neglected or underestimated in developing countries (Abdu et al., 2020). Statistics from sub-Saharan Africa show that nearly half (48%) of elderly Africans are underweight, almost a quarter (21%) are overweight and 56.0% of older South Africans are obese (Musa et al., 2022).

On the other hand, MUAC is a practical tool for screening and assessing the severity of nutritional status problems in the general population (Van Tonder et al., 2019) and it has proved superiority over BMI (Bhattacharya et al., 2019). Additionally, previous studies have reported a positive association between MUAC and BMI (Musa et al., 2022: Thorup et al., 2020). Furthermore, various studies have identified the MUAC cut-of measurement as an alternative method of detecting underweight and obesity (Thorup et al., 2020: Eleraky et al., 2021: Musa et al., 2022)

Lifestyle risk factors of mental health

Understanding modifiable risk factors that alleviate or prevent premature mortality is essential (Walker, McGee, & Druss, 2015). Accumulative evidence suggests that lifestyle factors are linked to adverse physical health which include cardiovascular diseases, certain types of cancers, mental

illness and premature mortality (GBD, 2017 Risk Factor Collaborators, 2018; WHO, 2013). This evidence supports the indication that population-tailored interventions that pay attention to lifestyle modifications are a keystone of health outcome determination (Teasdale et al, 2017). Smoking has been associated with mental illness. Several studies have reported a positive association between smoking and mental illness, with smoking rates increasing with the severity of the disease (Fluharty et al., 2017; RCP, 2013; McManus, 2010). Smoking has also accounted for much of the reduction in life expectancy associated with mental illness (RCP, 2013). Harmful use of alcohol has shown a positive relationship with depression and anxiety.

Several studies have reported a positive association between harmful use of alcohol and depression (Edwards, et el., 2016; Hyun-Jin Jun 2015; Edwards, et el.,2014; Meier, et al., 2013). Similarly, more studies also reported a positive association between alcohol consumption and anxiety (Virtanen, et al., 2015; Hill, et al., 2010; Pardini, et al., 2007). Evidence supporting physical activity and its health benefits when compared to pharmacological interventions has been established (Naci & Ioannidis, 2013). Many studies have demonstrated that low PA levels are consistently associated with a high risk for depression (Mammen and Faulkner 2013: Stubbs, et al., 2016). Additionally, engaging in structured physical activity exercises has been proven to be an effective treatment for depression (Schuch, Vancampfort, Firth, & Rosenbaum, 2016).

CHAPTER THREE

Methodology

Study site and design

This study was conducted at the Chainama Hills hospital located in Lusaka, the capital city of Zambia. Chainama Hills hospital is the main mental health inpatient facility in the country. The study was cross-sectional and aimed at determining the dietary patterns, nutritional status, and lifestyle risk factors of mental health patients admitted to Chainama Hills hospital in Lusaka. Data collection was done in April 2021. A mixed-methods approach was adopted in data collection and analysis.

Sample size and Sampling procedure

The sample size was calculated using the equation for sample size determination when a population proportion is to be estimated (Daniel & Cross, 2018):

$$N = (Z)^2 * p*(1-p) / (\text{margin of error})^2$$

Where, N= calculated sample size, p= proportion of individuals suffering from mental disorders (i.e. 20%), (Munakampe, 2020), Z corresponds to Z-score value at 95% confidence level (given as 1.96). Therefore, the calculated sample size was 246 participants. This was adjusted for 30% attrition and non-response, which resulted in a sample size of 320. However the patients admitted to the hospital were about 90 which was less than the sample size; hence only 44 non-violent patients were included in the study. Mental health patients admitted at the hospital were those receiving specialized psychiatry treatment of which some were violent and secluded from the non-violent patients. The patients admitted at the hospital do not usually exceed more than 100. Therefore the sample size reduced even further after excluding the violent patients. The study applied convenient sampling based on the available admitted mental health patients admitted to Chainama Hills hospital.

Study population

The study included mental health patients with either AUD, SUD bipolar disorder, psychosis or schizophrenia admitted to the hospital at least for more than 5 days. The mental health patients included both male and female aged between 18-64 years. The study also engaged patient care givers, which included psychiatry nurses, a doctor, nutritionist and a chef. The psychiatry nurses determined the patients who were stable and issued their hospital files for mental disorder identification and demographics.

Inclusion and exclusion criteria

The study included the following participants;

- Mental health patients admitted to the Chainama Hills hospital between the age 18 and 64 years.
- Both male and female mental health patients admitted to Chainama Hills hospital who were non-violent
- Care givers who helped with attending to the mental health patients.
- Key informants (a Doctors, Nurse, Chef and a Nutritionist who worked at Chainama Hills hospital).

The study excluded the following;

- Mental health outpatients and
- Violent mental health patients.

The study had minimum risk as it only engaged non-violent mental health patients with the help of care givers at the hospital.

Ethical considerations

Ethical clearance was obtained from University of Zambia Biomedical Research Ethics Committee (UNZA BREC) REF NO. 2086-2021. During data collection the participants were informed about the study purpose and consent to participate was sought. Names of respondents were not indicated to ensure confidentiality.

Pretesting the research questionnaire

Prior to data collection, the questionnaire was piloted at the Chainama Hills Hospital. Data collection in this exercise was used to evaluate validity of the tools.

Data collection techniques

The dietary data among mental health patients were determined by using a seven-day FFQ. The FFQ questionnaire was designed to collect data on the types and amounts of food consumed by the patients during the previous seven days, as well as the variety of foods consumed. The questionnaire did not have a section on supplements given to patients. The care givers were the respondents. The data from the FFQ were used to establish dietary patterns using principal component analysis. The use of dietary pattern compared to individual foods is recommended when exploring dietary practices related to nutrition epidemiology (Hu, 2002). This study used the food groups from Minimum Dietary Diversity – Women (MDD –W) which was introduced in 2014 by the Food and Agriculture Organization of the United Nations and the Food and Nutrition Technical Assistance Project (FANTA) (FANTA , 2014). According to this indicator, consumption of at least 5 out of 10 food groups shows a better likelihood of meeting micronutrient needs compared to those consuming foods from fewer food groups among women of reproductive age group.

To determine the dietary inflammation index, DII score was calculated using the FFQ and DDQ based on 16 foods with a few modifications, eight pro-inflammation foods (red and processed meat, sugar sweetened drinks, eggs, refined grains e.g. polished rice, and white maize meal and other fish) and the other 8 anti-inflammation foods (green leafy vegetables, dark yellow vegetables, fruit juice, oily fish, coffee or tea, wine and beer or other alcoholic beverages) (Kanauchi et al, 2019). The pro-inflammatory components were scored as 0, +1, +2 points and ant-inflammatory components were scored as 0, -1, or -2 points depending on the food consumption frequency. The total scores ranged from -16 to +16 with a low score (less than one) indicating an anti-inflammatory potential on the diet while a high score (more than one) indicating a pro-inflammatory potential on the diet.

Anthropometric measurements for assessing nutritional status included weight, height and MUAC. A Seca scale and a Seca height board were used to measure body weight and height respectively. MUAC was measured using a color coded non-stretchable MUAC tape with the following colors; red, yellow and green which according to WHO corresponds to severe undernutrition, mild undernutrition and normal. BMI was calculated as weight in kilograms divided by height in meter squared to establish the nutritional status of the participants. The WHO categorizes nutritional status in terms of BMI as follows: Underweight: <Below 18.5; Normal: 18.5 -24.9; Overweight: 25-29.9; Obesity class 1: 30-34.9; Obesity class 2: 35-39.9 and Obesity class 3: > 40

To determine the lifestyle risk factors, data on history of smoking and alcohol consumption were collected from the patient's hospital file respectively. Additionally, levels of physical activity was assessed using the Global Physical Activity Questionnaire (Irazusta, Gil, Ruiz , et al., 2006), which was administered to nurses to answer on behalf of the patients.

Data collected were analyzed to explore the associations between mental health, dietary patterns, nutritional status, and lifestyle risk factors. Additionally, interviews were conducted with key informants such as the psychiatry nurse, nutritionist, doctor, and chef to gain further insights into the nutritional care of mental health patients and how it may affect their mental health outcomes.

Data analysis

Data analysis was done using SPSS version 16.0 software to generate descriptive statistics for the following variables; sex, socio-economic and demographic characteristics, physical activity, dietary patterns, and frequency of consumption of various foods. Means ± standard deviation (SD) were generated for continuous variables such as BMI, age, MUAC after assessing for data normality using Shapiro-Wilk test. Age and MUAC were normally distributed, therefore means ± SD are reported, BMI was not normally distributed as such it is reported as median (Interquartile range). BMI was also categorized into underweight (BMI<18.5), normal (18.5-24.9) and overweight/obese (BMI≥25.0) while MUAC was categorized as normal (≥21.0 cm) and moderately underweight (<21.0 cm).

Thematic analysis was used to ascertain feeding practices and associated challenges faced caregivers using qualitative data obtained from key informants. A table of guiding questions was created to facilitate the analysis of the qualitative data.

CHAPTER FOUR

Results

This chapter presents the findings of the study in line with the specific objectives. The chapter specifically presents results on nutritional status, and lifestyle risk factors of mental health patients admitted to hospital in Lusaka. It also shows the relationship existing between factors such as lifestyle, MUAC and BMI, as well as mental health.

Socio-demographic characteristics

Table 1 shows demographic characteristics of mental health patients. The socio-demographic information was obtained from the hospital files for the patients. The maximum age was 55 years. The mean ± SD age of the participants was 33.3 ± 10.4 years. Half of the participants were below the age of 30 years (50%). Regarding gender, 63.6% of the participants were male. Concerning education levels, half of respondents had attended primary education (50%), fifteen percent reached up-to secondary school (15.9), the other 15.9% attained tertiary education but remaining 18.2% of the participants was unknown. The missing information was due to the fact that some patients were brought into the hospital by either well-wishers or policemen who hardly had background information about the patients. With regard to the geographic location (permanent residence) of the patients, majority came from high density population areas (59.1%), while 36.4% came from middle density populated areas. About five percent (4.5%) of the patient's geographic location was unknown.

Table 1: Socio-demographic characteristics of mental health patients (N=44)

Demographic Characteristics		FREQUENCY (N)	PERCENTAGE (%)
AGE	<30 years	22	50
	31-40years	11	25
	41-50years	8	18.2
	51-60years	3	6.8
	Mean±SD	33.3 ± 10.4	
GENDER	Male	28	63.6
	Female	16	36.4
MARITAL STATUS	Single	29	65.9
	Married	12	27.3
	Divorced	3	6.8
INCOME (K)	None	16	36.4
	Below 1,000	19	43.2
	Between 1,001-3,000	7	15.9
	Between 3,001-5,000	2	4.5
OCCUPATION	Formal	3	6.8
	Informal	21	47.7
	Student	4	9.1
	None	13	29.5
	Unknown	3	6.8
EDUCATION LEVEL	Non	8	18.2
	Primary	22	50
	Secondary	7	15.9
	Tertiary	7	15.9
GEOGRAPHICAL LOCATION	High density area	26	59.1
	Middle density area	16	36.4
	Unknown	2	4.5

Dietary patterns and nutritional status

Dietary patterns

Table 2 shows the proportion of participants consuming foods from different food groups. The study showed that all patients consumed six food groups; grains, roots and tubers, meat, pulses, nuts and seeds, dark green leafy vegetables, and other fruits. No patient reportedly consumed any food from the following food groups; fish and sea food, eggs, dairy, other vegetables and others foods (fast foods e.g. chicken chips, pies, pizza, shawarma, sweetened beverages etc.). Participants consumed more of roots, tubers and cereals as compared to any other food and fruit consumption being the least.

Table 2: Proportion of participants consuming foods from different food groups

Food group	Frequency	Percentage (%)
Cereals, Roots and tubers	44	100
Pulses (beans and lentils)	44	100
Nuts and seeds	44	100
Dairy products	0	0
Meat, poultry and fish	44	100
Eggs	0	0
Dark green leafy vegetables	44	100
Other vitamin A rich fruits and vegetables	0	0
Other fruits Other vegetables	44 0	100 0
Other foods e.g. fast foods	0	0

It was observed that from cereals, roots and tubers, maize was the most consumed followed by rice. Beans was the most consumed food from pulses, followed by soy beans. As for nuts and seeds, only peanuts were consumed. Under meat and poultry, chicken was the most consumed followed by beef. As for dark green leafy vegetables, only rape was consumed. Under other fruits and vegetables, apples, oranges and bananas were consumed equally. None of the patients consumed eggs, fish and sea foods, dairy products, other vitamin A fruits and vegetables as well as other foods (e.g burgers, potato chips, carbonated drinks, tea etc.).

The dietary inflammation index score was calculated based on 16 foods. Of the 16 foods eight were pro-inflammation foods (red and processed meat, sugar sweetened drinks, eggs, refined grains e.g. polished rice, and maize meal and other fish) and the other eight were anti-inflammation (green leafy vegetables, dark yellow vegetables, fruit juice, oily fish, coffee or tea, wine and beer or other alcoholic beverages. The pro-inflammatory components were scored as 0, +1, +2 points and ant-inflammatory components were scored as 0, -1, or -2 points depending on the food consumption frequency. The patients scored 2 out the 16 foods. Table 3 shows the DII scores on both pro-inflammation and anti-inflammation foods.

Table 3: DII scores on both pro-inflammation and anti-inflammation foods

Pro-inflammatory foods	**+2 points (≥ 7 times/week)**	**+1 point (2-6 times /week)**	**0 points (<2 times/week)**
Red meat, processed meat, organ meat	_	_	0
Other fish, eggs, SSB, tomatoes	_	_	0
Refined grains	_	_	_
White bread, white nshima	2	_	_
White rice	_	_	0
Anti-inflammatory foods	**-2 points (>8 times/week)**	**-1 point (5-7 times/week)**	**0 points (<5 times/week)**
Leafy green vegetables	_	_	0
Dark yellow vegetables	_	_	0
Fruit juice, oily fish	_	_	0
Coffee, tea	_	_	0
Wine	_	_	0
Beer /alcohol beverages	_	_	0
Total	**2**	**_**	**0**

DII; dietary inflammatory index; -, no score

Nutritional status

Nutritional status was analyzed in terms of BMI and MUAC. Table 4 shows the results of nutritional status of both male and female mental health patients. Regarding BMI, 61.4% of the mental health patients were within normal range, 29.5% were either overweight or obese while 9.1% were underweight. On the other hand, MUAC also revealed nearly similar results with BMI. Only 9.1% were underweight while 90.9% were within normal range. Overweight and obesity were not detected under MUAC because it is a screening tool for undernutrition, therefore every other patient with the cut-off points above moderate underweight was perceived to be within

normal range. Table 5 shows results of the nutritional status by gender. The study revealed that both BMI and MUAC showed that of the 9.1% participants who were underweight, 3 were male (6.8%) while one was female (2.3%). BMI also showed that 47.7% male and 13.6% female participants were within normal range while 9.1% male participants were either overweight or obese compared to their female counterparts (20.5%).

Table 4: Results of nutritional status indicator in terms of BMI and MUAC

Health indicator	**Frequency (N)**	**Percentage (%)**
BMI		
Underweight	4	9.1
Normal	27	61.4
Overweight and Obese	13	29.5
MUAC		
Underweight	4	9.1
Normal	40	90.9

Table 5: Nutritional status by gender (N=44)

Gender	**MUAC**		**BMI**		
	Normal	Underweight	Underweight	Normal	Overweight and obesity
Male, N(%)	25 (56.8)	3 (6.8)	3 (6.8)	21 (47.7)	4 (9.1)
Female N(%)	15 (34.1)	1 (2.3)	1 (2.3)	6 (13.6)	9 (20.5)
Total	40 (90.9)	4 (9.1)	4 (9.1)	27 (61.4)	13 (29.6)

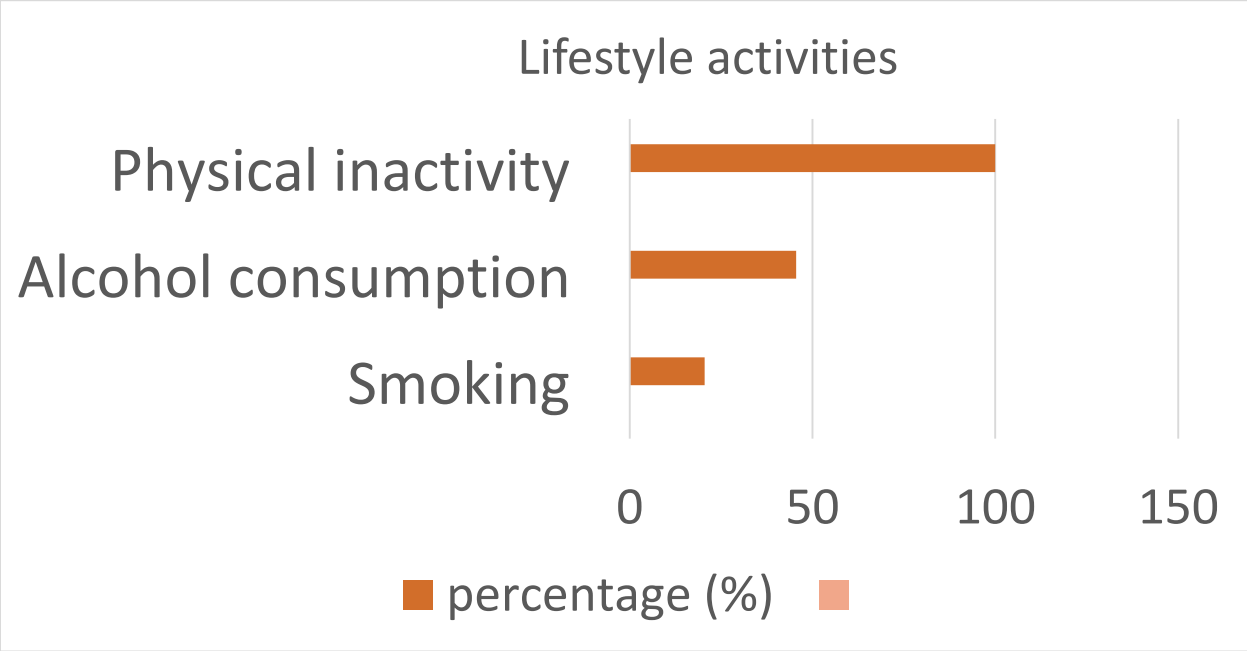
Lifestyle activities and mental health conditions

Lifestyle activities

Figure 2 presents findings on the lifestyle activities of the mental health patients. The findings were that majority of the patients (79.5%) were non-smokers while only 20.5% were smokers.

Regarding alcohol consumption, more than half of the patients (54.5%) consumed alcohol and 45.5% did not. The study also revealed that none of the patients (0%) engaged in any physical exercise.

Figure 2: Lifestyle activities



Mental health conditions

The study revealed five mental health conditions (Schizophrenia, AUD, Bipolar disorder, SUD and Psychosis) among the study participants. Table 6 shows the mental health conditions inclusive of gender among the study participants. Alcohol withdrawal syndrome was the most common (36.4%), followed by Schizophrenia (34.1%), Bipolar (20.5%), Psychosis (6.8%) while SUD was the least (2.3%). The results showed that the males dominated nearly in all the mental health conditions (63.7 %%) except for Bipolar and Psychosis

Table 6: Mental health conditions N=44

Gender.	AUD	Schizophrenia	Bipolar	Psychosis	SUD
Males N(%)	11(25%)	11 (25%)	4 (9.1%)	1 (2.3%)	1 (2.3%)
Female N(%)	5 (11.4)	4 (9.1%)	5 (11.4)	2 (4.5%)	0 (0%)
Total	16 (36.6)	15 (34.1)	9 (20.5)	3 (6.8)	1 (2.3)

Association results

Associations could not be analyzed because the main exposure which was diet, did not vary across all the patients. The other exposure that did not vary was physical activity. None of the patients participated in physical exercises. Nutritional status on the other hand varied across all patients but it could not be correlated with diet and physical activity because they were the same. Additionally, the sample size was also too small**.**

Key informant interviews

This section presents the results from the key informant interviews. The interviews were conducted with a chief caterer, a nutritionist, and the hospital's head of department. Emerging themes included nutrition practices, challenges, and mental health policy. The following sections include a brief summary of the key informant interviews information, highlighting the main themes with use of direct quotations.

Nutrition practices

The first theme emerging from the interviews related to the nutrition practices of healthcare professionals and support staff. This included nutrition assessments, the sources of information on nutrition that healthcare workers access, the types of special foods served to patients as well as critically ill patients, and the handling of donated foods. The interviews revealed that nutritionists conduct anthropometry (weight, height, and MUAC) assessments, as well as assess for dehydration, pellagra, sores on the feet and mouth, hair changes, and burns.

The main source of nutrition advice for the chief caterer was the nutritionist who assessed patients upon admission and made recommendations for their dietary needs. The chief caterer also mentioned listening to the radio to stay informed on nutrition. Regarding special diets for critically ill patients, nurses and nutritionists prepared smoothies in rare cases, but otherwise patients were transferred to other hospitals where special diets are provided. The special foods mentioned by the care givers to critically ill patients were mostly liquids and blended foods such as apples, bananas, sour milk, and peanut butter.

"We normally prescribe sour milk for patients with gastro intestine truck malfunction. When funds are available, we also buy bananas, sour milk peanut butter and apples, then we make smoothies which are given to the nurse to give to the patients. But for the usual diet, we serve them samp mixed with groundnut powder for breakfast, then mid-morning we serve rice mixed with groundnut powder, as for lunch and dinner, we normally nshima with either chicken, beans or beef. The patients are also served vegetables at least 3-4 times a week and fruits either bananas, oranges or apples once a week" Nutritionist.

"We usually have many cases of AUD who present with vitamin B_3 (niacin) deficiency evidenced by pellagra, such patients are put on diets rich in green leafy vegetables as well as green smoothies which have green vegetables." Nutritionist.

The hospital receives donations in terms of food, clothes and bedding for the mental health patients admitted to the hospital. The chief caterer stated that only uncooked foods such as maize meal, chicken, cooking oil, and Fanta were allowed and were primarily received on special occasions such as Youth day, Christmas, and New Year's Day.

"Yes, occasionally we receive donations but it is not significant to bumper our yield. Sometimes they bring bags of maize meal and cooking oil, which supplements our budget. We do not allow fish because patients are not able to debone the fish on their own and nurses cannot do it due to limited human resource" - Doctor.

"We request the donors to put it in writing whenever they want to bring in donations because we are a public institution and we like to be accountable for what is administered to our patients."

"Also for the purpose of records, follow-ups in case of anything and acknowledgment. We do not allow cooked foods from outside because of diarrhea cases and the patients do not have bedsides to take care of them. We do allow food like bread and drinks from reputable places and foods that have been approved by bureau of standards. For those that want to cook for the patients, we allow them to bring raw food and then our team supervises them closely" - Doctor.

Challenges

The HoD identified challenges such as working with a limited budget, difficulties in feeding violent patients, and managing the food supply. The most critical challenge cited by the key informants was limited funds.

"Funds allocated to the mental health budget are very low," Psychiatry nurse.

"When it comes to nutrition, we do not have a lot funds, so we work within what is available." We distribute fruits to the patients once a week due to limited funds" Nutritionist.

"Yes, because we work within a limited budget, we have to buy food as well as drugs," Alternatively, there was a time when we had a farming project which was meant to supplement the diet but it was not consistent. We had a poultry but heavy rains ruined it and we did not fix it. We also had a garden but it did not work too because water was limited due to water regulations" Doctor.

Respondents also reported challenges when dealing with violent patients who are unpredictable, which made it difficult to measure certain assessments or trust them when feeding them.

"For patients who are restless, it is difficult to feed them because they cannot eat on their own so we use nasogastric (NG) feeding tubes but this patient cannot tolerate the NG tube and definitely will remove it. So that becomes a challenge because you need corporation," Psychiatry nurse.

The need for community psychiatric nurses in communities also paused to be challenge because there is no sensitization on mental health in communities.

"Most communities are knowledge deficient about mental health and that's why we have a lot of cases AUD and SUD at the hospital. Mental health information is normally limited to the patient's

relatives and not the community large because we only sensitize the patient's relatives as they come to the hospital. The sad thing is that most of the trained community psychiatric nurses are deployed in hospitals, so there is no one to sensitize the community at large about mental health especially about the effects of alcohol and substance," Psychiatry nurse.

Another challenge cited was that some parents or guardians abandon patients by providing incorrect contact information, which makes it difficult to trace them when discharging the patient; hence they become residents of the hospital. Lastly, the respondents also mentioned that the patients do not do physical exercises during their hospital stay.

"*We are very much aware that physical exercise is good for mental health, unfortunately our patients do not exercise. In the past, we used make them busy by making them do a little garden work, but the labor office stood up for them and stopped us from making them work because we did not pay the patients"* Doctor.

Mental health policy

There are various policies in place to address mental health, some aimed at reducing and preventing mental health disorders, while others are for managing the conditions. The policies aimed at reducing mental health disorders include alcohol policy, narcotics, and bill act, while the policies aimed at managing the conditions include nursing documents, tobacco policy, and the mental health act. The head of department (HoD) stated that nutrition services formed part of the hospital's mental health policy. Staff participate in budgeting for food for patients, including the distribution of fruits once a week. They also prescribe supplements such as omega 3, multivitamins, and certain types of fish. The HoD also suggested that the mental health policy should incorporate increased supplementation, and a diverse diet that caters for key micronutrients.

"We have treatment guidelines, alcohol policy, nursing documents, tobacco policy, nutrition and mental health act. Among these policies, others reduce and prevent mental health disorders while others are about management of the mental disorders. The policies aimed at reducing mental health disorders are alcohol policy, narcotics and bill act which covers things like cannabis which are high risk factors of mental health. Once the alcohol policy is well implemented, we expect less

cases of AUD. When you visit the ward, you will find that most of the patients in both female and male wards are victims of harmful use of alcohol and substance use." Doctor.

"If only the government and the hospitals can come up with policies on how to disseminate information to the society, that would reduce mental illnesses by giving people the right information. In the previous four months, we had so many suicide cases and all that is mental illness because for someone to reach an extent of taking their life, it means that it is the brain that was working and that is psychiatry. The current act limits mental health education to the relatives of the patients, for example, if the patient is brought to the facility and am on duty, I will give them mental health education. But when you are working as a community mental health nurse, you can disseminate information to the community unfortunately the community mental health nurses are deployed in the hospital," Psychiatry nurse.

CHAPTER FIVE

Discussion

The present study was conducted to assess the dietary patterns, nutritional status and lifestyle factors of mental health patients at Chainama Hills hospital in Lusaka, Zambia.

Socio-demographic characteristics

The findings of the study showed that half (50%) of the patients were below the age of 30 years. These results are consistent with the STEPS survey whose findings revealed that majority of the mental health patients were among the youths. The study also highlighted gender based differences where more men (64%) than women had mental health disorders. This is in line with other studies whose results revealed that the male gender have an increased risk of childhood developmental and behavioral disorders, such as early-onset schizophrenia, attention deficit hyperactivity disorder and autism spectrum disorder (Bale & Epperson, 2015: Robson et al., 2020). It is well known that people with mental health disorders often encounter negative social outcomes as they have a greater likelihood of experiencing difficulties in forming and maintaining relationships and inadequate social support (Wang et al., 2018). Marital status emerged as an important factor as it was observed that more than half (66%) of the mental health patients were single. These results could imply that married people have a lesser risk of developing mental health disorders. These findings are consistent with other studies who observed that married people tend to have better mental health than unmarried due to marital social support (Vaingankar et al., 2020: Feder et al., 2019). The other reason that can explain why marriage reduces the risk is that, in marriage, there is family support, care, and provision of food and high sense of responsibility for partners. On average, being married is associated to lower levels of anxiety, depression, substance use and suicide risk (Karakose, 2022). Majority (80%) of the patients earned very little income (less than k1000). It has been reported that unemployment, little or no income is associated with high risk of developing mental health disorders (lund et al 2018). More than half (68%) of the mental health patients only attained either primary or no education at all. These findings are consistent with Franzen et al., (2020) whose study concluded that lower levels of education and literacy were risk factors of development of mental health disorder like dementia, while higher education levels was believed to affect the brain by increasing vascularisation, generating cognitive reserve and

resilience against dementia. In Zambia, a study by Makamo (2017), also showed that nearly half (40%) of the mental health patients had attained some primary or no education at all. This clearly shows that the level of education could be a risk factor for mental health disorders. Results also showed that more than half (59.1%) of the mental health patients came from high density populated areas (rural areas). These findings are consistent with another Zambian study (Munakampe, 2020). In rural areas, houses are in close proximity with taverns and bars where age restriction is less enacted, hence more youths abuse alcohol and other substances like marijuana and tobacco. Additionally, poor housing as well as overcrowding due to low income, are also associated with increased risk of common mental health disorders in adults (Patel et al., 2018).

Dietary patterns

The findings of the study showed that the mental health patients consumed six food groups out of the ten food groups for the Individual Dietary Diversity Score (IDDS). The IDDS was used to establish the dietary diversification of food. The MDD-W uses ten food groups (Table 3). According to this indicator, consumption of at least 5 out of 10 food groups shows a better likelihood of meeting micronutrient needs compared to those consuming foods from fewer food groups. The study revealed that the mental health patients met the cut-off point for food diversity which is five out of ten food groups. Some components of a well-balanced diet which are also typical of a Mediterranean diet and beneficial for mental health include leafy greens, other vegetables, olive oil, dairy beverages, fish and seafood, legumes and nuts (LaChance & Ramsey, 2015). Fish is a rich source of omega 3 fatty acids which are good brain health. The omega 3 fatty acids are essential because they have anti-inflammatory properties, act as anti-oxidants and also play a role in the central nervous system, specifically neurotransmission (LaChance & Ramsey, 2015). However, fish was not part of diet, as patients are unable to de-bone fish on their own due to their mental health state. Despite meeting the dietary diversity, the study revealed that the frequency of fruit consumption was once per week while vegetables was 3-4 times per week, which is not consistent with the WHO recommendation for the consumption of five portions of fruits or vegetables daily. This was due to the hospital's limited budget. Regular fruit and vegetable consumption is believed to have a positive influence on general mental health (Peltzer & Pengpid, 2017: Richard et al., 2015). Several studies suggest that an increase in consumption of fruits and vegetables to the recommended level may produce a measurable effect (Ocean et al., 2019: Lesani

et al., 2016: Mujcic & Osward, 2016). Nevertheless, every increase of consumption of fruits and vegetables results in the enhancement of well-being, boosts happiness, and decreases depressive symptoms (Bishwajit, O'Leary, Ghosh, & Sanni, 2017).

Dietary inflammation index

The study findings show that the DII of the patients was +2. This indicated that the diet had a high inflammatory potential. The patients scored zero for all anti-inflammatory foods and +2 for pro-inflammatory foods. This indicates that the diet consumed by patients had an inflammatory potential according Kanauch et al., (2019) whose study concluded that a score above +2 implied that the diet had an inflammatory potential. Other studies suggest that those who consume pro-inflammatory diets are likely to be diagnosed with depressive symptoms when compared with those on anti-inflammatory diets (Tolkein et al., 2019).

Additionally, many studies have concluded that adherence to a healthier diet such as the Mediterranean diet is associated with a decrease in depressive symptoms (Lassale et al., 2018: Molendijik et al., 2018). Mechanisms by which a pro-inflammatory diet may enhance the risk of depressive symptoms could be through pro-inflammatory nutrients triggering the innate immune system that can lead to low-grade inflammation and chronic diseases such as diabetes, cardiovascular diseases and mental health (Cordain et al., 2005: Bosma-denBoer et al., 2012).

Nutritional status

Nutritional status was assessed by BMI and MUAC. Several studies (Schaap et al., 2018: Reber et al., 2019: Musa et al., 2022) support the use of BMI and MUAC to determine the nutritional status of large populations as they are reliable tools and provide comparable measures. With regard to BMI, 9.1% were underweight, 61.4% were within the normal range while 29.5% were either overweight or obese. MUAC on the other hand showed similar results. 9.1% patients were underweight and 90.9% were within the normal range because MUAC is a screening and assessment tool for nutritional status but it does not classify overweight and obesity, therefore everyone having a MUAC above 22cm is perceived to be normal. More females than male patients were either overweight or obese. This could be because of the psychotropic drugs that induce appetite and weight gain (Firth et al., 2019). Other studies have reported that females are associated

with eating disorders and anxiety compared to the males (Becker et al., 2017). The other reason for the detected overweight and obesity could be attributed to the fact that the patients do not engage in physical exercise during their hospital stay as it is not part of their treatment regime.

Interestingly, of the patients that were either overweight or obese, their MUAC results were in range of 27-35cm. These findings are consistent with other studies (Benitez Brito et al., 2016: Van Tonder et al., 2019: Thorup et al., 2020) which found a strong relationship in terms of results from BMI and MUAC. This relationship suggests that both MUAC and BMI can possibly provide comparable measures for nutritional status categorization in adults with similar demographic characteristics.

Lifestyle risk factors

Information on lifestyle factors that may influence mental health such as physical exercise, smoking and alcohol abuse was obtained from the patient's hospital files and nurses. The findings of this study indicated that physical inactivity, alcohol consumption and smoking contributed to mental health disorders, with physical inactivity being the major and smoking the least factor. This is consistent with other studies (Vaucher et al., 2018: Awaworyi Churchil, 2017: Mikkelsen et al., 2017) whose findings support the potential link between these factors & mental health disorders. In spite of this, the causal link between smoking and mental disorders seem controversial as observational findings can always be hindered by confounding factors such as socioeconomic, demographic, personal history, family history as well as environmental markers (Large, Di Forti & Murray, 2015: Csete et al., 2016).

Nearly half of the patients had a history of alcohol consumption, which could explain AUD being the highest (36%) mental health disorder in patients. In Zambia, it is well known that alcohol consumption has been on the rise especially among adolescents. These results are comparable to a study by de la Torre-Luque et al. (2021) that found that Zambia has the highest prevalence of regular alcohol use among adolescents. Additionally, according to the World Health Organisation (WHO, 2015) Zambia is among the African nations with the highest alcohol consumption. The prevalence of alcohol consumption in Zambia among adolescents is 53% (DEC, 2018) which is very high. In Zambia, the lifestyle in rural areas contributes a lot to high alcohol consumption because the bars are near homes, alcohol is cheap and there is a lot of peer pressure among young

adults. A study by Mungandi et al. (2022) revealed that unemployment, poor parental guidance, boredom, rebellion among adolescents, experimentation and fragile alcohol regulatory measures, contributes to the high consumption of alcohol among adolescents Zambian rural areas. Alcohol induced disorders and substance use disorders varied by gender, more men had AUD and SUD compared to their female counterparts. This is consistent with other studies that observed a higher risk of substance abuse in men (Lund et al., 2018: Becker et al., 2017). Many studies support that increased alcohol consumption is strongly associated with mental health (Awaworyi Churchil, 2017: Sapranaviciute-Zabazlajeva et al., 2017: Stranges et al., 2014).

Despite the growing evidence (Biddle, 2016: Marx et al., 2017: Mikkelsen et al., 2017: Grave, 2020) on the use of exercise as non-pharmacological methods to improve mental health, the study revealed that none of the patients were engaged in physical activity as it is not part of the treatment protocol of the patients. These results are inconsistent with recent international guidelines that recommend physical exercise as first line treatment for mild/moderate depression and as an intervention for severe mental illness (Firth et al, 2019). According to literature, patients with mental health disorders benefit from exercise interventions through psycho-behavioral mechanisms, physiological, neurobiological and immune system (Mikkelsen et al, 2017). Exercise also boosts self-esteem of patients with mental health disorders and distracts them from negative moods (Middelkamp et al, 2017).

Associations

The associations between mental health, diet, nutritional status and lifestyle could not be analyzed. This was due to the findings of the study. The main exposure was diet, and the findings showed that the patients were fed a monotonous diet regardless of their different mental health conditions. The other finding was physical inactivity among the patients. The study showed that physical activity did not vary across all patients because none of them were involved in physical exercises. The other contributing factor was the sample size which too small and there was no comparison group.

Key informants

The care givers revealed overall satisfaction with information on nutrition mental health care. Nutrition mental care was suggested to not be a one man's show but a multidisciplinary service because it involves many players such as the doctors, nurses, nutritionist, chefs, ward assistants as well as the maids. All these were said to have significant roles to play in order to achieve their goals. The care givers indicated that the mental health patients are fed four times daily in order to improve their nutritional status during their hospital stay. The care givers wish to give fruits at least on a daily basis but are unable to do so due to their limited budget, hence patients are given once a week. This is inconsistent with what many studies that have reported about increased consumption of fruits and vegetables being associated with increased happiness and higher levels of mental health and well-being (Conner et al., 2017: Jacka, 2017: Emerson & Carbet, 2019: Ocean, Howley & Ensor, 2019). The care givers are also aware about the importance of physical exercise in mental health patients and this is consistent with reports about the inverse relationship between physical exercise and mental health (Schuch et al., 2019: Firth et al., 2019). Unfortunately, patients do not do any physical exercise during their hospital stay. The doctors explained that the labour office stopped them from engaging them in any environmental maintenance works around the hospital because they did not pay them. The doctor and psychiatry nurse explained that the alcohol policy has not been well implemented, that's why almost half the patients had a history of alcohol abuse. Their explanation is consistent with the findings of Mungandi (2022) who reported alcohol measures in rural areas were fragile and led to high alcohol consumption. The psychiatry nurse mentioned that there are no community psychiatry nurses working in communities because all the community psychiatry nurses are deployed in the hospitals. This could contribute to why most mental health disorders are found in the rural areas because they are lacking sensitization from the health professionals. Sensitization about mental health from the health professionals in communities would help people in rural areas to become aware and more knowledgeable about mental health and this could lead to a reduction in mental health disorders. The care givers were not satisfied with the funds allocated to the mental health budget because it limits their expenses such as drugs, food, clothes as well as bedding for the patients. Occasionally, particularly on public on holidays, their budget is supplemented by food donations from well-wishers. The care givers further suggested that the alcohol policy be well implemented to reduce cases of AUD and SUD

Study limitations

The present study is subject to limitations that must be taken into consideration when interpreting the results. The primary limitation is the small sample size of only 44 participants, which is substantially lower than the calculated sample size of 320. This limited sample size could affect the generalizability of the findings and the statistical power of the data analysis.

The small sample size may limit the ability to identify significant differences between groups, reducing the validity and reliability of the results. To mitigate this limitation, the study incorporated qualitative data from caregivers to triangulate the findings, which helped to provide a more comprehensive understanding of the results.

Despite the limitations posed by the small sample size, this study contributes to the field of nutrition and mental health and highlights the need for further research in this area. Future studies with larger sample sizes may be able to confirm the current findings and enhance the generalizability of the results.

CHAPTER SIX

Conclusion and recommendations

Conclusion

This study provides important insights into the dietary and lifestyle patterns of mental health patients. The study findings showed that the patients met the minimum dietary diversity despite their diet having a pro-inflammatory potential. The results suggest that there may be a need for dietary interventions to reduce the pro-inflammatory potential of patients' diets. Regarding nutritional status, only 9% were underweight while 30% were either overweight or obese. This highlights the need to monitor the nutritional status of patients, especially those who may be at risk of malnutrition owing to their mental health condition.

The study further showed that lifestyle risk factors contribute to mental health disorders especially physical inactivity. Additionally, nearly half of the patients had AUD, with a higher proportion of affected men. This finding emphasizes the need for community sensitization of the effects of alcohol and substance abuse. The study did not establish any correlations because the main exposure (diet and physical activity) did not vary across all patients and the sample size was too small.

Recommendations

- Dietary interventions: Healthcare professionals should provide patients with personalized dietary interventions that aim to reduce the pro-inflammatory potential of their diets. These interventions could include increasing the intake of anti-inflammatory foods, reducing the intake of pro-inflammatory foods, and incorporating dietary supplements that may help reduce inflammation.

- Nutritional status monitoring: Patients should be routinely monitored for their nutritional status to identify those who are at risk of malnutrition. The monitoring could include assessments of BMI, mid-upper arm circumference (MUAC), and other relevant anthropometric measures. Patients who are identified to be at risk of malnutrition should receive appropriate nutritional interventions to improve their nutritional status.

- Exercise interventions: As exercise is known to have many benefits for mental health, patients should be encouraged to engage in physical exercise. Healthcare professionals could provide personalized exercise interventions that are tailored to the patient's needs and capabilities. Exercise interventions could include walking, yoga, or other types of moderate-intensity exercises.

- Screening and early intervention for AUD: As nearly half of the patients had AUD, it is important for healthcare professionals to screen all patients and provide early intervention for those who are affected. This could include community counseling and awareness programs, support groups, or pharmacotherapy, depending on the severity.

- Larger studies: To establish correlations and identify potential interventions that could improve the overall health and well-being of patients, larger studies with a more representative sample size are needed. These studies could provide further insights into the dietary and lifestyle patterns of patients, and identify potential interventions that could help improve their overall health and well-being.

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APPENDICES

Appendix i: Information sheet

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

NUTRITIONAL STATUS, DIETARY ASSESSMENT AND RISK FACTORS OF MENTAL HEALTH PATIENTS ADMITTED TO HOSPITAL IN LUSAKA, ZAMBIA

INFORMATION SHEET

This information sheet is for mental health patients and care givers at the hospital who will take part in the research study.

Introduction

I am a student at the University of Zambia, studying a MSc Human Nutrition and carrying out this research as part of the University requirement. You are invited to participate in this research study. Before you take part in this research, it is important for you to understand why this research is being carried out. Please read the information carefully.

What is the purpose of the study?

The purpose of this study is to determine level of physical activity, dietary intake and nutrition status, risk factors and to evaluate the possible associations between them. This will involve asking the participant questions about their food consumption, level of physical activity, smoking frequency and taking down anthropometric measurements (waist, hip and mid upper arm circumference).

Why have I been invited to take part?

You have been chosen to participate in this research because you are a mental health patient admitted to the hospital. We trust that the results from this research will generate information that

will fill in the existing knowledge gap on the relationship between nutrition, risk factors and mental of adults.

Do I have to take part?

It is entirely up to you to choose to whether or not to participate. If you decide to participate, you will be given the participant's information sheet to keep and a consent form to sign. If you decide not to participate, you are free to withdraw at any point without giving any reason.

What are the possible disadvantages of taking part in this study?

The possible disadvantage of this study is that there will be physical body contacts when taking down anthropometric measurements (waist, hip and mid upper arm measurements).

Is my information in this study going to be kept confidential?

All information collected from individuals will be handled with strict confidentiality. Our intention is not to share information obtained with anyone outside the research but will be shared with the University of Zambia.

Who should I contact?

For further information about the study, you can contact

The researcher: Thandiwe Zulu
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Department of Food Science and Nutrition

Appendix ii : Participants consent form

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

Participants consent form

I clearly understand that participating in this research is entirely voluntary and that I can choose to withdraw from it at any point without giving a reason. I hereby give consent to take part in the study titled "*Nutritional status, dietary assessment and risk factors of mental health patients admitted to hospital in Lusaka, Zambia*."

Signature of respondent: …….

Date: …….

Signature of researcher: ……. Date:……

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Appendix iii : Study questionnaire

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

Nutritional status, dietary assessment and risk factors of mental health patients admitted to the hospital in Lusaka, Zambia

STUDY QUESTIONNAIRE

Instructions

This questionnaire shall be administered to mental health patients admitted to the hospital in Lusaka. The researcher shall introduce herself to and make respondents understand the scope of the study and the type of information needed. Before proceeding to administer the questionnaire, the consent form will be given to the respondent for review and then both parties will sign.

Identification

District:…….

Respondent's ID Number…….

Date of interview:……

SECTION A

Socio-economic and demographic

Cross out appropriate answers by marking it with 'X' and fill in the spaces provided according.

1.	Sex of Respondent (observe and record)	
2.	How old are you?	……years
3.	What is your marital status?	Married……01 Divorced……..02 Single……...03
4.	Where is your geographical location?	
5.	What is your level of education?	Primary level (grade1-7)…….01 Secondary level (grade 8-12)……..02 Tertiary level (college/university)……..03
6	How much money do you earn at the month end (salary, wage or gift)	Below K1000……..01 Between K1000 – K3000……02 Between K3000 -K5000…….03 Above K5000…….04 None……..05
7	What is your mental health condition?	
8	What is the type of current medication?	

SECTION B

Behavioral characteristics and physical activity

7.	Do you smoke? (If the answer is no, skip to question 9)	Yes……..01 No……..02
8.	Have you smoked in the last 30 days?	Yes……..01 No……..02
9.	Do you consume alcohol? (If the answer is no, skip to question 11)	Yes……..01 No……..02
10.	Have you consumed alcohol in the last 30 days	Yes……..01 No……..02
11	Do you do physical exercises, e.g. running, jogging, jumping, aerobics? (If the answer is no, skip to section C)	Yes……..01 No……..02
12.	What is the main reason why you exercise?	General health…….01 Enjoyment……02 Maintain or lose weight……03 Stress relief…….04 Strength……..05 Fitness…….06 Self-esteem…….....07 Other specify…….
13.	Did a doctor/medical practitioner prescribe physical activity to you?	Yes…….01 No……..02

Physical Activity

12	How often do exercise?	0-1 Times/week	2-4 Times/week	5+ Times/week		
13	What is the intensity level of your exercise?	Light* (Normal walking, walking downstairs, bowling, mopping, etc.)	**Moderate – (Brisk walking, lawn mowing, shoveling, social dancing, etc.)	Heavy*** (Jogging (5mph, 12 min mile), cycling (13mph), skiing, fencing, etc.)		
14	What type of exercises do you do?	Flexibility (e.g. yoga)	Aerobic	strength	Recreational/competitive sports	Other (specify
15	What kind of movements do you do most during the day apart from your usual exercise?	Sitting	standing	Walking	Cycling	Other (specify
16	What kind of activities do you during the day related to lifting? During the day related to lifting?	Don't often lift loads	Light loads	Moderate loads	Heavy loads	Other (specify)

SECTION C

Anthropometry

Waist circumference (cm)

Hip circumference (cm)

MUAC (cm)

Weight

Height

SECTION D

Instructions: This section shall be administered to the care givers

- Read the food item list in column 1
- In the past week, how often have you given the foods listed?
- Mark only one X for each food consumed often.
- Please answer the questions in the best possible manner

Food Frequency

FOOD CATEGORY	Food consumed Yes/No	Once a week	2-4 times/week	5-6 times a week	Once a day	2-3/day	4-5/day	6+/day
a. Grains, roots and tubers								
Maize								
Millet								
Rice								
Wheat								
Sorghum								
Cereal blend. Specify……								
Others fruits specify……								
Munkoyo								
Cassava								
Sweet potato								
Irish potato								

Others, specify……	
b. legumes and nuts	
Soy beans	
Beans	
Cow pea	
Peanuts	
Hazel nuts	
Others (specify)…	
c. Vitamin A rich vegetables and fruits	
Spinach	
Bondwe (Amaranth)	
Rape	
Chibwabwa (pumpkin leaves)	
Carrots	
Sweet potato leaves	
Other vegetables, specify……	
Examples of fruits: guava, papaya, mango	
d. Other fruits and vegetables	
Apples	
Oranges	
Bananas	
Other, specify……	
e. Milk and milk products	
Fresh milk	
Sour milk	
Powdered milk	
Skimmed milk	
Yogurt	
Cheese	
Other, specify	
f. Eggs	
Chicken eggs	
Duck eggs	

Quail eggs	
g. Fish and other sea foods	
Kapenta	
Fish	
Prawns	
Crabs	
Other, specify	
h. Flesh foods	
Chicken	
Pork	
Beef	
Lamb	
Turkey	
Others (specify)…..	
i. Organ meat	
Liver	
Kidney	
Gizzard	
Offal's	
Other, specify	
j. Other foods	
Fats (butter)	
Beverages (sweetened drinks, tea and carbonated drinks)	
Sweets	
Fast foods (pies, samosas, burgers, chips, hungry lion, pizza	

SECTION F

POLICY: Key informants

1. Psychiatrist Nurse/Doctor

1. What is the current mental health policy in regard with reducing or averting mental disorders?	
2. Have you ever considered including nutrition in the mental health policy as a preventive or curative measure?	
3. What challenges do you face with the current mental health policy in relation to nutrition?	
4. What aspects of the mental health policy in relation to nutrition would you like to modify and why? 5. How do you ensure that each patient has eaten including those in the seclusions? (nurse only)	

2. Chief caterer

1. Do you ask for nutrition advice from nutritionists or dieticians?	
2. What other sources of information on nutrition do you access (clinics, hospitals, social media, TV, radio, friends/friends)?	
3. Do you cook or serve special foods other than the usual meals for critically ill patients?	
4. Do you receive food from outside e.g. from donors, well-wishers or churches? If so, what type of food do you receive and how do you handle it?	
5. Do you face any challenges when accessing, preparing or delivering meals for patients?	

3. Nutritionist

1. Do you do any nutrition assessments in the wards? If so, which ones?	
2. What challenges in relation to nutrition do you face when you are in wards?	
3. Apart from nutrition assessment, what other roles/activities do you participate in, in relation to mental health nutrition?	
4. How do you handle critically ill patients with nutrition disorders?	
5. Do you prescribe special foods for critically ill patients with nutrition disorders other than the usual meals prepared?	
6. What challenges do you encounter in relation to nutritional care for the mental health patients?	

Appendix iv: Ethical Approval

UNIVERSITY OF ZAMBIA
BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: +260 977925304
Telegrams: UNZA, LUSAKA
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Fax: + 260-1-250753
Federal Assurance No. FWA00000338

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia
E-mail: unzarec@unza.zm
IRB00001131 of IORG0000774

14th February, 2022

Your REF. No. 2086-2021

Ms. Thandiwe Zulu,
University of Zambia,
School of Agricultural Sciences,
P. O Box 32379,
Lusaka.

Dear Ms. Zulu,

RE: NUTRITIONAL STATUS, DIETARY ASSESSMENT AND RISK FACTORS OF MENTAL HEALTH PATIENTS ADMITTED TO HOSPITAL IN LUSAKA, ZAMBIA (REF. NO. 2086-2021)

The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee on 26th January, 2022. The proposal is **approved**. The approval is based on the following documents that were submitted for review:

a) **Study proposal**
b) **Questionnaires**
c) **Participant Consent Form**

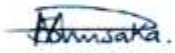
APPROVAL NUMBER : REF. 2086-2021

This number should be used on all correspondence, consent forms and documents as appropriate.

- **APPROVAL DATE : 14th February 2022**
- **TYPE OF APPROVAL : Standard**
- **EXPIRATION DATE OF APPROVAL : 13th February 2023**
  After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the UNZABREC Offices should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING**: All SAEs and any other serious challenges/problems having to do with participant welfare, participant safety and study integrity must be reported to UNZABREC within 3 working days using standard forms obtainable from UNZABREC.
- **MODIFICATIONS**: Prior UNZABREC approval using standard forms obtainable from the UNZABREC Offices is required before implementing any changes in the Protocol (including changes in the consent documents).

- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the UNZABREC using standard forms obtainable from the UNZABREC Offices.
- **NHRA:** You are advised to obtain final study clearance and approval to conduct research in Zambia from the National Health Research Authority (NHRA) before commencing the research project.
- **QUESTIONS**: Please contact the UNZABREC on Telephone No. +260977925304 or by e-mail on unzarec@unza.zm.
- **OTHER**: Please be reminded to send in copies of your research findings/results for our records. You are also required to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study. Use the online portal: unza.rhinno.net for further submissions.

Yours sincerely,



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