FACTORS CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS IN PRIMARY HEALTH CARE FACILITIES IN LEPELLE-NKUMPI SUB-DISTRICT, LIMPOPO PROVINCE

By

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DEDICATION

The following people are honoured by this scientific work:

- My mother, my wife (Smonkie), my sons (Leago, Letago and Modise).

DECLARATION

I declare that **FACTORS CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS IN PRIMARY HEALTH CARE FACILITIES IN LEPELLE-NKUMPI SUB-DISTRICT, LIMPOPO PROVINCE,** was never submitted to another university or for a different degree before**.** All sources that I have used or quoted have been acknowledged with detailed references.

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Audrey Lehlogonolo Mashita   Date

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ABSTRACT

Background: Obesity is a significant public health issue worldwide, affecting various populations including healthcare workers. This research aims to look into the factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of Limpopo Province, South Africa.

Method: Data were gathered from a sample of 174 healthcare workers using self-administered questionnaires as part of a quantitative and cross-sectional study design. The questionnaire included sections on sociodemographic characteristics, lifestyle factors, dietary habits, physical activity levels, and workplace-related factors. Based on their Body Mass Index, participants were categorized as underweight, normal weight, overweight, or obese. The data were analyzed with the Statistical Package for Social Science version 28 and descriptive statistics. Relationships were calculated at a 95% confidence level using the Chi-square test, and a p-value of 0.05 was deemed statistically significant.

Results: The study found that 9.8% participants were severely obese, 38.5% were obese, and 27.6% were overweight. Several factors contribute to obesity amongst healthcare workers in the clinics of the Lepelle-Nkumpi sub-district. These factors include inadequate physical activity, poor habits and lifestyle behaviours, sedentary behaviour during leisure time, exposure to restaurants, unhealthy dietary habits, and workplace environmental factors or a demanding profession.

Conclusion: These findings highlight the need for interventions targeting healthcare workers' obesity in clinics in the Lepelle-Nkumpi sub-district. Strategies such as workplace wellness programs, promoting physical activity during working hours, providing healthy food options in the workplace, and enhancing awareness and education on healthy lifestyle choices are recommended. A weight management program is also needed.

Keywords: Obesity, Lifestyle factors, Body mass index, Primary healthcare workers, Lepelle-Nkumpi sub-district.

ABBREVIATIONS

BMI: Body mass index

CDC: Centre for Disease Control and Prevention

CPC: Centres for Psychological Care

CVD: Cardiovascular diseases

DGA: Dietary Guidelines for Americans

DRC: Democratic Republic of Congo

EU: European Union

FFQ: Food Frequency Questionnaire

FBDGs: Food Based Dietary Guidelines

GDP: Gross Domestic Products

HCW: Health care workers

HR: Human Resource

HRQoL: Health Related Quality of Life

LMICs: Low Middle Income Countries

LTPI: Leisure Time Physical Inactivity

MDT: Multidisciplinary Team

NICHD: National Institute of Child Health and Human Development

NCD: Non-Communicable Diseases

NHS: National Health Services

OECD: Organization for Economic Co-operation and Development

PA: Physical Activity

PHC: Primary Health Care

PI: Physical Inactivity

PIC: Pacific Island Countries

PRIMASYS: Primary Health Care Systems

SADC: Southern African Development communities

SES: Socioeconomic Status

SPSS: Statistical packages for social Sciences

SSBs: Sugar-Sweetened Beverages

TREC: Turfloop Research Ethics Committee

T2DM: Type 2 Diabetes Mellitus

USA: United States of America

UAC: Upper Arm Circumference

UK: United Kingdom

UN: United Nations

WHO: World health Organization

ZAR: South African Rand

DEFINITIONS OF CONCEPTS

Anthropometric measurement is characterized as the science that establishes the physical dimensions of a person's form, size, and functional capabilities (CDC, 2022). In this study, anthropometric measures refer to the calculation of body mass index through measuring weight and height.

Body mass index (BMI) is determined by multiplying their height in meters by the square of their weight in kilograms (kg/m^2) (World Health Organization, 2021). In this study the same definition is used as it is.

Contributing factors is something that contributes to the development or occurrence of a phenomena (Collins, 2022). In this study contributing factors refers to physical activity, eating behaviour and environmental factors.

Obesity is characterized as "abnormal and excessive fat accumulation that may harm health with body mass index of $30kg/m^2$ (Muller, 2017). This study uses the definition as is.

Primary Health Care (PHC) is an all-encompassing strategy that covers illness prevention, treatment, and management, palliative care, and health promotion (WHO, 2020). In this study PHC refers to fixed and mobile clinics.

Health Workers are all people primarily engaged in actions with the primary intent of enhancing health(WHO,2006). In this study in involves anyone employed and working in the PHCs

Healthcare workers Is defined as individuals working who are employed, contracted or volunteer to provide services at a healthcare facility (cook country, 2021). In this study Healthcare worker refers to anyone employed and working in the fixed and mobile clinics.

CHAPTER ONE: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

An overview of the research is provided in this chapter on obesity and contributing factors. It shows how common obesity is and overweight on a global scale, other continents, Africa, Sub-Saharan Africa, South Africa, and the Limpopo province. Furthermore, the chapter discusses the problem statement, the purposes of the research (aim, objectives and research questions), as well as its significance. Lastly, it also provides hints regarding the content of subsequent chapters.

Obesity may be described as an excessive accumulation of body fat. Different chronic illnesses that impact various circulatory, endocrine, respiratory, gastrointestinal, hepatobiliary, and immunological systems are examples of bodily systems that can be affected by obesity (Ali *et al.*, 2022). Additionally, Chooi, Ding and Magkos (2019) mentioned that obesity can raise the danger of developing multiple diseases like type 2 diabetes mellitus, several types of cancers, cardiovascular disease, musculoskeletal disorders and poor mental health. All these diseases or conditions can impact negatively on a person's life satisfaction, workplace effectiveness, and medical expenses.

 Since 1980, the prevalence of overweight and obesity has increased dramatically over the world, to the point where about a third of the global population is now considered to be either overweight or obese (Chooi, Ding & Magkos, 2019). These increases in both overweight and obesity have been witnessed in all areas, in people of different socioeconomic statuses, ethnicities and across all genders and age groups. A significant increase has been seen among women and older people. According to the United Nations (UN) (2022), recent data indicates that there are more than one billion obese persons in the world. This comprises of 39 million toddlers, 340 million teenagers, and 650 million adults. World Health Organization (WHO) estimates that by 2025, approximately 167 million people will become less healthy because they are overweight or obese because these numbers are still increasing (UN, 2022). Gona, Kimokoti, Ballout, and Rao (2021) found that about 39% of adult's population globally

are overweight while 13% have obesity, which is known to be a significant factor in early death and disability, low quality of life (QoL), various health complications as well as an increase in health costs. Overweight and obesity are more prevalent than ever in low- and middle-income nations (LMICs). Similarly, developed countries too experiences an increase in obesity. Oladeji, Zhang, Moradi, Tarapore and Nsoesie (2021) found that in 2016, according to the WHO, Africa has a prevalence of obesity ranging from 4.5% to 32.5% and a prevalence of overweight ranging from 20.9% to 66.8%. The highest obesity and overweight prevalence rates were noted in 52 African countries. According to Boachie (2022), half of all adults in South Africa are overweight (23%) or obese (27%).

The population of primary healthcare workers like the general population, they too experiences obesity and overweight. Simfukwe, Van Wyk and Swart (2017), mention that the frequency has increased rates of obesity among health workers worldwide. According to Kyle, Wills and Mahoney (2017) on a Scottish survey, 35% of unregistered care workers, 29% of nurses, and 17% of other healthcare professionals (including doctors, pharmacists, dentists, and therapy experts) were found to be obese (Kyle *et al.*, 2017).

Another study of almost 5000 certified nurses and midwives in Australia, New Zealand, and the UK discovered that their rates of obesity and overweight were greater than those of the general population. Studies on nurses in several countries, including South Africa, Nigeria, Scotland, the United Kingdom, Australia, and New Zealand, have shown that nurses are much more likely to be obese (Adaja & Idemudia, 2018; De Wet, Kruger, & Joubert, 2022). Different studies on health of healthcare workers have found that significant proportions of these populations are obese (Monakali, Goon, Seekoe & Owolabi, 2019; De Wet *et al.,* 2022).

A study conducted in Saudi Arabia by Elabd, Basudan and Alabduljabbar, (2022) on how common obesity is among staff members at a tertiary healthcare facility found that compared to other European nations like the UK, the prevalence of obesity among hospital personnel is comparatively greater. According to the report, in 2021, there will be 38.7% obese men and 36.8% obese women within the workforce. According to a research conducted in the UK, 14% of other healthcare professionals and 25% of nurses were obese. Moreover, a study conducted by Bazrafshani, Randhawa, Ghaedi,

and Khan (2020), in a hospital in the United Arab Emirates (UAE) discovered that 47.3% of the healthcare workers were overweight and obese, compared to 52.7% who were underweight and of normal weight. According to the survey, men (53.5%) have a higher prevalence of obesity than women (46.6%).

In Northern Nigeria, there is a significant prevalence of overweight and obesity among tertiary hospital staff, despite health workers' awareness of the obesity-related risk factors (Adaja *et al.*, 2018). Several countries like Ghana and Nigeria have reported a high prevalence of obesity amongst their health workers (Simfukwe *et al.*, 2017). According to Abubakar *et al.* (2021)*,* healthcare workers in Ghana were more likely to be overweight or obese than the general population, with prevalence rates ranging from 25.3% to 38.39% and 12.5% to 28.9%, respectively. Oladeji, Zhang, Moradi, Tarapore, Stokes, Sengeh and Nsoesie, (2021), conducted a study in African countries, in which the World Health Organization (WHO) estimated a prevalence of obesity ranging from 4.5% (95% CI 2.9%-6.5%) to 32.5% (95% CI 27.2%-38.1%) and an overweight prevalence ranging from 20.9% (95 credible intervals [CI] 17.1% - 25.0%) to 66.8% (95% CI 62.4%-71.0%).

A study conducted on nurses employed at a private hospital in Pietermaritzburg, South Africa, found that most (86%) of the subjects were overweight or obese. (Kunene, Taukobong, 2017). According to Phetla and Skaal (2017), a study conducted in Mpumalanga found that only 24.3% of the participants were of normal weight, whereas 51.9% were obese and 21.4% were overweight. According to a study done in the Eastern Cape, rates of abdominal obesity among professional nurses have increased alarmingly, reaching up to 90% (Monakali *et al*, 2019) and 78% of nurses in South Africa's Limpopo province are obese or overweight, according to a different research done in two districts there (De Wet *et al*, 2022).

Health inequalities also play a huge part in the development of overweight and obesity. These disparities derive from social, cultural, demographic, and economic factors, as well as the backgrounds of individuals. There have been studies done to observe the connection between obesity and socioeconomic factors, and the results indicate an association between adult obesity and people of high socioeconomic status (Anekwe *et al.,* 2020; Cronin *et al.* 2022). The inequalities are connected to elements such as

age and gender, but also socioeconomic elements like wealth, level of education, or disparities in socio demographics (Goetjes, Pavlova, Hongora & Groot, 2021) According to the study, males who were wealthier had higher odds of being overweight or obese. There is a link between socioeconomic status (SES) and body weight. In South Africa, the trend was that the higher the SES, the higher the obesity rates were (Goetjes *et al.*, 2021). Working conditions in nursing may be the reason for high rates of obesity. Workers doing shift work were reported to be at risk of being obese, as opposed to non-shift workers (Yegambaram & Pillay, 2022). Long working hours' impact on the time to engage in physical activities. These were backed by a Polish study, which noted that healthcare workers who work more than eight night shifts each month run the risk of becoming obese (Kunyamahu, Daud & Jusoh, 2021). Factors contributing to obesity may vary and can be influenced by multiple factors. Research on factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district is limited, prompting the importance of this local study to gain more accurate and detailed information.

Obesity can manifest from various factors. Individual-level contributors can arise from non-modifiable factors such as genetics and family history, modifiable behaviours such as dietary intake and physical activity, socioeconomic circumstances such as poverty. Physical inactivity is mentioned as one of the main contributors to the obesity in the US (Gray, Messer, Rappazzo, Jagai, Grabisch & Lobdell,2018). Study by Ladabaum, Mannalithara, Meyer and Singh, (2014) found correlation of 20 years' trends in leisure-time physical inactivity and obesity and concluded that public health emphasis should be placed on physical inactivity, even over dietary intake.

Combinations of excess dietary intake (mainly due to poor eating habits) and reduced energy expenditure (due to lack of physical activity and prolonged sedentary activities) lead to sustained positive energy balance which causes overweight and obesity. Increase in body weight was observed during COVID-19, where lockdown influenced dietary intake and energy expenditure, with mixed impacts on weight status. Frequent snacking, lack of fresh produce, alcohol consumption and sedentary behaviour have been observed as a risk factor for obesity during self-quarantine (Moschonis & Trakman, 2023). Al-Jawaldeh and Abass, (2022), also mentioned that transition in eating behaviour toward diet containing energy-dense foods, high in fat and sugars,

and less physical activity due to the sedentary nature of many forms of work and modes of transportation are contributing to increase in obesity.

Modern lifestyles are also reported to be the main factor in contributing do the development of obesity globally, factors such as poor quality diet to increased exposure to junk food and highly processed foods. Additionally, the transition from healthy dietary patterns to a more Western-style diet, marked by consumption of nutrients-poor and energy-dense ultra-processed foods such as sugar-sweetened drinks have been identified as a possible cause. Safaei, Sundarrajan, Driss, Bouilla and Shapi, (2021) found that obesity is not a simple problem but a complex health issue resulting from a combination of individual factors (genetics, learned behaviours) and substantial causes (unhealthy societal or cultural eating habits).

Obesogenic environment is the term used to describe all surroundings which makes us, encourage us, or make it the default option, to eat more and move less. It includes physical, socio-cultural, economic and environmental (Lake, O'Malley & Moore, 2022). It can be divided into food environment and the built environment, where food environment is opportunity to obtain food, which includes the availability, accessibility, advertising and marketing of food. Foods can be accessed in different ways from the food environment in shops, catering establishment, and in the institutions where people spent most part of their day (workplaces, schools and homes). Built environment consists of three elements physical design, land use, and transportation. All these factors make opportunities available for physical inactivity and for unhealthy food access (Martinez-Garcia, Trescarto-Lopez, Galiana-Sanchez &Pereyra-Zamora,2019).

Overweight poses a severe health concern and is associated with a number of non-communicable diseases (NCD). Increased risk of sickness, disability, and death is linked to obesity. Its effects are comparable to those of smoking. Increased cardiovascular events, such as coronary heart disease, hypertension, stroke, Type 2 Diabetes Mellitus (T2DM), and several kinds of cancer, are major risk factors for mortality (Zatonska *et al.* 2021). High prevalence of overweight and obesity can be reduced by promoting healthy lifestyles and health education. Nurses have a major role to play in this regard because they constitute a significant population of the healthcare workforce (Monakali, Goon, Seekoe & Owolabi, 2019). Because of the

increase in overweight and obesity, there is a need for developing public health policies which will help in reducing these problems (Owolabi, Goon, Adeniyi & Seekoe, 2017). Orgel and Cavender (2018), stated that as much as there is a need for the promotion of healthy behaviours toward the public, it is also more important for health workers to practice these behaviours. Enhancing the work environment to encourage physical exercise and healthy lifestyle, fitness centres at workplaces and affordable healthy meal options are offered in the hospital cafeteria were mentioned as measures that can be used to curb obesity among healthcare workers.

Obesity affects the productivity of employees at the workplace, which concerns their employers (Kyle *et al.*, 2017). Hospitals play an essential role in assisting their staff to maintain a healthy body weight and have a better lifestyle. By assessing their health status and the effects of obesity on workers' productivity at work, they can then build healthy workplace environments and ensure better communication on topics related to obesity with employees. To encourage employees, measures include launching weight management programs at work with the assistance of doctors, nurses, and dietitians, to consume a wholesome diet, exercise regularly and give up bad habits. Moreover, hospitals can assist in providing healthy food options in hospital canteens and on-site vending machines (Elabd *et al.*, 2022).

The World Health Organization (WHO) (2017) suggests a series of extensive programs targeted towards transforming obesogenic environments and providing healthy food options and opportunities to engage in increased physical activity throughout the community as a whole and in schools and homes. Obesogenic environments within primary health care (PHC) institutions and within the homes of PHC workers needs to be prioritized, hence the aim of this study to evaluate the contributing factors among PHC workers in the Lepelle-Nkumpi sub-district. A comprehensive approach is needed since no single intervention can singlehandedly halt the obesity crisis. Policies focused on improving diet and reducing physical inactivity have the potential to impact on population health, including among PHC workers. Policies related to obesity have often weakened at the level of implementation because they focus more on individuals, rather than focusing on structural determinants (WHO, 2022).

There is a clear indication that the increase in obesity among healthcare workers is worrying, and that it could lead to the prevalence of illnesses like diabetes mellitus, hypertension, cancer, stroke and osteoarthritis, as well as increased absenteeism and mortality. Obesity may overtake other causes of mortality in healthcare workers, hence the need for individuals, government and a crucial role by private sector to play in reducing the rates of obesity among healthcare workers.

1.2. PROBLEM STATEMENT

Obesity among healthcare workers (HCWs) is crucial because it may have an impact on their professional skills and health status (Kunyahamu *et al.*, 2021). Obesity among primary healthcare workers is a growing concern, as it not only affects individual healthcare workers but also has potential implications on the quality of healthcare delivery. Studies conducted on obesity were done at the tertiary or secondary level of care, neglecting primary healthcare givers. This increase in body weight can cause an increased risk of occupational injuries, absenteeism at the workplace and can compromise work-related ability (De Wet, Kruger & Joubert, 2022). Understanding the factors that contribute to obesity among primary healthcare workers is crucial for developing targeted interventions and promoting a healthier workforce.

During clinic visits, meetings, and campaigns in at health care facilities in the Lepelle-Nkumpi municipality, health care workers (HCWs) were requested to do anthropometric assessments, the results of which showed that they were overweight and obese. Moreover, it was observed that an increasing number of HCWs were gaining weight. Despite the importance of this issue, limited research has been conducted specifically on the factors contributing to obesity amongst primary healthcare personnel in the Lepelle-Nkumpi municipality. This knowledge gap hinders the development of effective strategies to address and prevent obesity in this population. There is therefore a need to conduct a study to identify and analyse the factors that contribute to obesity among primary healthcare workers.

1.3 PURPOSE OF THE STUDY

1.3.1. Aim of the study

To determine the factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province.

1.3.2. Research objectives

- To assess the prevalence of obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province
- To describe the eating habits among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.
- To describe the level of physical activity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo Province
- To investigate the factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province

1.4. RESEARCH QUESTION

- What is the Body Mass Index (BMI) among primary healthcare employees in the Lepelle-Nkumpi sub-district of the Limpopo province?
- What are eating habits of primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province?
- What is the level of physical activity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province?
- What are the factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province?

1.5. SIGNIFICANCE OF THE STUDY

Health and well-being of primary healthcare workers: By identifying the specific factors contributing to obesity among primary healthcare workers, the study intends to shed light on the unique challenges faced by this population. Understanding these factors can lead to targeted interventions and programs that promote healthier lifestyles, reduce obesity rates, and improve the overall health and well-being of healthcare workers.

Quality of healthcare delivery: Obesity among healthcare workers may have implications on the quality of healthcare services provided. Obese healthcare workers may experience reduced physical and mental capacities, leading to decreased productivity, increased absenteeism, and potentially compromised patient care. Therefore, the findings of this study may lead to interventions which could subsequently contribute to better healthcare delivery and patient outcomes.

Public health impact: The study's findings may have public health implications beyond the healthcare workforce. Primary healthcare workers are often viewed as role models and trusted sources of health information in the community. By addressing obesity among this group, the study may produce a ripple effect, positively influencing community members' health behaviours and promoting healthier lifestyles.

Policy and intervention development: Evidence-based research on the contributing factors for obesity among primary healthcare workers may inform the development of policies and interventions at the sub-district level. The findings may guide the implementation of workplace wellness programs, improvements in the built environment, changes in food availability, and other initiatives aimed at creating a healthier work environment and community.

Future research: The findings of this study offer other researchers an opportunity to conduct further studies, particularly in developing strategies and interventions. Moreover, further studies on how the contributing factors lead to obesity may be conducted.

1.6. OUTLINE OF CHAPTERS

Chapter 1: Introduction and background

The introduction and background of the study are covered in this chapter. It includes the study's background, goals, and objectives as well as the problem statement and the study's significance.

Chapter 2: Literature review

This chapter presents a literature review on the prevalence and contributing factors of obesity among healthcare workers. It also deals with the theoretical framework.

Chapter 3: Research methodology

This chapter addresses the research methodology followed in conducting the study. A quantitative and cross-sectional descriptive study design was conducted among 174 primary healthcare workers in Lepelle-Nkumpi municipality in the Capricorn district of the Limpopo province in South Africa. It also explains the target population, sampling, data collection and analysis, validity and reliability, ethical clearance, and biases.

Chapter 4: Presentation, analysis and discussion of the findings

This chapter outlines the findings of this study, which emerged from data analysis. The findings are presented, interpreted and further discussed with the support of the literature.

Chapter 5: Summary, recommendations, and conclusions

This chapter summarises the findings of the study as presented in chapter 4. Conclusions are further drawn from the summary, and recommendations are made. Limitations of this study are also addressed in this chapter.

1.7 SUMMARY

This chapter describes the study background, the justification for its conduct, the research's purpose, objectives, and questions, as well as the importance of the planned research. It further describes the outline of the chapters.

CHAPTER TWO: LITERATURE REVIEW

2.1. INTRODUCTION

The study's literature review is covered in this chapter. A narrative literature review provides a comprehensive overview of existing research studies and knowledge related to the contributing factors to obesity among primary healthcare workers. It provides a background on the obesity prevalence in South Africa and other nations in Africa, in other continents, and worldwide. The literature review explores the importance of studying obesity among primary healthcare workers, while also outlining the contributing issues to obesity. Literature was sourced from databases such as Google Scholar, Scopus, Web of Science, Embase, and Science Direct. Keywords such as obesity, contributing factors to obesity, and prevalence of obesity among healthcare workers were used during the search. The data was screened for relevance based on the eligibility criteria. The inclusion criteria were studies published in English and with various research designs, like cross-sectional studies, longitudinal studies, case-control studies, cohort studies, and intervention studies.

Obesity is an unhealthy build-up of body fat that typically exceeds the average ideal body weight by 20% and could be harmful to general health (Maligha & Riaz, 2017). It is a public health challenge which contributes to the problem of illness (Owolabi *et al.*, 2017). Obesity can increase the risk of developing multiple diseases including diabetes mellitus, cancers, cardiovascular disease, musculoskeletal disorders and poor mental health. All of these illnesses or ailments may have a detrimental effect on one's quality of life, productivity at work, and medical expenses (Chooi *et al.*, 2018). As reported by the National institutes of Child Health and Human Development (NICHD), (2021) several issues play a role of being overweight and obese. The issues that contribute to overweight and obesity include poor diet, inactivity, environmental elements and genetics.

2.2. PREVALENCE OF OBESITY

The WHO (2021) estimates that since 1980, the prevalence of obesity has doubled globally. Most of the world's population today resides in countries where mortality rates from overweight and obesity are greater than those from underweight (WHO, 2021). Several studies have been conducted indicating factors that can contribute to weight gain, such as trade liberalization, which makes it easier for obesogenic products like sugar-sweetened beverages and packaged foods to reach low- and middle-income countries (LMICs) (Fox *et al.*,2019; Lin *et al.,*2018).

Worldwide obesity has nearly tripled since 1975 (Lim *et al.*, 2020). According to the WHO (2021), over 1.9 billion adults were overweight in 2016 and over 650 million of them were obese. Adults that are at least 18 years and contributed to 39% overweight and 13% obesity in 2016 (WHO, 2021). Obesity has greatly increased in the last four decades, with the United States of America (USA) now leading the way in the prevalence of obesity (36.5% in 2011-2014), also with an average prevalence of 15.9% throughout all member states of the European Union (EU) in 2014, Europe is in second place. Europe recognizes obesity as a serious public health issue, thus further study is needed to understand how it may develop there in the future (Janssen *et al.*, 2020). The prevalence of obesity in Europe is projected to be about 16%. The increasing trend in European countries is in line with the worldwide population. In a research to gauge the incidence of adult overweight and obesity in 20 countries across Europe, the results were as follows: Hungary (61%), Czech Republic (60.1%), Lithuania (59.6%), Switzerland (43,3%), France (45%) and Denmark (42%) (Marques *et al.*,2017).

A study conducted in 12 European countries between 2017-2018 on the prevalence of overweight and obesity found the highest prevalence of obesity in Romania (21.1%), Greece (19.7%), and Bulgaria (19.5%) and the lowest in Italy (7.5%), France (8.8%) and Germany (9.0%) (Stival *et al.,* 2022). Obesity has becoming more common in less developed parts of the world, including Sub-Saharan Africa and South Asia. Asia and the Pacific region have seen a rise in overweight and obesity. Compared to 34.6% in 1990, 40.9% of adults in this area were overweight and obese in 2013 (Helble &

Francisco,2017). According to Wang *et al.* (2020), the standardised prevalence of obesity and overweight in China was 19.3% in 2013 and 25.6% in 2018. In both 2013 and 2014, males had a significantly greater prevalence of obesity and overweight than females. A study conducted by Mohd-Siddik, Lekhraj and Foo (2021) in Selangor, Malaysia, found that the overall prevalence of obesity among adults was 18.6%, with a 14.2% prevalence rate amongst men and 21.1% amongst women. This shows an increase in the prevalence of obesity by 3.6%, compared to 15.1% in 2011 and increasing to 17.7% in 2015. Helbe *et al.* (2017), revealed that adult men in Malaysia and Singapore, with prevalence rates of 43.8% and 44.3%, respectively, were among the most overweight in Asia. Maldives (54.0%) and Malaysia (48.6%) have higher prevalence rates for adult women.

According to WHO data from 2016, the Pacific Islands Countries (PIC) have an estimated 43.0% of adults who are obese and overweight, which is more than thrice the global norm, and non-communicable diseases are at an all-time high. According to WHO statistics, the prevalence of obesity was highest in nine out of ten PICs worldwide. At present, the sharp rise in obesity is caused by decreased physical activity and dietary changes among PICs. Environmental factors (13.6%) and sociocultural factors (27.3%) were identified as determinants of overweight and obesity (Tong *et al.*, 2022).

A study conducted by Hassan *et al.* (2022) in Eastern Mediterranean found that lifestyle modifications, such as bad eating habits, inactivity, cultural, social, and economic changes are the leading causes of overweight and obesity, where the prevalent of overweight and obesity is 23.5%-62.1% and 14.5%-40.6% respectively. Kuwait, Syria, and Israel were found to have the highest prevalence of obesity and overweight. Kuwait has a 29.25% obesity rate and 38.70% overweight rate. The prevalence of overweight and obesity in Israel was found to be 62.10% and 22.45% respectively. Syria was found to have a 31.64%overweight rate and 40.62% obesity rate.

According to the World Health Organization, Egypt ranks 18th in obesity widespread throughout the world. A survey conducted in 2019 on adults over 18 years of age in Egypt found that 39.8% suffered from obesity. It is reported that adult females were

more likely than adult males to be obese (49.5% of adult female Egyptians were obese compared to 29.5% of males) (Aboulghate *et al*., 2021).

In the past 30 years, obesity has doubled in prevalence in Libya. It is one of the countries observed as following the trend among developing countries where the population steadily becomes more obese. The rise in obesity rates among Libyan men and women encouraged a study to quantify and identify them. The study found that the prevalence of obesity among adults was 42.4%, compared to 32.9% and 24.7% for those who were overweight and normal weight respectively. The prevalence of overweight and obesity was 75.3%. Among men, the obesity prevalence was 33.8% and the overweight prevalence was 32.4%. Among women, the prevalence of obesity was 47.4% and the overweight prevalence was 33.2% (Lemamsha *et al*., 2019).

Over the past two decades, Africa has experienced a dramatic rise in the prevalence of obesity and overweight. Between 1975 and 2016, the prevalence of obesity grew by 12% among sub-Saharan women, while overweight increased by 24% in the same population. Overweight grew by 15% during the same time period, whereas obesity prevalence increased by 5% in men. (Oladeji *et al*.,2021). A study conducted by Yayehd *et al*., (2017) on the prevalence and causes of adult obesity in low-Income populations of Western Africa found that the prevalence is 20.1% and the most obese groups were women. Adult obesity prevalence is high in Togo, as compared to other reported West African Countries such as Nigeria (19.6%) or Ghana (17.1%). However, compared to the reported prevalence of 34.9% in the USA, the rate in Togo is lower during the same period. In a study that estimated shifts in the prevalence and causes of central adiposity and BMI in Ghana's older adult population, it was found that over a period of 7 to 8 years, the prevalence of obesity increased by 47%, and overweight increased by 25 % (Lartey *et al*., 2019).

Due to rapid demographic and lifestyle changes, countries within the Southern African Development Community (SADC) are facing similar difficulties to those experienced by other developing nations. According to Gona *et al.* (2021), the prevalence of obesity in SADC countries for adult females raised 1.54-fold from 12% to 18.5%, whereas the obesity rate among adult males almost doubled from 4.5% to 8.8%. Adult males' mean BMI rose by 0.7 from 22.4 (21.6-23.1) to 23.1 (22.3-24.0), and adult females' mean

BMI climbed by 1.0 from 23.8% (22.9-24.7) to 24.8% (23.8-25.8) (Gona *et al.,* 2021). The three countries with the highest obesity prevalence in 2019 were South Africa (44.7%) (42.5-46.8%), Swaziland (31.9%) (31.7-36.0), and Lesotho (31.6%) (29.8-33.5). Male prevalence in the three nations was, respectively, 19.1% (17.5-20.7), 19.3% (17.7-20.8), and 9.2% (8.4-10.1). The Democratic Republic of the Congo (DRC) and Madagascar both had the lowest prevalence of adult obesity in 2019, with females experiencing it at 5.6% (4.8-6.4) and males experiencing it at 4.9% (4.3-5.4) in the DRC and 3.9% (3.4-4.4) in Madagascar, respectively. (Gona *et al.,*2021). Another study by Boachie *et al.* (2022), found that 23% to 27% of South African people are overweight or obese.

There is a reported rise in the number of obese people among healthcare workers in both low-income and high-income countries, which contributes to non-communicable diseases (Simfukwe, Swart & Van Wyk, 2017). A study by Kyle *et al.*, (2017) on the prevalence of obesity among healthcare professionals in England, discovered that obesity prevalence was high among nurses (25.1%) while other healthcare professionals had an obesity prevalence of 14.4% and unregistered care workers had the highest prevalence at 31. 9%.). A study that was carried out in Malaysia on obesity among healthcare workers indicated that the prevalence of obesity was 21.1%. The prevalence of nurses was found to be higher (50%) than that of doctors (7.6%) and other job categories (42.4%) (Kunyahamu *et al.*,2021).

Elabd *et al.,* (2022) carried out a study on the occurrence of obesity among healthcare workers in tertiary health organization in Saudi Arabia and found the obesity prevalence rate to be36.8% and 38.7% among the female and male employees respectively. A study conducted in a hospital in the United Arab Emirates (UAE), (2020) found that 52.7% of the healthcare providers were underweight and of normal weight, whereas 47.3% were overweight and obese. Males were found to be more likely than females to be obese (53.5%) Bazrafshani *et al.*, (2020). Eighteen percent of participants in a survey of registered nurses in Eastern Cape were overweight, according to the results. Seventy-six percent of participants were obese, with 29% having obesity grade III, 24% having obesity grade I, and 23% having obesity grade II (Monakali *et al.*, 2019). According to Simfukwe *et al.*, (2017), study in South Africa discovered that health workers are overweight or obese. Sifumkwe *et al.*, (2017)

reported 29.7% and 41% of health workers at the Mafikeng Provincial Hospital were overweight and obese, respectively. De Wet *et al.* (2022), report that study carried out in two districts of the Limpopo Province revealed that 78% of nurses are overweight or obese. Another study in the Eastern Cape Province reported the abdominal obesity prevalence among professional nurses to be as high as 90%.

2.3. EFFECTS OF OBESITY

Obesity is the abnormal or excessive build-up of fat or adipose tissue in the body, which compromises health (Panuganti *et al.*, 2022) and may increase the risk of further pathological illnesses. Among adults, such illnesses include T2DM (80% of cases), ischemic cardiac disease (35% of cases) hypertension (55%), brain strokes, gall bladder disorders, dyslipidaemia, insulin resistance, sleep apnoea and some types of cancers (Krzysztoszek *et al.*, 2019). Obese people have a reduced quality of life, disability and other social disadvantages. Apart from being a risk factor, obesity is also recognised as a progressive disease (Nam *et al.*, 2020).

Being overweight and obese can significantly decrease work capacity. It has been reported that high BMIs among the general working population are associated with low work ability. Work ability reduction due to obesity can lead to decreased productivity and an increased frequency in sickness and absenteeism. The study confirmed that obesity is an important predictor of sick leave due to the increased incidence of illness and absenteeism among obese workers. It impairs the quality of life and the ability to function in daily life (De Wet *et al.*, 2022). Rozjabek *et al.* (2020), found that obesity is a heterogeneous disease. The quality of life (QoL) associated to health is negatively impacted by rising obesity rates, patient activation, work productivity, and weight loss behaviours, but there were some differences in effects by age, gender, and T2DM status.

2.4. ECONOMIC IMPACTS OF OBESITY

A study conducted in South Africa on the health costs associated with weight related diseases (Boachie *et al.,* 2022) found that the overall cost of being overweight or obese

was likely to be South African rands (ZAR) amounting to 33 194 million in 2020, this was equivalent to 0.67% of the gross domestic product (GDP) and constituted 15.8% of government health spending. Most of the cost comes from cardiovascular and endocrine diseases, especially hypertension and diabetes. The analysis from these study reveals similar findings to earlier studies on the costs of obesity in high-and middle-income countries, such as Brazil, South Korea, Thailand, and Colombia.

Due to increased burdens of obesity and related chronic diseases over the past decade, several countries have implemented measures to raise dietary standards, with a focus on controlling intake of sugar-sweetened beverages (SSBs), which in many populations are the main sources of added sugar. The 2015 Dietary Guidelines for Americans (DGA) and the World Health Organization's (WHO) recommendations urge reducing added sugar consumption to no more than 10% of total calories consumed. Taxes on SSBs have been implemented in various countries as a policy to reduce consumption and generate revenue to support the public health efforts (Malik, Willet & Hu, 2020). As a public health intervention to combat obesity, South Africa became the first country in Africa to announce the implementation of an SSB tax (Karim *et al.*, 2020).

A study by Saxena *et al.* (2019), revealed that a 10% growth in the SSB tax would, over the course of 20 years, avoid an estimated 8000 T2DM-related premature deaths, with the majority of those fatalities occurring in the third and fourth income quintile. Over a 20-year period, the national government would save roughly ZAR 2 billion (US$140 million) on healthcare subsidies, and annual tax revenues would increase to ZAR 6 billion (US$450 million). An increase in obesity has led to many countries taking action to decrease the obesity prevalence through policy-making. These regulations cover price controls, public awareness efforts, mobile applications, bans on food advertising, targeting children, school and workplace programs, and food and menu labelling. (OECD/EU, 2020). According to a study by Bollyky *et al.* (2017), there is an increase in premature non-communicable disease in lower-income countries. Results from this study show that there is an expectation to see an increase in premature death and disability from non-communicable diseases in countries with poor and lower-middle incomes by 2040.

Around 2 billion adults worldwide (or between 25 to 33 percent of the world's population) are overweight, and another 33 percent are obese. Obesity is a well-established risk factor for chronic diseases and is related to negative health implications. The workforce has been impacted negatively by the increased occurrence of chronic disease. When comparing healthy workers with those living with chronic diseases, the latter are less productive or work for fewer hours. There is a possibility of experiencing production losses and growths in welfare expenses as a result of the chronic disease incidence increase in the workforce (Anderson & Durstine, 2019).

2.5. HEALTHCARE PROFESSIONAL AND HEALTHY LIFESTYLE

Healthcare workers are seen by community members as mentors in the maintenance of a healthy lifestyle. Their responsibility is to promote healthy lifestyle modifications to prevent non-communicable diseases, such as those linked to obesity (De wet *et al*, 2022). These lifestyle decisions are crucial for our co-workers' individual health as well as the general success of our healthcare organizations. There is a need for healthcare workers to set an example through healthy lifestyle choices. According to the National Health Service (NHS) health-related absences from work account for 10 million days lost to work, costing the health system £1.7 billion. There is greater workplace satisfaction and improved quality of life among healthy employees (Orgel *et al.*, 2018). Healthy employees are the foundation of long-term employment and productivity. The World Health Organization (WHO) recommended that the workplace serve as the key setting for health promotion in the twenty-first century due to the high incidence of obesity and overweight worldwide and the accompanying non-communicable disease, and an appreciation of the impact made by sedentary behaviour, sitting too much, and consuming unhealthy food and beverages at work (Tauber *et al.*, 2018).

A study by Blake, Watkins, Middleton and Stanulewicz, (2021) on nurses and midwives' role on health promotion in public health reported that they play an integral part therein and are viewed as role models by their statutory bodies. According to the study, pre-registered nurses and midwives have a significant prevalence of overweight and obesity due to the high expense of healthy foods, their mental health, and working

shifts. Those with more expertise in the practice of health promotion, such as eating a good diet and maintaining a normal weight, are more certain that patients will heed their advice. Health workers who consume a good diet and have normal weight are reported to have adopted attitudes toward role modelling that are more positive and have a good attitude concerning health promotion.

According to Ross *et al.* (2019), several factors contribute to healthcare workers not practising a healthy lifestyle, namely "overwork" or lack of time, inadequate facilities or resources, exhaustion, lack of sleep, responsibilities outside of work, and an unhealthy culture. The most frequently mentioned barrier to healthy lifestyle practice by registered nurses is the intensity and pace, lengthy and frequently unpredictable shifts, long commutes, rotating shifts, and a lack of covering for mealtimes and breaks. Some mentioned a lack of resources or facilities including gym access, exercise sessions, showers/changing rooms as well as refrigerators and microwaves for storing and reheating of healthy food brought from home are all provided.

According to a study conducted by Uchendu, Windle and Blake (2020) on the perception of barriers and facilitators of health-promoting behaviours among Nigerian nurses, the nurses reported experiencing more barriers to the practice of health-promoting behaviours than facilitators. Barriers were cited as the absence of programs and policies to enhance health and wellbeing both nationally and within healthcare facilities. The most often cited obstacles to a balanced diet and active lifestyle were shift work, heavy workload, occupational stress, and lack of protected breaks. The study also mentioned a lack of knowledge on national guidelines by nurses.

Orgel *et al.*, (2018) found that there is a lack of motivation for healthy behaviours among healthcare workers. They also mentioned a lack of facilities/resources and fatigue as the reason they did not engage in physical activity. Due to a lack of inspiration and limited options, healthcare workers make poor dietary choices. In a study conducted on healthcare workers in Egypt, barriers to a healthy lifestyle fell into five groups including exercise environment, time commitment, physical effort, family support and facility obstacles (Gabal, Wahdan & Eldin, 2020).

2.6. MANAGEMENT OF OBESITY

Obesity prevention is a top goal according to the World Health Organization (WHO, 2010) in order to lessen the effects of non-communicable diseases (Pearce, Rychetnik, Wutzke & Wilson, 2019). In healthy individuals, regular physical activity (PA) is regarded as a major health indicator. Regular physical activity, especially exercise, has positive psychological and bodily (physiological, morphological) effects. One of the major risk factors for illness and mortality in the globe, with an estimated 3.2 million deaths annually, is a lack of physical activity. All adults should regularly exercise, which is described by the World Health Organization (WHO) as "any planned physical activity" (such as brisk walking, aerobics, jogging, biking, swimming, or rowing) carried out to improve physical fitness. Such exercise should be done three to five times a week for 20–60 minutes each session" (Gabal *et al.*, 2020).

Obesity is a complex issue where genetics, socioeconomic circumstances (like having access to nutritious meals), and knowledge of the optimal dietary and exercise habits combine with individual behaviours related to nutrition and physical activity. Important challenges were identified in previous studies exploring obesity management among primary care providers. Lack of information and training in subjects like contemporary evaluation and counselling procedures and behaviour management approaches for obesity were cited as the main issues for practitioners. Another challenge that arose was the absence of compensation plan, referral possibilities, consultation time, and support services. Some healthcare workers decide not to address the topic at all because they feel uncomfortable doing so with their patients. (Sanchez-Ramirez, Long, Mowat & Hein, 2018). Multidisciplinary teams (MDT) have been shown to enhance obesity results, motivating healthcare professionals to collaborate with individuals from various professions and disciplines to deliver comprehensive care (Sanchez-Ramirez *et al*, 2018).

One of the biggest problems with worldwide public health is physical inactivity, which has been linked to a number of chronic illnesses. Regardless of public knowledge of the benefits of physical activity, physical inactivity remains a global problem. Being physically active lowers the threat of coronary heart disease, T2DM and hypertension (Mlangeni, Makola, Naidoo, Chibi, Silimfe & Mabaso, 2018). Physical inactivity,

according to the World Health Organization, is the fourth biggest global killer. A sedentary lifestyle raises the risk of cardiovascular illnesses, diabetes, cancer, hypertension, depression, and anxiety as well as playing a vital part in the emergence of excess weight and obesity (Saad, Low, Jamaluddin & Chee, 2020). Gabal *et al.* (2020) conducted a research on the advantages of physical activity for health professionals, and the results showed that the respondents included reduced stress, increased mental wellness, improved physical fitness, and improved muscle strength.

Australia has one of the highest percentages of physicians and medical students that engage in physical activity (70%), followed by Saudi Arabia (65.2%), South India (64%), Northern Ireland (56.6%), and Egypt (75%). A study by Mlangeni *et al.* (2018), on the factors influencing physical activity in South Africa discovered that 57.4% of respondents were physically inactive, 14.8% were exercising but only moderately, and 27.8% were physically active but aggressively. Gabal *et al.*, (2020) conducted a study on the prevalence of physical activity among healthcare professionals and discovered that 26.6% of respondents who did not exercise did not want to start, whereas 28.8% of those who were physically inactive had the plan to start.

Obesity is the abnormal build-up of body fat (about 20% above the average optimal body weight), which can be harmful to one's health (Maligha *et al.*, 2017). It is a public health issue and contributes to the burden of illnesses (Owolabi *et al.*, 2017). Obesity can increase the risk of developing multiple illnesses such as T2DM, several types of cancers, cardiovascular disease, musculoskeletal disorders, and poor mental health. All of these illnesses or ailments may have a harmful effect on one's quality of life, ability to work efficiently, and cost of medical care (Chooi *et al.,* 2018).

2.7. DETERMINING OBESITY

The World Health Organization (WHO) labelled obesity as the main non-communicable disease in adults. According to a study done in 175 nations, the average adult obesity percentage increased from 5% in 1975 to 19% in 2016. An

increase in obesity and overweight is also marked in South Africa among the general population and healthcare workers (De wet *et al.*, 2022).

Increasing overweight and obesity is regarded as a public health challenge worldwide. Despite them having knowledge of the risks of increased body weight, healthcare workers in some countries are also affected by the increasing overweight and obesity prevalence (Taib *et al.*,2019). Overweight and obesity are becoming more common among healthcare professionals, which has negative effects on their health, work productivity, and patient care (Chen *et al.*, 2021). De wet, *et al.* (2022), mentioned that obesity can affect the work ability of healthcare workers through lowering productivity or more frequent absences due to illness at work. Obesity has caused early retirement, chronic disease morbidity, and mortality among healthcare workers (Sari *et al.*, 2023).

Community members see healthcare workers as role models since they give them counselling about healthy living and encourage appropriate lifestyle modification to prevent disease. They must demonstrate a high level of understanding and awareness of the lifestyle modifications needed to prevent chronic illnesses (Abubakar *et al.* ,2021). De Wet *et al.* (2022) also mentioned the importance of healthcare workers in educating members of society on the significance of sustaining good lifestyle through proper lifestyle modifications and non-communicable diseases prevention.

Kyle *et al.*, (2017) found a rising prevalence of obesity among nurses (25.1%) and other health professionals (14. 39%). A study conducted in Turkey among healthcare professionals found that 52.5% were of normal weight, 34.8% were overweight, and 8.7% were obese (Asudu *et al.,* 2021). In Perak, Malaysia, researchers looked at the incidence of overweight and obesity among primary healthcare personnel. They discovered that 49.9% of them were overweight or obese, and another 51% were at risk of abdominal obesity (Kit, Saad, Jamaluddin & Chee,2020). Furthermore, Younis, Jiang, Fan, Wang, Li, Jebril, Ma and Hui, (2023) found combined prevalence to be 65%. De wet *et al.* (2022), discovered that among health personnel at a private hospital in South Africa, 33.7% were obese, 26.2% were overweight, 36.3% had a normal weight, and 3.7% were underweight. Abubakar *et al.* (2021), revealed that among healthcare workers in Ghana, the prevalence of overweight and obesity ranged from 25.3% to 38.39% and 12.5% to 28.9%, respectively.

2.8. EATING HABITS AMONG HEALTHCARE WORKERS

Kunene and Taukobong (2017) found that most of healthcare workers do not practice good eating habits. They skip meals and eat a lot of unwholesome foods, especially breakfast. Other South African study initiatives uncovered a comparable issue with unhealthy eating among healthcare workers. The majority of health professionals, according to the study, missed meals, but more men than women did, particularly at breakfast and lunch.

A similar study conducted by Yegambaram (2021) in KwaZulu-Natal, South Africa, reported that workers skipped meals, specifically breakfast, due to time constraints. For handover procedures, they had to be at work before the 7:00 am shift. Having breakfast helps reduce unexpected impulsive nibbling, which can happen when there is a significant gap between meals. The study discovered that people who skipped meals had a mean BMI that was considerably greater than participants who did not.

Al Hazmi, Alghamdi and Abdulmajeed (2018) found significant poor dietary habits among various healthcare workers at National Guard Health Affairs-Riyadh, Saudi Arabia. The study found that sweets were the most preferred food item as they are affordable, are a quick source of energy, and are readily available in many places, including hospitals. Coffee was the most common drink consumed by healthcare workers because it is usually sweetened and is known for stimulating mental processes and performance.

According to Jennifer, Sally and Simon (2022), healthcare workers frequently buy food and beverages, which is linked to signs of less healthy eating. Similar findings were discovered among American healthcare workers. Those who made healthy food purchases at work ate better outside of the office. The overall findings were that staff members were supportive of the hospitals' attempts to promoting healthy eating.

Blake, Watkins, Middleton and Stanulewicz (2021), found that less than the national average, more than a third of pre-registered nurses and midwives self-reported being overweight or obese. Only (31.5%) of participants reported to follow a healthy diet. Sixty-six percent (67.6%) of pre-registered nurses and midwives said they did not

consume five servings of fruit or vegetables each day. A comparable percentage admitted to eating more convenience foods, fat, sugar, and salt.

2.9. LEVELS OF PHYSICAL ACTIVITY AMONG HEALTHCARE WORKERS

Physical activity (PA) is known to prevent the occurrence of non-communicable diseases (NCDs) such as CVD, cancer, obesity and depression. According to two Malaysian studies, over 60% of healthcare employees were physically inactive, while a survey of Malaysian healthcare workers indicated that 45.6% of primary healthcare workers were physically inactive (Saad *et al.,* 2022). The findings from the latest study found that primary healthcare workers engaged in less physical activity than the general population.

According to a Malaysian study by Saad *et al.,* (2022), primary healthcare workers did not participate in transport-related physical activity and spent an average of 50 minutes in occupational physical activity. According to the study, women engaged in both leisure time and work-related physical exercise at much lower rates than males. Reasons included a shortage of recreational opportunities, and family duties as most primary healthcare workers were married. Findings reflected that non-medical staff engaged in more physical activities than medical staff.

Physical activity (PA) is known for improving the quality of life (QoL). Workers can attain a balanced lifestyle and relief through physical activity. Employee fitness initiatives can increase profitability and productivity. A study found that healthcare workers had low levels of PA, equivalent to those of the general Greek population (Saridi *et al.*, 2019).

Rocha, Barbosa and Araujo (2018) conducted a study on leisure-time physical inactivity (LTPI) among healthcare workers in primary healthcare in municipalities in Southern and North-Eastern Brazil and found that the prevalence of physical inactivity (PI) was 27.5%. The prevalence of PI was high (76.8%), according to a study of temporal patterns among employees at Centers for Psychosocial Care (CPC) in the municipalities of Southern Brazil. Another study that was done among Peruvian healthcare workers discovered that 87.8% of them had PI

According to Phetla and Skaal (2017) 75% of healthcare workers were found to be overweight or obese. Various researches have revealed that healthcare workers in South Africa have similar rates of overweight and obesity as the general population. In the study by Phetla *et al.* (2017), women were found to be more obese than men, which is likely due to 94% of nurses being women. Poor eating habits, physical inactivity, age, and race were mentioned as other risk factors related to obesity.

2.10. FACTORS CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS

The aetiology of obesity is complex and multifactorial. It is clear that biology significantly influences who becomes obese and who remain thin. There is widespread agreement that environmental factors are what have caused the significant increase in obesity prevalence. A combination of genetic predisposition and exposure to an environment that promotes a favourable energy balance leads to obesity and not only lifestyle choices. Individuals who live in a setting that makes it harder for them to make good decisions, such as those in deprived areas and those at high genetic susceptibility, are the ones who are at the greatest risk of developing obesity (Jackson *et al.*, 2020).

Sitting for a longer period has a detrimental effect on health. A significant number of overweight/obese individuals spent most of their time daily sitting and do not engage in physical activity. "Any waking behaviours characterized by low energy expenditure while in a sitting or reclining posture" is defined as sedentary behaviours. This behaviour is increasing in our communities and even come to take up more than 50% of an adult's waking hours. Watching TV, using a computer (particularly at work), and motorised trips are amongst the pursuits that can be carried out while sitting. Such behaviours have detrimental effects on one's health, and the amount of time spent (>6 vs<hours/day) is linked to death in both women and men. Chronic conditions include osteoporosis, some malignancies, metabolic syndrome, type II diabetes, cardiovascular disease, and metabolic diabetes and increased mortality are associated with prolonged sitting and overweight/obesity. A study conducted in Spain on patterns of sedentary behaviour in overweight and moderately obese users found that nearly half of those who are overweight or obese spend more than six hours every

day sitting down. Younger adults and men with office occupations and greater levels of education spend more time sitting and participating in sedentary activities, such as working or studying during the day and watching television during the evening (MartõÂnez-Ramos, Beltran, MartõÂn-Borràs, Lasaosa-Medina., Real, & Trujillo, 2018).

A 2007 systemic review in the United States showed that ethnic minorities and low-economic-status groups are more affected by obesity, at all ages. Another systematic evaluation of many studies evaluating the relationship between socioeconomic class and obesity in developing countries revealed that people in low-income countries are likely to be overweight if they had greater incomes and educational levels. Due of their availability to surplus food and lack of participation in manual labour, wealthy people are more prone to obesity. In some cultures, being overweight and obese is associated with wealth. In developing countries, individuals with higher income have access to healthy foods (vegetables and fruits, whole grain cereals), which Individuals from low socioeconomic backgrounds consume a less healthy, more affordable and denser diet as reported in a 2011 study in rural South Africa, which compared the prices of some commonly consumed foods and found that a healthier diet costs as much as 60% more than opting for fewer healthy choices (Omer, 2020).

There has been a rapid increase of obesity worldwide, which is difficult to explain based only on genetic background. The increase can be due environmental elements more food intake, more sweetened beverages, and decreased activity, and a sedentary lifestyle. It is important to comprehend how genes affect energy homeostasis mechanisms, causing changes in body weight within any given setting. Rarely do genes alone have the power to determine someone's anatomy, physiology, or behaviour. Weight gain can be influenced and activated by the association between genes and the environment (Albuquerque *et al.*, 2017).

Both genetics and environmental factors are closely linked to Obesity. To further our understanding of how the environment affects genetics, new findings in the field of epigenetics have been made. Genetic and epigenetic variations that alter how the body's metabolic pathways work as well as how hunger centers and brain pathways are controlled are the cause of obesity. These differences influence markers of obesity

including insulin resistance, dyslipidaemia, inflammation, hypertension, and ectopic fat deposition, especially in the liver (Tirthani, Said & Rehman.2022).

Based on investigations of twins' BMIs and family studies, a systemic evaluation of the heredity of obesity found that BMI heritability ranged from 47 to 90%. (Flores-Dorantes *et al.*, 2020). A further finding from research indicated that childhood BMI was more genetically influenced than adult BMI.

The United States of America (USA) has seen an alarming growth in the prevalence of obesity. In 2014, the prevalence of obesity was 40.4% for adult women and 35.0% for adult males. It has been reported that the adult population in the USA sleeps less, with most people reportedly sleeping less than the suggested 7 hours a night. Scientific research has established a strong correlation between inadequate sleep and weight growth and obesity. Despite the fact that the fundamental mechanisms for these interactions are not fully understood, if metabolic changes brought on by sleep deprivation result in an increase in body weight, insulin resistance, and blood pressure, then improving sleep quality and quantity may be used as treatments and primary preventative measures for these metabolic disorders (Cooper *et al.,* 2018).

Bonanno, Metro, Papa, Finzi and Manasseri (2019) assert that sleep is important for the functioning of the entire body. Numerous research has revealed the detrimental health implications of inadequate sleep on both the physical and mental state of balance. It includes modifications to mental processes like memory, emotion regulation, and control of hunger. It also been revealed that disrupted or inadequate sleep can cause metabolic disorders and weaken the immune system. The study stated that epidemiological research has revealed a connection between increasing obesity incidence, diabetes, cardiovascular illnesses, and mortality, and decreased sleep length and quality (less than 6-7 hours each night).

Bonanno *et al.,* (2019) also found that an inadequate quantity and quality of sleep can present as a risk element for overweight and obesity. Getting enough sleep is important for maintaining a healthy weight. Sleep deprivation increases the risk of weight gain in both adults and children because it leads to unhealthy eating habits, reduced physical activity, and metabolic abnormalities.

The effect of the workplace milieu on the rise in obesity is well documented. Individuals who work long hours have an increased BMI due to low engagement in physical activities and exercise. Long working hours are also mentioned as a reason for them not being able to prepare healthy meals, meaning that they tend to eat processed meals. Reduced sleeping hours due to long working hours is also mentioned as contributing factor to obesity. An increase in working hours and a decrease in sleep time were found to be substantially linked with an increase in body mass index (BMI) in a study done in Hong Kong with more than 4700 participants, including 49% men and 51% women (Omer, 2020).

Lindsey *et al.*, (2020) reported that the built environment, which is the living environment, influences everyday activities, community involvement, and lifestyle decisions. It encompasses patterns of activity inside these constructions as well as urban design, land use, and transportation networks. The density of growth in a region, the aesthetics of buildings and landscape, and the accessibility of public services are all factors that can affect the built environment (Omer, 2020). The built environment can also influence travel and commuting choices, with individuals who rely on vehicle trips showing adverse outcomes. The relationship between the built environment and obesity demonstrated that access to opportunities for physical activity and to food sources can have an impact on BMI. Lack of sidewalks and difficult access to recreational facilities are related to obesity and overweight. Lower obesity was linked with more land use and longer daily walks. Increased time spent in an automobile is related to increased obesity, whereas more local parks and open spaces are available, it reduces obesity (Omer, 2020).

A study conducted on healthcare workers in Malaysia indicated that senior workers are at a high risk of becoming obese due to a change in their daily duties, where their physically demanding responsibilities are being changed to sedentary job as supervisors or managers. Increasingly demanding work responsibilities also reduce the time available for physical activities (Singh *et al.*, 2020). Extensive working hours also contribute to obesity in healthcare workers as they often have to eat one or more meals at work (Orgel *et al.*, 2018). According to Ross, Leonard, Perez, Wehrlen, Kazmi and Gibbons (2019), healthcare workers face a number of obstacles that prevent them from living a healthy lifestyle, such as "overwork" or a lack of time, inadequate facilities

or resources, exhaustion from lack of sleep, outside obligations, and an unhealthy eating culture.

2.11. CONCLUSION

This chapter discussed the literature review and indicated databases used in search of the literature. The chapter showed the prevalence of obesity among the population at large and specifically amongst healthcare workers, who are the backbone of the healthcare system. The effects of obesity, which may affect healthcare delivery, were shown. The objectives of this study were taken into account and the literature review was discussed accordingly. The research methodology is covered in the following chapter.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. INTRODUCTION

The earlier chapter discussed the study's literature review. The techniques and resources used are covered in this chapter. It further defines the research design followed, the study population and the setting chosen. The sampling process and proportions are also explained, as well as the inclusion and exclusion criteria. Data collection equipment used to gather data and the steps used to guarantee validity and reliability of the tools are described. Procedures on how to reduce bias are defined. Data analysis, statistical tests and ethical considerations are also discussed.

3.2. RESEARCH APPROACH

The quantitative research method was used in this study. This method helped the researcher to address the objectives of the study and facilitated the description of factors contributing to the development of obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district.

3.3. RESEARCH DESIGN

Research design is the overall strategy for gathering data in a research study (Brink *et al*,2012). This study used a cross-sectional descriptive design. A cross-sectional study design consists of data collection at a specific time point with the goal of estimating illness prevalence (Kesmodel, 2018). Data from 174 primary healthcare workers were gathered for the study using a cross-sectional descriptive design without further follow-up. The design helped in determining the relationship between BMI and sociodemographic profiles, and between habits and lifestyle factors and socio-demographic profiles.

3.4. RESEARCH SETTING

The research was carried out in clinics in the Lepelle-Nkumpi sub-district of the Capricorn district in Limpopo province, South Africa. The Lepelle-Nkumpi sub-district is situated south of Polokwane. It consists of 23 fixed clinics and 7 mobile clinics. The clinics are staffed by nurses of various categories, dietitians, and support staff such as data capturers, cleaners, and groundsmen. The primary healthcare workers at the clinic provide preventative services such as healthy weight promotion. The services are provided to residents of the Lebowakgomo, Zebediela, Mphahlele, Mathabatha and Mafefe areas. The municipality has 30 wards. There are three hospitals situated in Lepelle-Nkumpi, namely Lebowakgomo Hospital, Magatle Hospital and Thaba-Moopo Psychiatric Hospital. The researcher decided to use clinics because of a low level of data about obesity among primary healthcare workers as compared to hospitals.
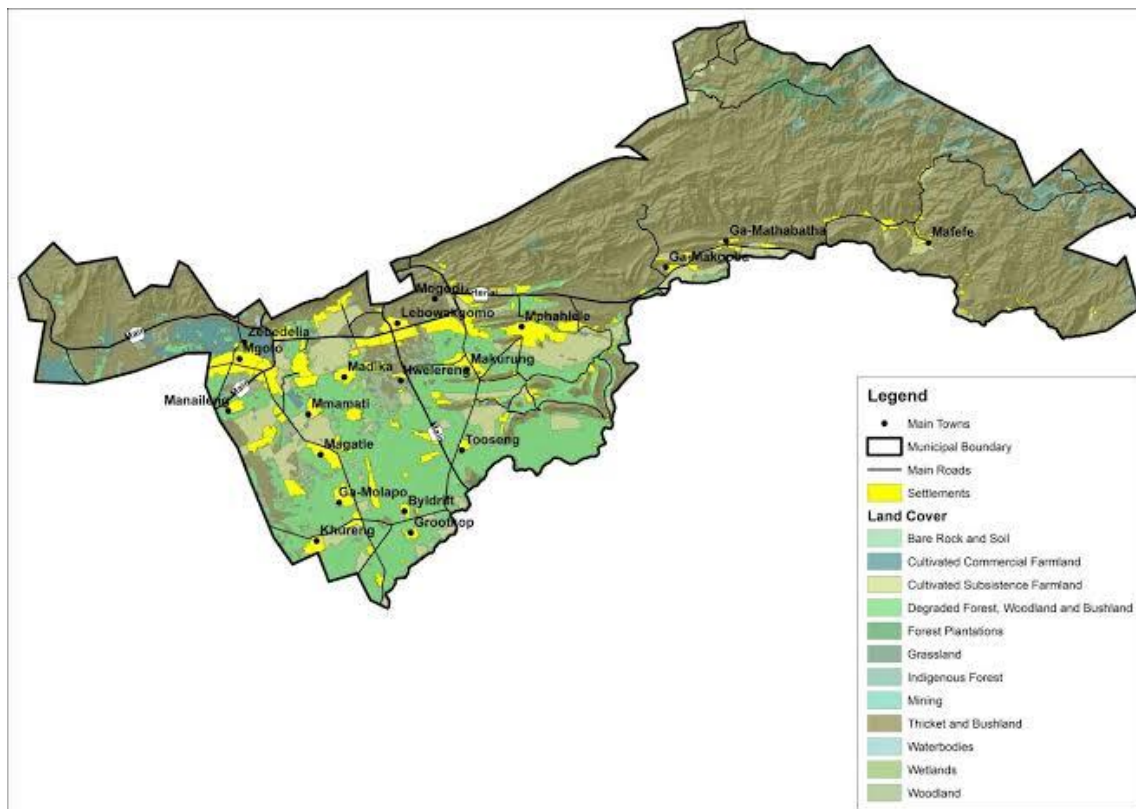
Figure 1 Map of PHC study sites in Lepelle- Nkumpi Municipality, Limpopo Province

Source: http//www.lepelle-nkumpi.gov.za/lepelle-nkumpi-admin/pages/sites/lepellenkumpi/documents/strategies/Annexure

3.5. STUDY POPULATION

The target study population included healthcare workers working in Lepelle-Nkumpi primary health care facilities. According to the Health Protection Surveillance Centre (HPSC), (2021) a healthcare worker is defined as "anyone who works in a healthcare or social care setting, including healthcare students on clinical placement, frontline healthcare workers, and other healthcare workers not in direct patient contact". This study had different categories of HCWs, namely healthcare professionals and support staff. Healthcare professionals include nurses and allied health workers, whereas support staff include data capturers, groundsmen and cleaners. The nursing category covers managers, clinical nurses, enrolled nurses, and assistant nurses. The Lepelle-Nkumpi PHC facilities have a population of 331, of which 236 are nurses, 81 are support staff, and 14 are allied health workers. The total population for this study was 331.

3.5.1. Sampling and Sample Size

Sampling is a crucial strategy for identifying and including participants in a research project since the population of interest is made up of too many people (Majid, 2018). Stratified random sampling was used in this study. Stratified random sampling can be applied by categorizing the study population into strata according to factors that the researcher is interested in, which then increases sample representatives (Howell *et al.,* 2020). From a list provided from Human Resources (HR) department, the participants were chosen based on their strata. Participants were selected according to their categories, since the study was using stratified random sampling. Categories in this study were nursing, support staff and allied health workers. To ensure a fair sampling procedure, each category had a member in different strata. After signing the consent paperwork, those who were willing to take part were given a number that was scribbled on a sheet of paper. The numbers were selected randomly. The needed sample size was determined according to the Taro Yamane formula (Uakarn, Chaokromthong, Sintao,2021), calculated at 5% margin of error and a 95% confidence interval. The formula is $S = \frac{n}{1+n(0.05)^2}$, where S= sample size, n= population size.

Where n= sample size, N= population size (N=), e=error margin (5%)

Sample size = $209/1+209(0.05)^2$

S = 137

Stratified Sampling Method

Table 3.1: Stratified sampling method followed to get the sample size of participants.

STRATA	POPULATION(n)	SAMPLE(s)
Nurses	214	138
Allied	14	14
Support Staff	73	57
TOTAL	**301**	**209**

The final sample size of participants was 174.200 participants were given questionnaires to fill in and 36 of the were not returned. 10 additional questionnaires were used as a replacement of unreturned questionnaire.

3.5.2. Inclusion criteria

- Primary healthcare workers such as nurses, allied health professionals, and administrative staff working in the clinics, irrespective of age or gender.
- Only full-time permanent workers
- Primary health workers with over 3 months working at the facilities.

3.5.3. Exclusion criteria

- Healthcare workers placed at the hospitals or district conducting outreach services at the clinic.
- Pregnant healthcare workers, as pregnancy can affect weight status and may introduce confounding factors.

3.6. DATA COLLECTION

Data collection is the systematic process of obtaining observations or measurement (Pritha, 2021).

3.6.1. Data collection tools

Participants completed a questionnaire with help from the researcher to collect the data. The questionnaire (see attached annexure C) was separated into sections, where section A covered socio-demographic data and section B covered anthropometric assessments, section C included a food frequency questionnaire, section D covered habits and lifestyle, and section E was about obesogenic environments. The anthropometric assessment involved the calculation of BMI to determine obesity using measurements of weight and height. Digital scale and stadiometer were used as part of data collection tools. A validated food frequency questionnaire was used to determine eating habits, while habits and lifestyle was used to determine physical activity levels. The obesogenic environment was used to ascertain the contributing factors to obesity. The socio-demographic section, habits and lifestyle, and obesogenic environments were developed using literature and [South African Demographic and Health Survey (SADHS) (2016)].

3.6.2. Recruitment and procedure

After obtaining approval to conduct the study at the Department of Health, further approval was requested from clinic managers to approach healthcare workers and conduct the study within their premises. Information leaflets about purpose, procedures, confidentiality, risks, rights of withdrawal at any time, and potential benefits, were sent to eligible primary healthcare workers. The researcher sampled in accordance with the sampling strategy of this study in order to find individuals to take part. Concerns expressed by workers were clarified by the researcher. Before including participants in the study, informed consent was sought from each one of them. Appointments were arranged with sampled participants and data was collected at convenient times for the participants, ensuring privacy and confidentiality.

3.7. DATA ANALYSIS

Data analysis is the process of gathering, modelling, and analysing data to produce information that supports decision-making (Calzon, 2021). The Statistical Package for Social Sciences (SPSS) version 28 was used for the data analysis. To show sociodemographic data, graphs in the shape of pie and bars were used to present the data. Analysis of frequencies, correlations, and means was done using the descriptive statistical method.

Prevalence of obesity

To calculate a person's BMI, their height in meters was divided by their weight in kilos (Zierle-Ghosh & Jan, 2023). It was classified according to the WHO (2010). BMI categories for adults are shown in table 4.1 below.

Table 4.1: BMI classification

Status	Body Mass Index (kg/m^2)
Underweight	< 18,5
Normal weight	$\geq$ 18.5 – 24.9
Overweight	$\geq$ 25 -29.9
Obese Grade 1	$\geq$ 30 -35
Obese Grade 2	$\geq$ 35 -40
Obese Grade 3	$\geq$ 40

World Health Organisation 2010

Cross-tabulation to scrutinize the association between obesity and socio-demographic profiles was calculated using the chi-square test to determine whether these correlations are statistically significant. The confidence intervals for the estimated prevalence of obesity were calculated at 95%, and p-value of 0.005 was considered to be statistically significant.

Eating Habits

Percentages and frequencies of specific foods consumed, including how often they were consumed, were calculated. Moreover, factor analysis or cluster analysis was applied to identify common dietary patterns among participants.

Habits and lifestyle factors

Data on walking, cycling, leisure-time physical activity, and occupational activity was summarised in frequencies and percentages. Means were calculated for self-reported physical activity variables, such as duration, frequency, and intensity of activities. Adherence to physical activity guidelines were assessed using WHO recommendations of exercise for 30 minutes 3 days a week.

Moreover, habits and lifestyle were classified into poor, good and excellent. For the purposes of this study, habits and lifestyle factors was graded on 100% core and on a scale from poor to good. Poor habits and lifestyle factors receive a total score between 0 and 60%, good habits and lifestyle factors between 61 and 80%, and excellent habits and lifestyle factors between 81 and 100%.

Cross-tabulation to scrutinize the relationship between habits and lifestyle factors, and socio-demographic profiles was calculated using the chi-square test to evaluate the statistical importance of these relationships. The confidence intervals for the estimated habits and lifestyle factors were calculated at 95%, and p-value of 0.005 was considered statistically significant.

Obesogenic environment

Obesogenic environments were assessed as contributing factors to obesity. and were categorised as home and workplace exposure. The data on proximity to restaurants, and purchasing was summarised in frequencies and percentages.

3.6.4. Pilot Study

A pilot study helps in collecting preliminary knowledge about the studied phenomenon (Dzwigol, 2020). Before the main research could be conducted, a pilot study was carried out. The pilot study was carried out on 12 healthcare workers from the PHCs

who did not form part of the main study. A pilot study helps to test the possibility and effectiveness of study procedures, data collection tools, and research protocols before implementing the full-scale study. Additionally, the reliability of the data gathering method was assessed through the usage of this pilot study. Descriptive statistics was used to analyse the pilot study's data. The outcomes of the pilot study may demand changes to the data collection tool or method, but in this study no adjustments were found necessary.

3.8. RELIABILITY

Reliability refers to the consistency of the tool being utilized over time. It should produce similar results while using different measuring tools at different times (Surucu & Maslakci, 2020). In this study, reliability was ensured by measuring the weight of the participants twice. The scale was standardized by weighing an item of a known weight and the scale will be zeroed after every participant. The same digital scale was used throughout the study. The reliability of the stadiometer was ensured by repeating the height of each participant twice and taking the height of a known object. A pilot study was carried out to ensure the reliability of this study. Internal consistency of items in the instrument was ensured through statistical techniques like Cronbach's alpha, which was found to be 0.70 indicating that the questionnaire was more reliable.

3.9. VALIDITY

Validity is the degree of a test's ability to measure what needs to be measured. Validity is achieved when a measuring device performs its measurements accurately (Erlinawati & Muslimah, 2021). In this study, the weighing scale was used.

- *Face validity*

In this study, face validity was ensured by using the same digital scale, measuring tape and stadiometer throughout the data collection duration and the same questionnaires throughout the study. The digital scale was standardized by weighing an object with a known weight and zeroed before subsequent participants were weighed. The food frequency questionnaire was in simple English, which was easily

understood by participants. The digital scale and stadiometer were put on a flat, hard surface to ensure correct readings.

- *Content validity*

According to Koller *et al.* (2017), content validity Is "the degree to which elements of an assessment are pertinent to a member of the targeted construct for a particular assessment purpose". Sociodemographic data was reported to the university statistician for content validity in this study, whilst BMI results were submitted to the supervisor and dietitian.

3.10. BIAS

Morkunas *et al.* (2020) defined bias as "any systematic error in the design, conduct or analysis of a study", whereas Yarbrough (2021) describes bias is defined as any process that has a tendency to yield outcomes or judgments that, at any point during inference, deviate systemically from the truth. The following types of biases were likely to occur and addressed:

Sampling bias occurs when some members in a specific population are chosen more often than others (Wang *et al.*, 2020). Stratified random sampling was used in this study and this have warranted a reasonable representative of all groupings.

Respondent bias was minimised by using standardized questionnaires prepared in English because all HCWs are proficient in reading and writing the language.

Measurement bias was prevented by measuring the subject's height and weight twice, with each measurement requiring a new calibration of the weighing equipment.

Information bias can occur if there are errors or inaccuracies in the data collected. The researcher minimised this information bias by using a standardised data collection tools, and provided clear instructions to participants, and ensured anonymity and confidentiality to encourage honest responses.

Response bias occurs when participants give unreliable or unfair responses to survey questions. This bias can arise due to factors such as social desirability bias, recall

bias, or participants not fully understanding the questions. Researchers can minimize response bias by using validated and reliable measurement tools, pre-testing survey instruments, asking clear and unambiguous questions, and emphasising the importance of honest and accurate responses.

Bias in data analysis can be brought upon by human sources through the use of unrepresentative data sets, incorrect statistical tests and biased reporting and measurements. To minimise this form of bias, the researcher did not manipulate or tamper with the participants' responses.

Bias in data interpretation occurs when the data analyst tries to prove a predetermined assumption. In this study, bias in data interpretation was ensured by the interpretation of data by the researcher, together with the supervisor, to ensure that the interpretation was not based on what the researcher was expecting to get from the study but   on the actual findings.

3.11. ETHICAL CONSIDERATIONS

- *Ethical clearance*

The study proposal was submitted to the University of Limpopo Department of Public Health and approved for submission to the School of Healthcare Sciences' research committee. From the school it was submitted to the faculty, where it approved and submitted to Turfloop Research Ethics Committee (TREC) for ethical clearance. The TREC issued an ethical clearance certificate with the following reference number: TREC/586/2022: PG. (See Appendix J).

- *Permission*

This permission to carry out this research at the clinics of Lepelle-Nkumpi was approved by the Department of Health Limpopo Research Committee (See Appendix F) and Capricorn District Department of Health (See Appendix H). The Lepelle-Nkumpi clinic managers provided verbal permission from each clinic.

- ***Informed written consent***

All participants who took part in this study provided written informed consent following the explanation of the research purpose, procedure, confidentiality, anonymity, etc (See Appendix D).

- ***Confidentiality***

Confidentiality was upheld during the course of the study. Participants filled in the questionnaire and had their measurements of weight and height taken in private rooms of the clinics. The data was saved in a locked safe where only the approved researcher had right of entry to the keys electronic documents were password-protected and shall be kept for a minimum period of five years.

- ***Anonymity***

Anonymity was ensured by warranting that no member of the research team could collect any direct or indirect personal identifiers that could be used to connect responses to a particular person. The written consent forms were separated from the questionnaire making it difficult to link responses to individuals. Furthermore, personal identify codes were allocated to identify participants.

- ***Privacy***

Privacy refers to defending people's right to decide who can access and participate in a study (i.e., extent, timing, circumstances). Data was collected in private rooms at the clinics, which only the researcher and participants could access.

- ***Avoidance of Harm***

Varkey (2020) defined non-maleficence "as the duty of the physician not to harm the patients". No one should kill, inflict pain or suffering, render someone helpless, or deprive them of a good life, according to these ethical principles. The emotional harm, bodily discomfort and shame of participants in the study were avoided. This study was

not invasive to participants. However, if any of the participants felt offended during the study, a psychologist was on standby for individual sessions.

3.1.2. SUMMARY

This chapter examined the study's design, setting, participants, sampling, data collecting, validity, reliability, data analysis, and ethical considerations. The results will be displayed in the following chapter.

CHAPTER FOUR: PRESENTATION, INTERPRETATION, AND DISCUSSION OF FINDINGS

4.1. INTRODUCTION

This chapter presents the findings of the data collected from a sample of 174 healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province. The purpose of this study was to determine factors contributing to obesity among HCWs in primary health care in the Lepelle-Nkumpi sub-district of the Limpopo province. Frequency distributions were calculated for categorical data and chi-square tests was used for associations. Statistical Package for the Social Sciences (SPSS) version 28.0 was used for data analysis. Tables and graphs were used to display the results. This chapter discusses the results presented in this study in relation to previous studies and literature on factors contributing to obesity. The results are outlined in line with study's objectives which are:

- To assess the prevalence of obesity among Primary healthcare workers in the Lepelle-Nkumpi sub-district of Limpopo province
- To describe the eating habits among Primary healthcare workers in the Lepelle-Nkumpi sub-district of Limpopo province.
- To describe the level of physical activity among Primary healthcare workers in the Lepelle-Nkumpi sub-district of Limpopo Province
- To investigate the factors contributing to obesity among Primary healthcare workers in the Lepelle-Nkumpi in sub-district of Limpopo province

4.2. SOCIODEMOGRAPHIC RESULTS OF THE PARTICIPANTS
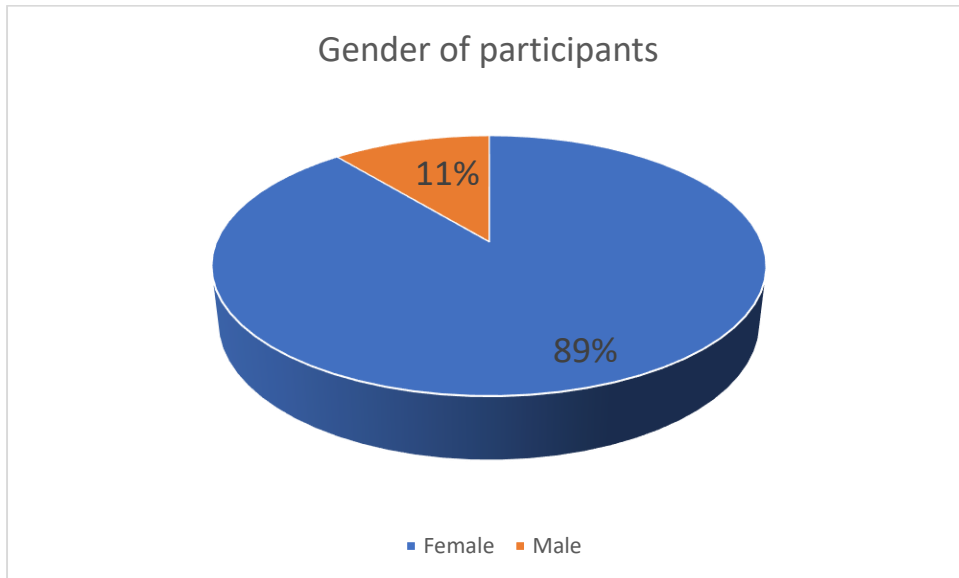
Figure 1: Gender of participants

Figure 1 shows that the majority (89%) of the participants were female and 11% were males.

This is in accordance with the South African study by Phetla *et al*. (2017), which revealed that the healthcare profession is dominated by females. According to O'Neill (2023), South Africa has a significantly high population of females compared to males The results of this study are reflective of gender representation in the country.
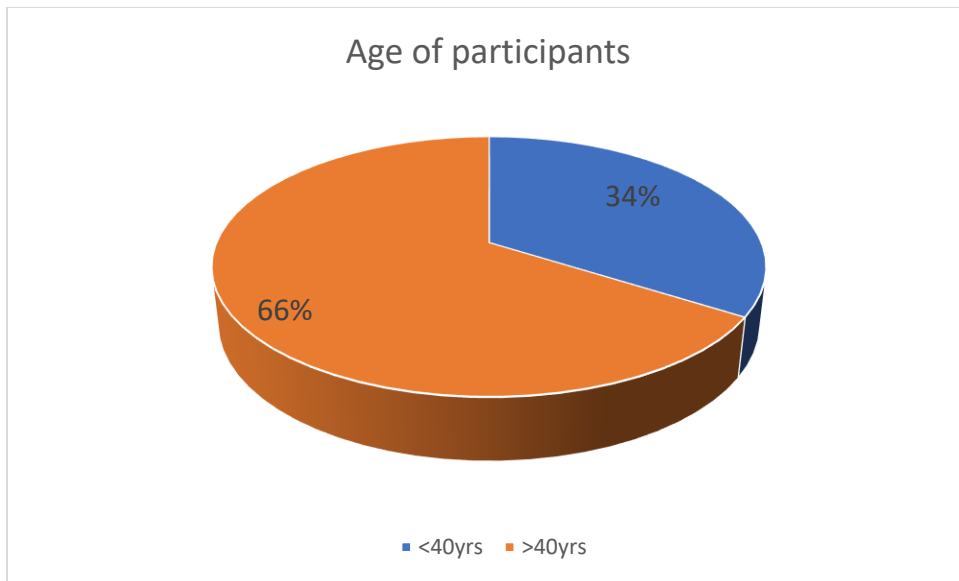
Figure 2: Age of participants

Figure 2 reveals that 34% participants were younger than 40 years of age and 66% were older than 40 years.

Results of this study are similar to a study which reported that public service employees are mostly aged 45 years or more (DPSA,2018/19). This study is therefore also reflective of the health sector.
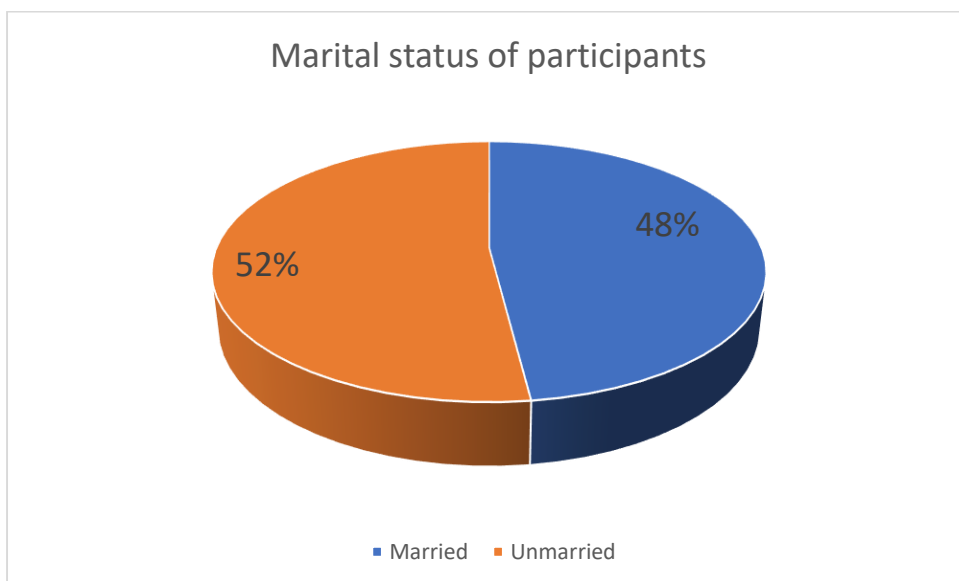
Figure 3: Marital statuses of participants

Figure 3 shows that 52% of participants were unmarried and 48% of participants were married.

Statistics according to South Africa's most recent report on marriages and divorces (2021), there were 106 499 marriages there in 2021 as opposed to 161 112 in 2012. In South Africa, 111 415 weddings and unions were recorded overall in 2021. While there were fewer marriages in SA since 2020, there were 13.1% more divorces. In 2021, 18 208 divorces were granted (Stats SA, 2021). The study concurs with the findings from the current study.
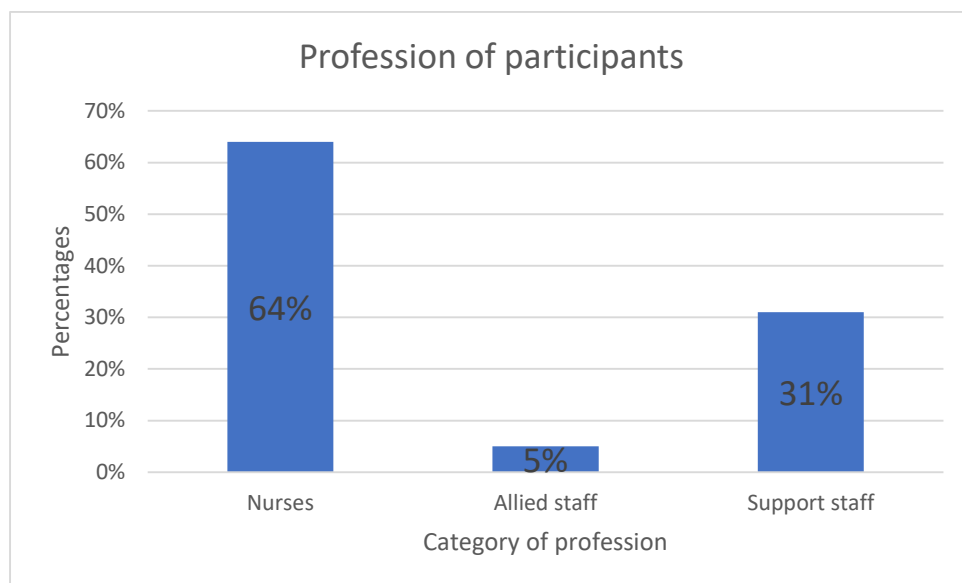
Figure 4: Professions of participants

Figure 4 reveals that 64% of participants were nurses, 5% allied staff and 31% support staff.

According to the Primary Healthcare System (PRIMASYS) (2017), nurses are the backbone of PHC in South Africa. It is therefore not surprising that fewer allied health professionals participated in the study in comparison with nurses. Additionally, close to one-third of support staff participated in this study as they mainly provide support to nurses, who are the numeric majority in PHCs.

Table 4.1: Categories of various professions and race, N = 174, % in rows.

Categories		Frequency	Percentages
Nurses	CNP/Prof Nurse	75	61.5%
	ENA	18	14.7%
	EN	29	23.8%
Allied staff	Dietitians	5	100%
Support staff	Data Capturer	21	44.7%
	Ward attendant/Cleaner	18	38.3%
	Groundsman	8	17%
Race	African	174	100%

Table 4.1 shows that in the nursing category, 61.5% were professional nurses and 14.7% were enrolled nurse assistants. It also shows there are more data capturers (44.7%) than other support staff. All participants (100%) were Africans.

In the public sector of South Africa, there were 173 761 health professionals employed in 2015; 77% of them were nurses, 11% were doctors (generalists and specialists), and the rest were divided amongst other occupations, - pharmacists (2.9%), dental (0.9%), therapists (1.5%), psychologists (0.7%), and environmental (0.5%). The backbone of PHC in South Africa is Nurses and they are categorised as professional nurses, enrolled nurses, and nursing assistants (PRIMASYS, 2017). Hospitals and clinics employs more than 60% of registered nurses, which represent the majority of nurses working in these settings (Clarke,2023). The findings concur with these study, which has more registered/professional nurses (61. 5%).In 2021's fourth quarter, the labour force participation rate among Africans attained 55%, indicating a 0.5% change year-over-year from the first quarter of 2020 (Stats SA,2023). The study was conducted in the rural areas of Lepelle-Nkumpi sub-district, where African people make up to 99.6% of the population.

4.3. PREVALENCE OF OBESITY

The occurrence of obesity among participants was determined using body mass Index (BMI). It was calculated to address the objective 1 of this study as follows: *To assess the prevalence of obesity among Primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.*
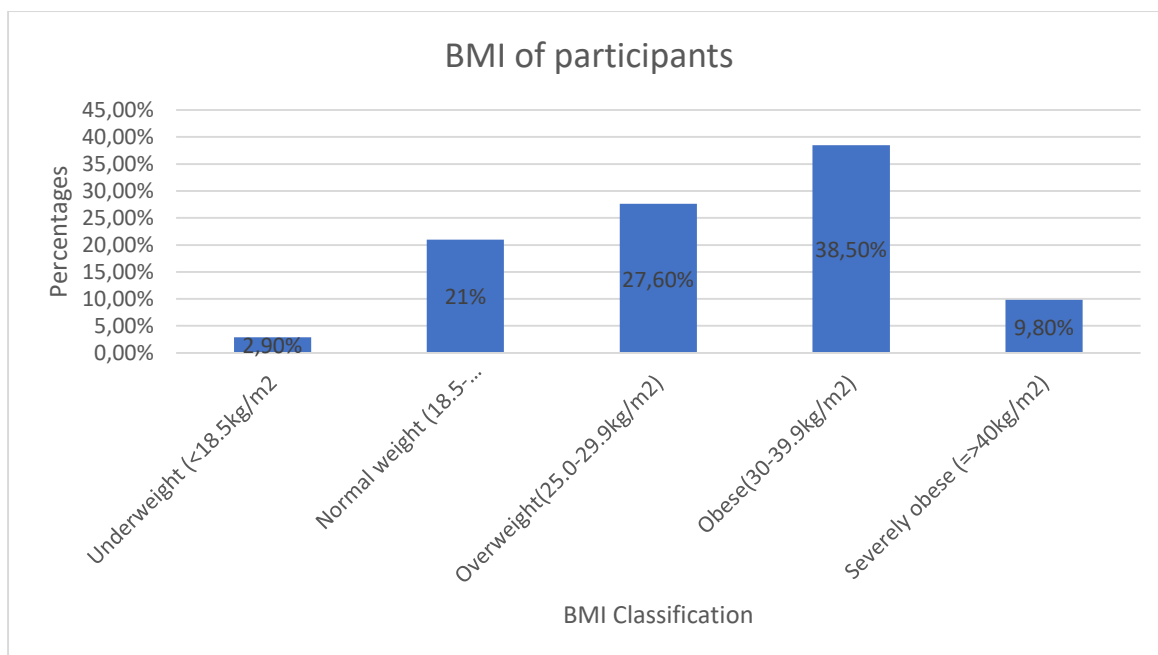
Figure 5: Body mass index classifications of participants

Figure 5 shows that 21% of participants had normal weight, 27.6% were overweight, 38.5% were obese and 9.8% were severely obese.

The study's results reveals that the majority of participants were obese, which is in agreement with a study carried out by Kunyahamu *et al*. (2021), where the study found that 33.1% were categorized as overweight and 21.1% were obese. Phetla *et al.* (2017), conducted study in South Africa, Mpumalanga on healthcare professionals addressing their own body weight, it was found that only 24.3% of participants had normal weight, 21.4% were overweight, and 51.9% participants were obese. Different studies have shown no difference between general population and health care professionals in South Africa (Skaal, Pengpid, 2011). As shown in figure 4.5, majority of participants in the current study were nurses, therefore this study affirms many studies which reported obesity among nurses (Kunyahamu *et al.*, 2021) and (Yegambaram *et al.*,2022). A low level of physical activity, dietary habits and routine daily activities might be the cause of obesity and excess weight among nurses. Therefore, it is important to encourage nurses to manage their weight in a healthy way, since they are the drivers of public health policies and the faces of PHC. The PHC reengineering program promotes preventative health, which is central to the promotion of a healthy weight among the population. As such, it may be necessary that faces or

drivers of the PHC policies inspire communities to promote healthy weight through role modelling. As things stands in this study, it may be difficult for overweight or obese nurses to encourage or convince the public to maintain their weight.

Participants in this study are at jeopardy of several health problems due to overweight and obesity. Studies found that obesity is related with problems like cardiovascular diseases, cancer, liver diseases, and T2DM (Kayle *et al.*, 2017 & Chooi *et al.,* 2019). It is worrisome that healthcare workers are the drivers of public health policies promoting healthy weight management to avoid diseases, as the overweight or obese health workers in this study may not be leading by example, meaning that community members may not listen to them when they are encouraged to lose weight.

4.4. THE CROSS-TABULATION OF BODY MASS INDEX AND SOCIODEMOGRAPHIC PROFILE OF PARTICIPANTS

Table 4.1: The cross – tabulation of body mass and sociodemographic profile of participants.

SOCIO DEMOGRAPHIC DATA		BODY MASS INDEX CLASSIFICATION				CHI - SQUARED TEST AND P-VALUE
		UNDER WEIGHT N (%)	NORMAL WEIGHT N (%)	OVERWEIGHT N (%)	OBESE N (%)	
Gender	Males	0(0%)	11(55%)	7(35%)	2(10%)	X^2 = 20.170
	Females	5(3.2%)	26(16.9%)	41(26.6%)	82(53.2%)	P-value = 0.001
Age	<40 Years	4(6.8%)	15(25.4%)	17(28.9%)	23(38.9%)	X^2 = 11.642
	>40	1(0.9%)	22(19.3%)	30(26.3%)	61(53.5%)	P-value= 0.168
Marital status	Married	2(2.4%)	16(19.0%)	23(27.4%)	43(51.2%)	X^2 = 1.657
	Unmarried	3(3.3%)	21(23.3%)	25(27.8%)	41(45.6%)	P-value = 0.799
Professional category	Nurses	4(3.6%)	21(18.7%)	27(24.1%)	60(53.6%)	X^2 = 7.799
	Allied	0	2(25%)	2(25%)	4(50%)	P-value = 0.453
	Support staff	1(1.8%)	14(25.9%)	19(35.2%)	20(37.1%)	
Job title status	CNP/Prof Nurse	3(4%)	13(17.3%)	19(25.4%)	40(53.3%)	X^2= 33.698
	EN	1(3.4%)	4(13.8%)	6(20.7%)	18(62.1%)	P-value = 0.090
	ENA	0	5(27.8%)	5(27.8%)	8(44.4%)	

	Data Capturer	1(4.7%)	6(28.6%)	6(28.6%)	8(38.1%)
	Ward Attendant/ Cleaner	0	1(5.6%)	7(38.8%)	10(55.6%)
	Groundsman	0	6(75%)	2(25%)	0
	Dietitian	0	2(40%)	3(60%)	0

Table 4.2 reveals no significant relationship between BMI and age, marital status, professional category and job title status at (P=0.168, P=0.799, P=0.453 and P=0.090). Significant correlations existed between BMI and gender (P= 0.001). The study found no significant correlations between BMI and, age (P-value= 0.168), marital status (P-value= 0.799) and professional category (P-value = 0.456).

A study by Chew *et al.* (2023), discovered an important correlation between sociodemographic factors (race and marital status) and anthropometric measurements (BMI). Qureshi, Straiton and Gele (2020), also conducted a study, which found a significant association between sociodemographic factors (age, gender and marital status) and overweight/obesity. Consequently, these studies findings and this study's findings are similar, which found a significant correlation between age and BMI with p-value = 0. 001. At the same time, this study differs with the cited studies because there was no significant correlation between race and marital status.

4.5. EATING HABITS OF PARTICIPANTS

Eating habits were determined or investigated to address the objective 2 of this study which is as follows: *To describe the eating habits among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.*

Table 4.3: Consumption of the protein sources, N = 174, % in rows.

Consumption of items		Frequency	Percentages
Chicken	With skin	93	53.4%
	Without skin	76	43.7%
	None	5	2.9%
Red Meat	Fatty meat	73	42%
	Lean meat	80	46%
	None	21	12%
Milk	2% or Low Fat	34	19.5%
	Skim/Fat free	12	6.9%
	Blends	9	5.3%
	Full Cream	113	64.9%
	None	6	3.4%

Table 4.3 shows a total of 53.4% consume chicken with skin compared to 43.7% eating without skin. Also, 46% eat lean meat compared to 42% who eat fatty meat, and 6.9% who consume fat-free milk, compared with 19.5% who consume 2% or low fat milk.

It was discovered that while poultry without skin was unrelated to weight increase, poultry with skin was directly linked to weight gain. Although there was no significant correlation with consumption of lean red meat, eating fresh, fatty red meat was linked to an increased risk of central obesity (Khodayari *et al*.,2022)**.** According to Guo, Dougkas, Elwood and Givens (2018), consumption of high-fat dairy is not associated with high BMI. The study revealed little evidence that high-fat dairy consumption had a detrimental effect on health outcomes, despite the fact that low-fat dairy products have been advocated as a healthier option. Despite this, it is generally accepted that healthy eating includes the consumption of lean meat, chicken without skin, and fat-free or low-fat milk, as the intake of fatty food including chicken with skin, fatty meat and full cream milk may contribute to overweight and obesity.

According to Dor, Stark, Ditchtiar and Sinai (2022), a study revealed animal protein from sources like red and processed meat, as well as chicken, was linked to gaining weight, but protein from sources like fish and dairy products was not linked to any change in weight. Magkos, Rasmussen, Hjorth, Sjodin, Astrup and Geiker (2022), found that a diet rich in fatty meat compared to lean meat, has been linked to a higher incidence of obesity. 42% of participants consume fatty red meat, which may increase

their chances of obesity, whilst 46% consume lean meat, which minimises their chances of obesity. In a study comparing variations in abdominal adiposity and BMI with milk-fat consumption, Wilkinson, Tucker, Davidson and Bailey (2021) found that when compared to consumption at higher levels, non-fat milk consumption was linked to lower BMI of milk fat. Most participants in this study consume full cream milk, which may increase their threat of overweight and obesity.

It is recommended that participants in this study, especially nurses, practise a healthy lifestyle. Dietitians need to educate their colleagues on healthy eating. The increased intake of chicken with skin, full cream and red meat could have contributed to high overweight and obesity among nurses or participants in this study.

Table 4.4: Use of spreads, fried and processed foods, N =174, % in rows.

Use of spreads, fried and processed food		Frequency	Percentages
Spread	Butter	52	29.9%
	Hard Margarine (brick)	16	9.2%
	Soft Margarine (Tub)	71	40.8%
	None	35	20.1%
Fried foods	Occasionally/Never	80	46.0%
	Weekly (at least once)	83	47.7%
	Daily	11	6.3%
Processed foods	Occasionally/never	95	54.6%
	Weekly	66	37.9%
	Daily	13	7.5%

Table 4.4 revealed that 40.8% of the participants use soft margarine as their spread, while 47.7% eat fried food weekly and 54.6% eat processed foods occasionally. 6.3% of participants mentioned that they consume fried foods daily.

This study shows that 47.7% and 37.9% of participants consumed fried and processed food weekly, respectively. Eating fried and processed food weekly can predispose individuals to obesity and lifestyle diseases. Overweight and obesity is significantly associated with fast foods consumption due to the high energy density of these foods (Mohammadbeigi *et al.,* 2018). Kunene *et al.* (2017), found that 37% of healthcare workers consumed fast foods, 38% consumed fatty foods and 49% consumed fried foods. Beslay, Srour, Mejean, Alles and Debras, (2020) found that higher BMI and higher odds of being overweight and obese were linked to higher ultra-processed food

consumption. Beslay *et al*. (2020), recommend limiting the ultra-processed foods consumption and encouraging use of foods that have undergone minimum or no processing.

Table 4.5: Frequency of consumption of salty foods, N = 174, % in rows.

Consumption of food items		Frequency	Percentages
Salted	Very salty	21	12.1%
	Lightly salty	142	81.6%
	Don't know	11	6.3%
Add salt/Aromat	No, I never add salt	103	59.2%
	Yes, but I taste first and then add	62	35.6%
	Yes, even before having tasted food	8	4.6%
	Do not know	1	0.6%
Salty snack	Yes	51	29.3%
	No	123	70.7%

Table 4.5 shows that a high percentage of participants (81.6%) reported using salt lightly, 59.2% reported that they never added salt to their food before eating, while 70.7% reported that they were not consuming salty snacks.

Kunene *et al*. (2017), found that around 36% participants ate salty snacks, while in this study 29.3% reported consuming salty snacks. It is impressive that most participants never consumed salted snacks or added salt or aromat to their food. On the other hand, 81.6% consume food with light salt. Numerous research has discovered a correlation between salt or sodium intake and increased BMI and the prevalence of overweight/obesity (Zhou *et al*., 2019; Fang, He, Fang, & Lian, 2021). Participants in this study were already obese and overweight, which emphasises the importance of addressing and managing sodium intake. Excessive salt consumption among obese and overweight persons can have negative health implications, including increased cardiovascular disease risk and blood pressure.

Table 4.6: Frequency of consumption of fruit and vegetables, N = 174, % in rows.

Consumption of fruit and vegetables	Never	Weekly		Every day		
		1-3 times /week	4-6 times/week	1 time a day	2 times a day	3 times a day
Spinach/morogo	15(8.6%)	91(52.3%)	30(17.3%)	29(16.7%)	6(3.4 %)	3(1.7%)
Tomato(raw/cooked)	39(22.4%)	76(43.7%)	25(14.4%)	26(14.9%)	4(2.3%)	4(2.3%)
Green peas	77(44.3%)	62(35.6%)	21(12.1%)	13(7.5%)	0(0%)	1(0.6%)
Mixed vegetables	50(28.7%)	74(42.5%)	29(16.7%)	13(7.5%)	3(1.7%)	4(2.3%)
Pumpkin/butternut	57(32.8%)	86(49.4%)	13(7.5%)	11(6.3%)	4(2.3%)	3(1.7%)
Sweet potato	72(41.4%)	74(42.5%)	12(6.9%)	9(5.2%)	5(2.9%)	2(1.1%)
Potato	35(20.1%)	90(51.7%)	30(17.2%)	15(8.6%)	4(2.3%)	0(0%)
Citrus fruit	27(15.5%)	75(43.1%)	37(21.3%)	25(14.4%)	3(1.7%)	6(3.4%)
Pure orange	71(40.8%)	66(37.9%)	21(12.1%)	11(6.3%)	4(2.3%)	1(0.6%)
Bananas	21(12.1%)	79(45.4%)	36(20.7%)	30(17.2%)	4(2.3%)	0(0%)
Mangoes	43(24.7%)	86(49.4%)	21(12.1%)	19(10.9%)	4(2.3%)	1(0.6%)
Apples/pears	12(6.9%)	75(43.1%)	41(23.6%)	30(17.2%)	11(6.3%)	5(2.9%)
Avocado	76(43.7%)	66(37.9%)	17(9.8%)	12(6.9%)	2(1.1%)	1(0.6%)

Table 4.6 shows that most participants are consuming morogo/spinach (91.4%), tomato (77.6%) and potato (79.9%) as their vegetables and apple/pears (93.1%), banana (85.6%) as their fruits. The percentage of participants who mentioned not to consume sweet potatoes (41.4%), pumpkin/butternut (32.8%), or green peas (44.3%) was very high.

The findings from the study reveals high consumption of fruits and vegetables among participants, which can help them prevent non-communicable diseases and obesity. A study by Wall *et al.* (2018), found that consuming a diet high in fruits, vegetables, and whole grains can reduce the risk of obesity since these foods are satiety-inducing due to their high water and dietary fiber content. Insufficient consumption of fruits and vegetables is a factor in 14% of deaths from gastrointestinal cancer, 11% of deaths from ischemic heart disease, and 9% of deaths from stroke. Low fruit and vegetable consumption in South Africa was linked to 3.2% (1.667) of the country's 521 000

fatalities and 1.1% of disability-adjusted life years, according to a comparative burden of disease research (Okop, Ndayi, Tsolekile, Sanders & Puoane, 2019).

Perez *et al.* (2020), conducted study on the prevalence of intake of fruits and vegetables among Spanish employees. The study found that healthcare staff had the highest prevalence of fruit and vegetable consumption. In addition, campaigns to promote the advantages of eating fruits and vegetables should be started, with the intended audience being community leaders, people who consume food in their homes and schools, as well as people who produce and manage food (Okop *et al.*, 2019).

Banana and mangoes were consumed more than 2 times per day by participants, due to their availability. Since mango is a seasonal fruit, participants were able to eat mangoes at work and at home because of their availability in the study areas. Most of the street vendors near facilities were selling bananas at affordable prices. HCWs consume fruits and vegetables because of their health benefits and the majority of participants were women, who often carry lunchboxes when they go to work. Most participants reported eating morogo/spinach because of its availability and affordability, with some even growing it in backyard gardens. The South African Food Based Dietary Guidelines (FBDGs) (2013) recommend 3 vegetables and 2 fruits a day, which most of participants in this study are not practising. Increasing knowledge about fruits and vegetables to healthcare workers will assist them in improving compliance to a balanced diet.

Fruits and vegetables are rich in essential vitamins, minerals, fibre, and antioxidants, while being low in calories. Including these foods in one's diet provides the necessary nutrients while promoting a feeling of fullness and reducing overall calorie intake (Slavin & Lloyd, 2012). Intake of more fruits and vegetables among persons with normal body weight may help in maintenance of the weight. Most participants in this study were obese and overweight, meaning that the addition of more fruits and vegetables into meals and snacks may increase their food volume while managing calorie intake in effort to maintain weight and support weight loss. A lower risk of chronic diseases like heart disease, T2DM, and several types of cancer is correlated with enough fruit and vegetable consumption (Slavin *et al.*, 2012).

Table 4.7: Frequency of intake of protein sources per day, N = 174, % in rows.

Consumption of protein sources	Never	Weekly		Every day		
		1-3 times /week	4-6 times/week	1 time a day	2 times a day	3 times a day
Red meat	62(35.6%)	93(53.4%)	5(2.9%)	10(5.7%)	2(1.1%)	2(1.1%)
Chicken	9(5.2%)	101(58%)	28(16.1%)	26(14.9%)	7(4.0%)	3(1.7%)
Tinned fish	50(28.7%)	105(60.3%)	6(3.4%)	9(5.2%)	2(1.2%)	2(1.2%)
Organ meat	84(48.3%)	76(43.7%)	3(1.7%)	11(6.3%)	0(0%)	0(0%)
Eggs	24(13.8%)	98(56.3%)	22(12.7%)	23(13.2%)	4(2.3%)	3(1.7%)
Dairy	45(25.9%)	77(44.3%)	24(13.8%)	21(12.1%)	6(3.4%)	1(0.6%)
Cheese	85(48.9%)	58(33.3%)	18(10.3%)	10(5.7%)	3(1.7%)	0(0%)
Peanuts/nuts	74(42.5%)	74(42.5%)	15(8.6%)	9(5.2%)	1(0.6%)	1(0.6%)

Table 4.7 reveals that chicken was consumed by the majority of participants (94.7%), followed by tinned fish (86.2%) and dairy (74.1%). Food items such as cheese (48.9%), organ meat (48.3%) and peanuts/nuts (42.5%) were reported as never consumed by participants.

According to a study by Dor *et al.* (2022), animal protein from red and processed meat as well as chicken was associated with gaining weight, whereas protein from sources including fish and dairy had no effect on weight. An increased risk of obesity has been linked to a diet high in meat, especially red meat (Magkos *et al.*, 2022). A study by Wilkinson *et al.* (2021) on frequent use of non-fat milk was linked to a reduced BMI as compared to consumption of greater levels of milk fat, according to research on milk-fat intake and differences in abdominal adiposity and BMI. Participants in the study reported eating tinned fish (60.3%) 1-3 times per week, more than any other protein sources, while 53.4% participants in this study consumed red meat 1-3 times a week. 58% of participants consumed chicken 1-3 times per week and 16.1% consumed chicken 4- 6 per week. 56.3% of participants reported eating eggs 1-3 times per week, while 12.7% consumed eggs 4-6 times per week. This study shows that almost 56.3% of participants consumed red meat weekly while 74.1% consumed chicken weekly.

Schlesinger, Schwedhelm, Hoffman, Bechthold and Schwingshacki (2019) found that red meat consumption was associated with higher risk of abdominal obesity, while fish consumption was inversely related to that risk. In addition, the study discovered that

eating eggs raised the chance of weight gain (Schlesinger *et al.*,2019). On dairy products, high-fat dairy products and changes in body weight were not linked in the study, but there was link between intake of yogurt and weight loss. This study found that participants were consuming red meat and chicken weekly, which may have contributed to them being overweight and obese.

Table 4.8: Frequency of intake of carbohydrates, N = 174, % in rows.

Consumption of carbohydrates	Never	Weekly		Everyday		
		1-3 times/week	4-6 times/week	once	2 times	3 times
Breakfast cereal	73(41.9%)	63(36.2%)	18(10.3%)	18(10.3%)	2(1.1%)	0
Oat porridge	87(50.0%)	57(32.8%)	18(10.3%)	9(5.2%)	3(1.7%)	0
Soft porridge	79(45.4%)	63(36.2%)	12(6.9%)	19(10.9%)	1(0.6%)	0

Table 4.8 shows that most participants were consuming breakfast cereal (57.9%), followed by soft porridge (54.6%). 50% of participants mentioned that they never consumed oat porridge while the other 50% reported consuming it.

 The present study reveals that most of participants were consuming more carbohydrate-rich foods. Sartorius, Sartorius, Madiba and Stefan (2018), based on their study they found that, it cannot be decided that a diet dense in carbohydrates or an increase in the amount of total energy consumed in the form of carbohydrates makes a person more likely to become obese. Malik and Hu (2022) also have suggested a link between weight growth and specific dietary carbohydrates, such as sugar-sweetened beverages.

A study by Tammi *et al.* (2023) mentioned the conflicting research on the relationship between carbohydrate intake and the danger of weight gain. Given that the overall amount of carbs consumed contains subcategories that may have different relationships with body weight measurements, the variations may be related to the quality of the carbohydrates consumed. This study's limitation is that it was unable to prove whether the participants eat breakfast cereal, oats or soft porridge as part of their breakfast intake or at any other time of the day.
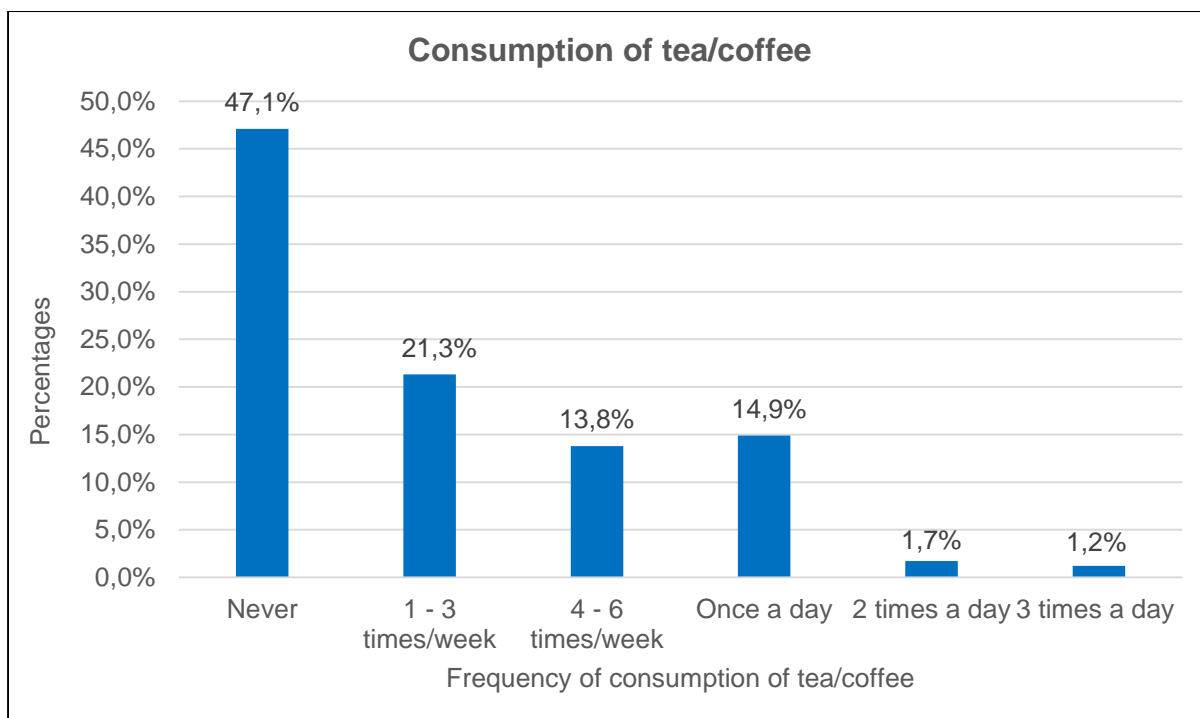
Figure 6: Frequency of consumption of tea/coffee

Figure 6 shows that most participants reported consuming coffee/tea (52.2%), while other participants (47.1%) mentioned never consuming it.

According to study results, the majority of participants were drinking more tea and coffee. Al Hazmi and Abdulmajeed (2018), also found that coffee was the commonest drink consumed by healthcare workers because it is sweet, has a stimulating effect, and helps in mental processes and work performance. It is possible that participants in this study also consumed tea or coffee as stimulants. A study by Lee *et al.* (2019), found that there was no evidence of an association between high coffee intake and weight gain in men, while increased weight in women was positively correlated with higher coffee consumption. In addition, Sirotkin and Kolesarova (2021) found that both coffee and tea have the ability to promote health and longevity and mitigate and treat many disorders, including obesity and obesity-related illnesses. Caffeine found in both plants can be the reason it can minimise obesity. Moran-Lev *et al.* (2023), found that coffee and catechin polyphenols (tea) have been found to have an impact on adult population weight control.

4.6. LEVEL OF PHYSICAL ACTIVITY OF PARTICIPANTS

Levels of physical activity were established to address objective 3 and further show contribution to obesity. Objective 3 is as follows: *To describe the level of physical activity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province*
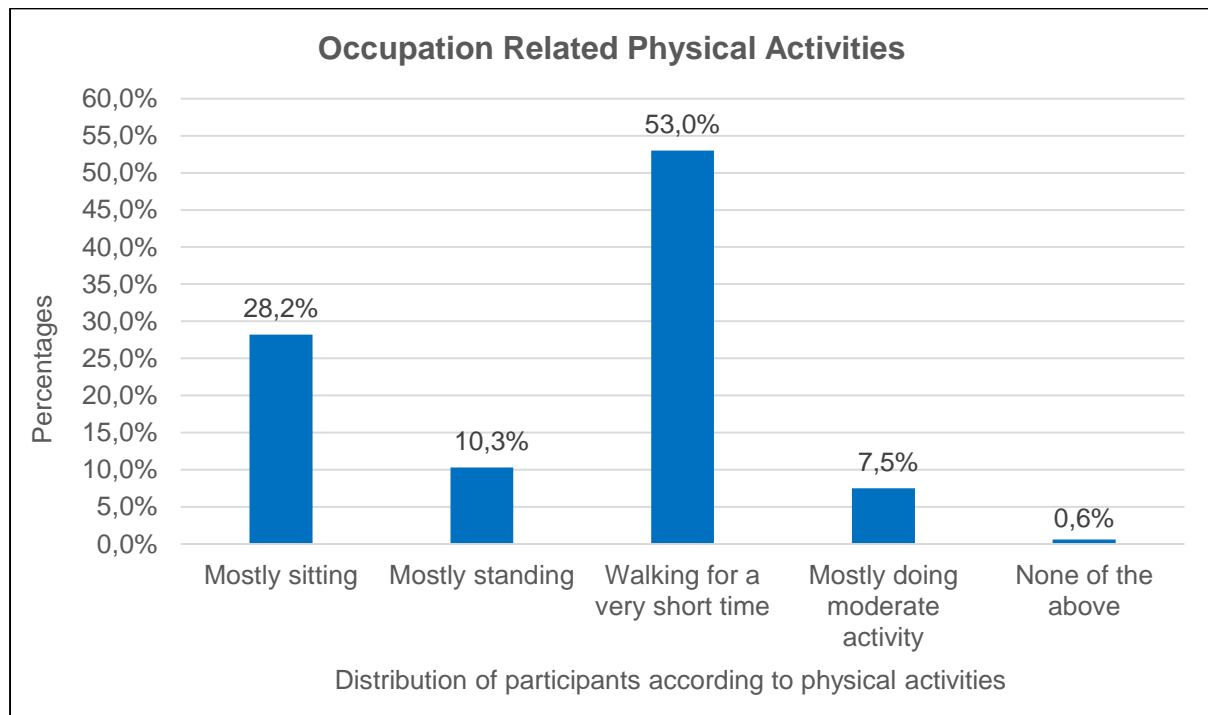
Figure 7: Occupation related physical activities

Figure 7 shows that 53% participants were walking for a shorter period at work, while 7.5% reported doing moderate activity.

Over half of participants (53%) walk for a very short time and 28.2% reported that they are mostly sitting at work, which might have impacted how many of them were overweight or obese. It has been found that reduced occupational activity and spending a long time sitting at were linked with overweight/obesity. Reduced sitting time at work and moderate to vigorous occupation-related activity may lower the risk of being overweight or obese (Yuan *et al.*, 2021). It is suggested that a qualitative research be done among these participants to explore their views on how to best

redesign their workplace to promote health and minimise the chances of developing obesity.

Table 4.9: Frequency distribution of participants according to level of vigorous and moderate activities N = 174, % in rows.

Statements	Minutes		None
	30 min or more	30 min or less	None
How much time do you typically devote to such work on a typical day when you engage in strenuous activity?	69(39.7%)	23(13.2%)	82(47.1%)
How long do you typically spend engaging in moderate-intensity activity on a given day?	44 (25.3%)	32(18.4%)	98(56.3%)
How long is you workday?	171(98.3%)	3(1.7%)	0(0%)
Statements	Days		
		1-3 days	4-7 days
In a usual week, how many days do you engage in vigorous activities as part of your work?		143(82.2%)	31(17.8%)
In a usual week, how many days do you do moderate-intensity activities as part of your work?		162(93%)	12(6.9%)

Table 4.9: Among participants in the study, 47.1% reported not engaging in vigorous activities, and of those who participated, 39.7% reported spending 60 minutes or less. 13.2% reported spending 30 minutes or less, while on moderate activity 56.3% never engage and 25.3% reported to spend less than 60 minutes or less and 18.4% spent 30 minutes or less. In terms of the number of days spent in a usual week on vigorous activities, 82% of participants reported 1-3 days, while 17.8% reported none. On moderate-intensity activities, 93% of participants reported spending 1-3 days while 6.9% reported spending 4-7 days.

The study found that the most people were participating in job-related physical activities and were more involved in vigorous activities than moderate-intensity activities. Most participants in this study were females, and it has been found by Saad *et al.* (2020), showed that the majority of female healthcare workers engage in much fewer physical activity both at work and in their own time. Exercise of a moderate intensity for 30 to 60 minutes, three times a week, is recommended as a weight-management strategy and a remedy for obesity-related musculoskeletal issues

(Barrow *et al.*, 2019). 39.7% engaged in vigorous physical activity, which creates a variety of beneficial health effects in the body, including less weight gain, lower obesity rates and less chance of related health conditions (Veazey *et al*, 2023).

For healthy growth, development, and maintenance of health at all ages, regular physical activity is essential. The recommended minimum amounts of physical activity are 60 minutes per day for people under the age of 17 and 150 minutes per week for those over the age of 18. One of the key elements contributing to the rise in obesity is the prevalence of a sedentary lifestyle. Non-communicable diseases increase quickly as a result of physical inactivity (Soyuer, 2021).

Participants in this study were already overweight and obese, and it has been found that vigorous and moderate activity helps in reducing and controlling weight (Physical Guidelines for Americans, 2018).

Table 4.10: Frequency distribution of participants according to physical activity = 174, % in rows.Travel related physical activity

Statements		Yes	No
Do you commute to and from destinations on foot or by bicycle for at least ten minutes at a time?		70(40.2%)	104(59.8%)
	Hours(>1hour)	Minutes (60 min or less)	None
How much time do you typically spend riding or walking for transportation?	47(27%)	79(45.4%)	48(27.6%)
Statement		**Days**	
		1-3 days	4-7 days
In a usual week, how many days do you walk or cycle for at least 10 minutes to get to and from places		148(85%)	26(15%)

Table 4.10 shows 59.8% participants reported not walking or using a bicycle to travel, while 45.4% of participants reported spending 30 minutes on a usual day for travelling.

The study found low travel-related physical activity among healthcare workers, which corresponds with Saad *et al.* (2020), discovered that primary healthcare workers engaged in occupational physical activity for just 50 minutes on average and did not

engage in physical activity connected to transportation. Walking and cycling can help fight overweight and obesity and reduces physical inactivity. Mortality can be decreased by 20 minutes of cycling or 30 minutes of walking most days (WHO, 2022).

This study's limitation is that it did not establish the participants' preferred mode of transportation for their commutes to work. Future studies should address this limitation. In addition, the study did not determine how many kilometres were travelled by the participants to get to work.

Table 4.11: Frequency distribution of participants according to physical activity = 174, % in rows. Non – work related and leisure time physical activity.

Statements		Yes	No
In your leisure or spare time do you engage in any vigorous or moderate-intensity physical activity lasting more than 10 minutes?		59(33.9%)	112(64.4%)
Statements		Minutes	None
		30 min or more	30 min or less	
How long do you typically spend doing this?	43(24.7%)	66(37.9%)	65(37.4%)
	Days		
		1-3 days	4-7 days
In a usual week, how many days do you do vigorous activities as part of your leisure or spare time?		148(85%)	26(15%)
Statements		Minutes	
		30 min or more	30 min or less
Over the past 7 days, how much time did you spend sitting or reclining (lying on a usual day (excluding sleeping)?		135(77.6%)	39(22.4%)

Table 4.11 shows that 64.4% participants reported not participating in vigorous or moderate-intensity physical activity in their leisure time and only 33.9% of participants do either vigorous or moderate-intensity physical activity in their leisure or spare time. Only 37.9% participants indicated spending 30 or less minutes on a usual day on these activities. Eighty-five percentage of participants admitted that they exercise 1-3 days per week, while other participants (15%) exercise 4-7 days per week.

The study found that 64% of participants did not take part in any physical activities during leisure time. Additionally, 47.1% and 56.3% of participants were not participating in vigorous and moderate exercise at work respectively. Similar findings were reported in a study by Rocha *et al.* (2018), which showed that women were more likely than males to engage in physical inactivity during leisure time, accounting for about 47.9% of the study group. Different findings were reported by a Brazilian study which highlighted that 27.5% of primary healthcare workers were physically inactive and the majority engaged in physical activity. Saad *et al.* (2020), also discovered that female healthcare workers spent much less time engaging in both work-related and recreational physical activity.

Most participants were reported to be spending hours (77.6%) resting in the past seven days. The results from the current study show than more participants spend their time resting or sitting. Saad *et al.* (2020), found that a higher percentage of primary healthcare workers were physically inactive and spent their greater time in sedentary activities. The finding is consistent with study by Phetla and Skaal, (2017) stating that the majority of healthcare workers were physically inactive due to their sedentary jobs.

Physical inactivity is recognised as one of the adjustable risk factors for the maintenance of a healthy lifestyle and long life. The new physical activity and sedentary behaviour guideline was launched by WHO, advising people to engage in 150-300 minutes a week to intense physical activity (Prince *et al.,* 2021).
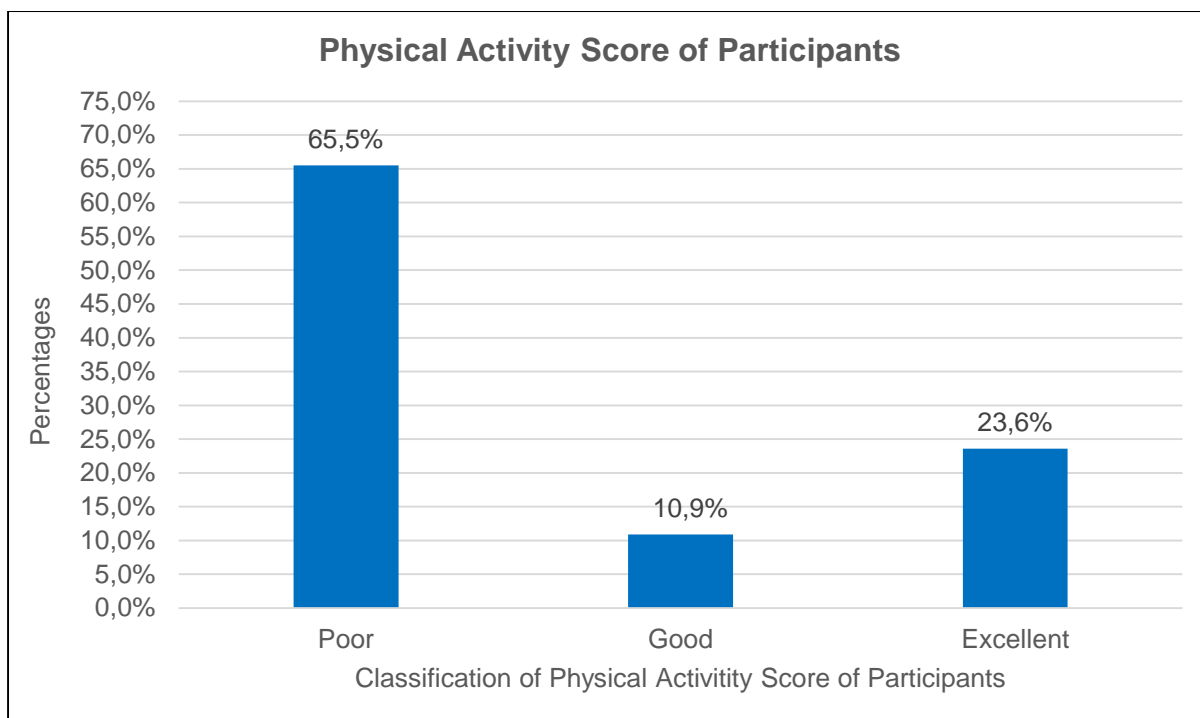
Figure 8: Physical activity scores of participants

Fig 8 reveals that 65.5% participants had poor habit and lifestyle scores, while 10.9% had good scores and 23.6% had excellent scores.

Silveria *et al.* (2022), discovered a significant risk correlation and high incidence of sedentary behavior in people with obesity. From public or private health systems, obese people should receive medical care and/or non-pharmacological treatment. Only 34.5% of participants in this study had good and excellent habits and lifestyle scores, and the majority had poor score. These participants are already overweight and obese, therefore, being physically inactive may predispose them to develop lifestyle diseases. However, this study did not assess whether these participants were diagnosed with any other condition. An intervention for weight management is recommended.

Numerous health advantages of exercise can be obtained without necessarily resulting in weight loss. The health benefits of physical activity are dependent on the kind, length, intensity and frequency of exercise (Boule & Prud'homme, 2020). Physical activity goes beyond its role to body weight and fat loss, looking after of body weight and fat reduction, and physical fitness in obesity. It contributes to mental and

social well-being and protects the environment from carbon emissions if one chooses physical activity as a means of transport instead of motor vehicle transport (Petridou, Siopi & Mougios, 2019).

Ogechi *et al.* (2022), also found a considerable correlation between better BMI, waist circumference, body weight, body shape, and overall wellbeing and moderate- to high-intensity exercise, such as walking, jogging, yoga, weightlifting, and aerobic exercises People who regularly engage in vigorous physical activity are more likely to feel more confident about their physique.

Table 4.12: The cross – tabulation of habit and lifestyle activities and sociodemographic of participants.

SOCIODEMOGRAPHIC DATA	Habit and Lifestyle activities			
		Poor	Good	Excellent	CHI-SQUARED TEST AND P-VALUE
		N (%)	N (%)	N (%)	
GENDER	Females	96(62.4%)	19(12.3%)	39(25.3%)	X^2=19.336
	Males	18(90%)	0(0%)	2(10%)	P -value= 0.022
AGE	<40 Years	42(71.2%)	7(11.9%)	10(16.9%)	X^2= 17.833
	>40 Years	72(62.3%)	12(10.5%)	31(27.2%)	P-value=0.467
MARITAL STATUS	Married	53(63.1%)	10(11.9%)	21(25%)	X^2 = 7.172
	Unmarried	61(67.8%)	9(10%)	20(22.2%)	P -value= 0.619
PROFESSIONAL CATEGORY	Nurses	68(60.7%)	16(14.3%)	28(25%)	X^2= 22.001
	Allied	8(100%)	0(0%)	0(0%)	P-value= 0.232
	Support staff	38(70.4%)	3(5.5%)	13(24.1%)	
JOB TITLE STATUS	CNP/Prof Nurse	42(56%)	10(13.3%)	23(30.7%)	X^2= 87.526
	EN	22(75.9%)	4(13.8%)	3(10.3%)	P-value= 0.003
	ENA	12(66.6%)	3(16.7%)	3(16.7%)	
	Data Capturer	15(71.5%)	2(9.5%)	4(19.0%)	
	Ward Attendant/Cleaner	11(61.1%)	0(0%)	7(38.9%)	
	Groundsman	7(87.5%)	0(0%)	1(12.5%)	
	Dietitian	5 (100%)	0(0%)	0(0%)	
Race	Black	19(10.9%)	41(23.6%)	114(65.5%)	

Table 4.12 reveals no relationship between the habit and lifestyle activity scores and age, marital status, professional category at (P=0.467, P=0.619, P=0.232)

respectively. There was a significant association between habit and lifestyle activity scores and gender and job title at (P= 0.022, P= 0.003) respectively.

The current study shows a significant association between habit and lifestyle activity scores and gender and job title status. McCarthy and Warne (2022) found that females participated in significantly less vigorous PA compared to males. The study also found that men engage in greater physical activity levels compared to women. A study conducted in South Africa by Mlangeni *et al.* (2018), found that men were more likely to be physically active than women. Similar findings were mentioned in previous studies in North America, Europe and Asia.

The study reveals that younger participants had poor habit and lifestyle activity as compared to older ones. Mlangeni *et al.* (2018), found that age-related decreases in physical activity were demonstrated to be related to biological characteristics, and older persons were less likely to engage in physical exercise than younger people. The majority of individuals in this study (66%) were over 40 and did not regularly engage in physical activity. The current study has been found to be dissimilar to other studies in respect of age and habit and lifestyle scores.

The present study finds no substantial association between marital status and lifestyle and habits activities. Mlangeni *et al.,* (2018), discovered that marriage decreases physical activity, especially vigorous activity, as a result of family adjustments such as having children. According to Saad *et al.* (2020), family obligations and a lack of recreational facilities seem to cause physical inactivity, as most of the participating primary healthcare workers were married.

This study found a significant association between job title and lifestyle and habits activities with a p-value of 0. 003.The study found that allied health workers had the poorest lifestyle and habits. There was no significant connection between occupation and physical activities levels, however logistic regression shows support staff members were more likely than professionals and associates to engage in physical activity. This concurs with a study in Malaysia that shows non-medical staffs were engaged in active physical activities Saad *et al.*, 2020).

4.7. CONTRIBUTING FACTORS TO OBESITY AMONG PARTICIPANTS

Obesogenic environments were determined in order to address objective 4 which is as follows: *To investigate the factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of Limpopo province.*

Table 4.13: The frequency distribution of participants according to food availability, accessibility, advertisement, and marketing at home, N = 174, % in rows.

Obesogenic environment	Home		Work	
	Yes	**No**	**Yes**	**No**
Do you have restaurant, food outlets in your neighbourhood (home or workplace)?	86(49.4%)	88(50.6%)	68(39.1%)	106(60.9%)
Is your home/workplace far from those restaurant of food outlets?	107(61.5%)	67(38.5%)	84(48.3%)	89(51.7%)
Do they deliver the foods, or you use transport, or you walk to get the area?	78(44.8%)	96(55.2%)	69(60.3%)	69(39.7%)
Did the restaurant advertise or show you their menus or products?	99(56.9%)	75(43.1%)	71(40.8%)	103(59.2%)
After seeing the menus, they showed you, did that make you to go and buy the foods?	49(28.2%)	125(71.8%)	45(26%)	128(74%)
On a monthly basis, how often do you go and buy their foods?	Daily	3(1.7%)	Daily	9(5.2%)
	Weekly	83(47.7%)	Weekly	87(50.0%)
	Occasionally	88(50.6%)	Occasional	78(44.8%)

Table 4.13 These findings show that home and work are obesogenic environment. It shows that 61.5% of the participants have reported not to be far from restaurant, while 56.9% reported that those restaurants advertise their products to them. 47.7% of the participants mentioned to buy foods from restaurants weekly and 50.6% they buy occasionally.

Eating at restaurant may increase the risk of obesity and overconsumption due to the big portion sizes, high-energy foods, and increased variety and favourite tastes of foods. Fast food availability is growing, which could have a negative impact on dietary habits, especially for those who are less health conscious with their health (Anderson *et al.*, 2011). Jennifer *et al.* (2022), found that buying food and beverages at work is widespread among healthcare workers and is related to less healthy eating. Otterbach,

Oskorouchi, Rogan and Qaim (2021) mentioned that obesity may be due to transitions in nutrition, specifically increased accessibility and consumption of harmful foods that have been excessively processed or otherwise added sugar, fat, and salt. Otterbach *et al.*, (2021) mainly found strong correlation between distance to modern retailers and individual nutrition status, showing that modern stores are contributing factors to obesity prevalence among adults in Africa.

Most participants (61.5%) in this study indicated that they reside far from restaurants, and over half (55.2%) indicated that such restaurants did not deliver. This minimised the opportunities for participants to order from restaurants while at home. It may take a long time for the food to be delivered and it may no longer be warm, which may discourage participants from ordering food from restaurants. A food satisfaction survey and delivery period were not established by this study, and it was not determined how foods from restaurants are cooked. However, the researcher observed that many restaurants use more fat, salt   and sugar in their cooking, which contribute to obesity. The researcher recommends that future studies look at strategies to improve healthy cooking at restaurant.

Modern shops and fast food cafeterias offers different food options and employ different marketing techniques when compared to traditional stores, which may lead customers to consume more processed meals and calories (Otterbach *et al.*, 2021). The research on obesogenic environments at the workplace level showed that 60.9% of participants had fewer food options since their workplaces had no restaurants or, food outlets nearby. 59.2% of participants mentioned that restaurants did not show their menus or advertise to them. Folkvord, and Hermans (2020) conducted a study on food marketing in an obesogenic environment and found that unhealthy food marketing is a risk factor for the emergence of overweight and obesity because it has a direct and negative impact on children's and young adults' food preferences and consumption. A study by Bleich *et al.,* (2020) on the relationship between chain restaurant advertising and obesity in US adults discovered a favourable correlation between dining establishment advertising and weight growth in underdeveloped nations, due to the types of foods and beverages marketed.

4.8. SUMMARY

The results of the study are presented, explained, and discussed in this chapter. Socio-demographic results were presented first, followed by the prevalence of obesity. An association between BMI classification presented and discussed. Eating habits and physical activity levels were also outlined. Additionally, presented and discussed was the relationship between sociodemographic characteristics and levels of physical activity. Findings on obesogenic environments were also presented. A discussions of the results was done in support of the literature review. The results, conclusion, limitations, strengths, and recommendations of the entire study are summarized in the following chapter.

CHAPTER FIVE: CONCLUSION, RECOMMENDATIONS, LIMITATIONS AND STRENGTH

5.1. INTRODUCTION

The earlier chapter described and discussed the findings of this study. This chapter discusses the summary of the findings, the conclusion, recommendations, limitations and strength of the research. The goal this study was to determine factors contributing to obesity among healthcare workers in primary health care in the Lepelle-Nkumpi sub-district of the Limpopo province. The study's objectives were as follows:

- To assess the prevalence of obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province
- To describe the eating habits among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province in the Lepelle-Nkumpi sub-district of the Limpopo province.
- To describe the level of physical activity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province
- To investigate the factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province

5.2 SUMMARY OF RESEARCH METHOD

This research used a quantitative and cross-sectional study descriptive design. It was conducted in clinics of the Lepelle-Nkumpi municipality in the Capricorn district of the Limpopo province. The target population was primary healthcare workers (nurses, dietitians, and support staff) working in fixed and mobile clinics of the area. Data was collected using closed-ended questionnaire, and obesity levels were determined using BMI through measuring weight and height. Data was analysed using SPSS, where descriptive statistics were calculated. Chi-square analysis was utilized to evaluate relationships at 95% confidence interval, where a p-value of 0.005 was regarded as

statistically noteworthy. The reliability and validity of instruments was ensured, and ethical standards were adhered to.

5.3. SUMMARY OF THE FINDINGS

The study is summarized in line with the study's objectives. An overview of the sociodemographic profile is also presented:

Socio-demographic profile

A total of 174 primary health workers including nurses, dietitians, and support staff participated in this study. All participants were Africans. Most participants (89%) were females and 66% were aged 40 years and above. Over half (52%) were unmarried. Close to two-third (64%) of the participants were nurses.

Objective 1: To determine the prevalence of obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.

The body mass index (BMI), which determines whether a person is obese or not, was calculated. It was found that 75.9% of the primary health workers were overweight and obese. The Chi-square analysis was done to calculate the relationship between BMI and the socio-demographic profile. It was revealed the relationship between BMI and gender was substantial. (P= 0.001). There was no association found with other sociodemographic factors.

Objective 2: To describe the eating habits among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.

Over half of the primary health workers (53.4%) consumed chicken with skin, while 42% ate fatty meat.64.9% consumed full cream milk. Chicken (94.7%) and tinned fish (86.2%) were consumed by most of the primary health workers. Only 40.8% of the primary health workers used soft margarine as their spread, while 47.7% ate fried food weekly and 54.6% eat processed foods occasionally. The majority of primary health

workers (81. 6%) used salt lightly, and 59.2% never added salt to their food before eating. In addition, the majority (70.7%) reported that they were not consuming salty snacks. Most participants were consuming *morogo/*spinach (91.4%), tomatoes (77.6%) and potatoes (79.9%) as their vegetables. Most participants were consuming apples/pears (93.1%) and bananas (85.6%) as fruits. Over half of the participants were consuming breakfast cereals (57.9%), soft porridge (54.6%), and oats (50%). Over half of the workers (52.2%) reported consuming coffee/tea.

Objective 3: *To describe the level of physical activity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.*

Over half of participants (53%) were walking for a shorter period at work, and 28.2% were mostly sitting at work. A total of 47.1% and 56.3% of primary health workers never engaged in any vigorous and moderate activities respectively. Only 39.7% of participants who engaged in vigorous physical activity did so for over 30 minutes. The majority of participants (82.2%) engaged in vigorous activity for 1-3 days a week. Only 25.3% reported engaging in moderate-intensity exercise for over 30 minutes. Most participants (93%) engaged in moderate-intensity exercise for 1-3 days a week. Over half of the participants (59.8%) did not walk or use bicycles to travel. Only 45.4% of participants reported spending 30 minutes on a usual day for travelling. In a typical week, the majority of participants (85%) travelled by foot or bicycle for at least 10 minutes. Close to two-third of participants (64.4%) reported no participation in vigorous or moderate-intensity physical activity in their leisure time. A third of participants (33.9%) did either vigorous or moderate-intensity exercise in their leisure or spare time. Only 37.9% participants indicated spending 30 or more minutes on a usual day to do moderate or vigorous-intensity physical activity in their leisure time. Eighty-five percentage of participants indicated that they engage in moderate or vigorous-intensity physical activity for 1-3 days in their leisure time. Close to two-third of participants (65.5%) had poor scores on the habits and lifestyle score, while 10.9% had good scores and 23.6% of the participants had excellent score. The association between habits and lifestyle, and a sociodemographic profile, was calculated using a chi-square test, which discovered a substantial link between the habits and lifestyle scores and

gender and job title at (P= 0.022, P= 0.003) respectively. There was no link between habits and lifestyle, and other socio-demographic factors.

Objective 4: To investigate the factors contributing to obesity among primary healthcare workers in the Lepelle-Nkumpi sub-district of the Limpopo province.

The majority of participants (61.5%) reported staying close to restaurants However, 55.2% indicated that the restaurants did not offer delivery. Over half of the participants (56.9%) reported that those restaurants advertise their meals. Only 47.7% indicated buying foods from restaurants weekly. Over half of participants (51.7%) indicated that the workplace is far from restaurants, and 39.7% reported non-delivery. Half of the participants (50%) reported buying from restaurants when at work.

5.4. CONCLUSION OF THE STUDY

This study revealed that a significant proportion of primary healthcare workers engage in unhealthy dietary habits. Over half of the participants consume chicken with skin, fatty meat, and full cream milk, which are high in saturated fats. Additionally, a substantial number of participants reported consuming fried and processed foods regularly, indicating a higher intake of unhealthy and calorie-dense options. While some participants exhibited unhealthy eating behaviours, there were also positive aspects to their dietary choices. Many primary healthcare workers consumed chicken and tinned fish, which are healthier protein sources. A considerable proportion reported using soft margarine as a spread, which is a healthier alternative to butter or other solid fats.

Additionally, the majority used salt lightly and did not consume salty snacks excessively, suggesting awareness of the importance of reducing sodium intake. The study found encouraging results regarding fruit and vegetable consumption among primary healthcare workers. Most participants reported consuming fruits such as apples/pears and bananas, which are nutrient-dense options. Similarly, a significant proportion included vegetables like morogo/spinach, tomatoes, and potatoes in their diets, highlighting a positive choice in terms of nutritional intake. Over half of the

participants reported consuming breakfast cereals, soft porridge, and oats, which indicates a positive inclination toward starting the day with nutritious options. Including these foods in their breakfast routine can contribute to a healthier diet overall. More than half of the workers indicated the consumption of coffee or tea, which have to be consumed in moderation as part of a healthy balanced diet.

The study found that more than half of participants walked for a shorter period at work, indicating a sedentary work environment. A significant proportion of participants reported spending most of their time sitting at work. The study found that a considerable percentage of primary health workers did not participate in any vigorous or moderate-intensity activities. This indicates a low level of engagement in physical activities for cardiovascular fitness and overall health. While a third of participants reported participating in vigorous or moderate physical activity throughout their leisure time, the majority of them did not spend 30 minutes or more on such activities. The study assessed participants' habits and lifestyle scores and found that a significant percentage had a poor score, while a small percentage had a good or excellent score.

The majority of participants reported staying closer to restaurants, indicating that they had easy access to these food establishments. This proximity could be influencing their food choices and eating behaviours. A significant proportion of participants indicated that restaurants advertise their meals. This suggests that participants are exposed to marketing messages that may influence their food preferences and decisions. Over half of the participants reported that their workplaces are far from restaurants, which may affect their ability to access restaurant food options during work hours. Additionally, a sizeable group of participants indicated that restaurants do not offer delivery services, further limiting them as a viable option. Half of the participants reported buying food from restaurants when at work. This suggests that restaurants play a role in providing meals for participants during their work shifts. Participants are already overweight and obese, so their exposure to restaurants, unhealthy food options and reduced physical activity predisposes them to diseases such as diabetes.

5.5. RECOMMENDATIONS

- There is a requirement for weight management programs targeting overweight and obesity.

- There is a need for improvement in the dietary habits of primary healthcare workers. Interventions should focus on promoting healthier food choices such as reducing the consumption of chicken with skin, fatty meats, and full cream milk, and encouraging the consumption of more fruits and vegetables.

- Additionally, providing education on portion control, moderation, and healthier cooking methods can be beneficial.

- The results demonstrate the importance of addressing sedentary behaviour in the workplace, and interventions should focus on promoting physical activity, encouraging longer durations of exercise, promoting active transportation, and targeting lifestyle habits. Strategies can include workplace wellness programs, educational campaigns, and policy changes that support physical activity and healthy lifestyle behaviours among primary healthcare workers.

- There is a need to encourage longer durations of physical exercise to accomplish optimal health benefits.

- It is important to encourage incorporating active transportation into daily routines.

- Given the proximity to restaurants, efforts should be made to ensure that these establishments offer healthier food choice, such as nutritious meal options with lower fat, sugar, and salt content.

- Collaboration with restaurants to promote healthier menu options can be beneficial.

- Collaborating with local restaurants to promote and advertise healthier meals can encourage participants to make healthier food choices when dining out.

- As workers often purchase food from restaurants while at work, it is important for workplaces to provide support and resources to encourage healthier options. Possible measures include on-site cafeterias or meal prep facilities.

- Providing nutrition education and awareness about healthier food choices can empower participants to make informed decisions when purchasing meals from restaurants or other food establishments.

5.6. LIMITATIONS

- Using a cross-sectional design had limitations on causal inferences. Future research must consider more objective measures of exercise and a longitudinal design to further investigate the connection between lifestyle habits and health results among primary healthcare workers.

- Due to limited information, there is no records of the specific types of foods purchased from restaurants. Moreover, there is no information on how the food at restaurants is prepared. Future research can explore in more detail the impact of restaurant proximity, advertising, and purchasing behaviours on the dietary patterns and health outcomes of primary healthcare workers.

- It's critical to remember that the study has certain limitations. These include the potential for self-reporting bias as participants may overestimate or underestimate their actual dietary habits.

- The study's findings are also limited to the specific population of primary healthcare workers in the study sample, which may not be representative of all primary healthcare workers in the Lepelle-Nkumpi sub-district. Future research should aim to include a larger and more diverse sample to enhance the generalisability of the results.

- The study did not provide information on additives and sugar content in beverages, which could affect their overall health impact.

- The study did not ask whether breakfast cereals, soft porridge or oats were consumed during breakfast. Future studies should specifically ask whether those are eaten during breakfast, rather than assuming so.

- This study did not establish the mode of transport participants used to travel to work. These needs to be addressed to determine the physical activity of participants and their walking distance to work.

- This study showed that participants are already overweight and obese, and therefore at risk of various diseases. It was not established whether participants had pre-existing conditions or not.

5.7. STRENGTH

- The use of a cross-sectional study design enabled collection of reliable data on factors contributing to obesity among primary healthcare workers.
- The study achieved a representative sample of primary healthcare workers in the Lepelle-Nkumpi sub-district, therefore enhancing the generalisability of the findings.
- The scales for weight measurements were calibrated and measurements were taken twice to increase the reliability and accuracy of data collected.
- The sample size was sufficient and enabled statistically significant results to be obtained, thus minimising the likelihood of errors.
- Adherence to ethical guidelines and obtaining informed consent from participants is essential for maintaining the morality and integrity standards of the study and protecting the rights and wellbeing of the participants.
- Focusing on primary healthcare workers in the Lepelle-Nkumpi sub-district ensures that the study's findings are relevant to the specific population of interest. This localised approach enhances the practical implications and applicability of the study's conclusions to the local healthcare context.

5.8. SUMMARY OF THE CHAPTER

This chapter offered a summary of the results, a conclusion, recommendations and the limitation of the study. A summary of the results was presented accordance with the study's goal, and the strength of the study was outlined.

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APPENDICES

Appendix A: Time schedule

Table 1: Time schedule

	Activity	2021								2022											
		MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A	Develop protocol	×	×	×	×	×															
B	Submit protocol						×	×	×	×	×	×	×	×	×						
C	Ethics consent and authorization															×	×	×			
D	Data collection																		×		
E	Data analysis																		×		

F	Write up																	×	
G	Submission for examination																	×	
H	Presentation of the research																		×
I	Release of the findings																		×

Appendix B: Budget

The researcher will finance the research independently.

Table 2: Budget needed for the research

	ITEMS	COST/ UNIT (R)	TOTAL COST (R)
A	Prints	R2 × 1000	R 2000.00
B	Transport	R 250/120km	R 4000.00
C	Data Capturing	R 750	R 750.00
D	Language rewriting and proof checking	R 1800	R1800.00
E	Dissertation binding and printing	R 300 × 6	R 1800.00
		TOTAL	R 10350.00

Appendix C: Questionnaires

Research title: Factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province.

Dear participant

Please respond to each question as directed in each section. Leave your name off of the questionnaire. Use [X] or [√] to select the best response, or type your response in the corresponding boxes or spaces.

Section A: Socio Demographic Data

1. Gender

Female		Male	

2. How old are you?

3. Marital status

Single		Married		Divorced		Widowed	

4. What is your race?

	Black		Coloured

5. What is your profession?

	Nurse		Allied		Support Staff

6. What is your job title?...

Section B: Anthropometric measurements for body mass index

1. Weight = …………Kg

2. Height =……………m^2

Body Mass Index (BMI) = Weight in kg/ (Height)^2 in metres =

Section C

Food Frequency Questionnaire

This section is about the food you eat and frequency, tick 1 answer and answer all questions.

Which of the following do you eat?

Chicken/Poultry	With Skin…………………………	[ ]
	Without Skin……………..……	[ ]
	None…………………………………	[ ]
Red Meat	Fatty Meat………………………	[ ]
	Lean Meat…………………………	[ ]
	None………………………………..	[ ]

Spread (Butter/Margarine)	Butter…………………….…………	[ ]
	Hard Margarine (Brick)………..	[ ]
	Soft Margarine (Tub)…………...	[ ]
	None…………………………….…..	[ ]
Milk/Milk Products in powder form	Full Cream…………………………..	[ ]
	2% Or Low Fat………………………	[ ]
	Skim/Fat Free………………………..	[ ]
	Blends…………………………….…	[ ]
	None……………………………………	[ ]
How frequently do you typically eat the foods below?		
Fried foods, e.g., chips, fish, potatoes, doughnuts,	Occasionally/Never……………………….. [ ]	
	Weekly (At Least Once A Week) ……………. [ ]	

eggs	Daily……………………………………….. [ ]
Chips, e.g., packet of 'Simba' chips or other salty snacks	Occasionally/Never…………………….. [ ]
	Weekly (At Least Once A Week) …….. [ ]
	Daily…………………………………….. [ ]
Processed meat, e.g., polony, viennas, meat pies, sausage rolls, Pizza	Occasionally/Never……………………. [ ]
	Weekly (At Least Once a Week) ……… [ ]
	Daily……………………………………… [ ]
Do you typically consume very salted, lightly salted, or unsalted food?	Very Salty……………………………… [ ]
	Lightly Salty…………………………… [ ]
	Not Salted…………………………….... [ ]
	Don't Know……………………………… [ ]
Do you typically season your food with salt or Aromat? IF SO, ASK: Prior to or following meal tasting	No, I Never Add Salt/Aromat…………………. [ ]
	Yes, But I Taste First and Then Add………. [ ]
	Yes, Even Before Having Tasted Food……. [ ]
	Don't Know………………………………… [ ]
Do you consume salty snacks (such as chips, niknaks, salted peanuts, salty biscuits, biltong, dried sausage, and dried fish) more frequently than three times a week?	Yes…………………………………………….. [ ]
	No……………………………………………... [ ]

The researcher is also curious about how frequently people consume particular food types.

Have you eaten any of the following in the last week, or the last seven days?

 ASK HOW OFTEN, IF YES

CIRCLE NEVER, IF NO

Food item	NEVER	NOT DAILY		EVERY DAY			CODE
		1-3 TIMES PER WEEK	4-6 TIMES PER WEEK	1 TIME A DAY	2 TIMES A DAY	3+ TIMES A DAY	
Red meat (any type)							
Chicken (any type)							
Tinned fish							

Organ meat, e.g., liver, tripe							
Eggs (any type)							
Milk/yoghurt/maas to drink on cereals							
Milk in tea/coffee							
Cheese (except cottage cheese)							
Peanuts and nuts							
Breakfast cereal (instant, not cooked)							
Oat-porridge							
Soft porridge (tub)							
Spinach and / or morogo							
Tomato (raw/cooked)							
Green peas							
Mixed vegetables							
Pumpkin/ butternut							
Sweet potato							
Potato (any preparation)							
Citrus fruit, e.g., orange, grapefruit							
Pure orange/guava juice (not others) (sweetened/unsweetened)							
Bananas							
Mangoes							
Apples/ pears							
Avocado							

SECTION D: HABITS AND LIFESTYLE

The next inquiries concern the amount of time you spend engaging in various forms of physical activity. This covers the activities you do at work, at home, while traveling, and in your own time. Even if you don't consider yourself to be an active person, you are still required to respond to the questions.

Work-Related Physical Activity (whether Paid or Unpaid): Consider (think of) a typical week while answering the following questions by looking back over the previous 12 months.	
Does the majority of your work entail sitting, standing, or short bursts of walking (less than ten minutes)?	Mostly Sitting………………………… [ ] Mostly Standing Still……………… [ ] Mostly Walking For Very Short Periods [ ] Mostly Doing Moderate/Vigorous Activity [ ] None of The Above………………… [ ]
Does your job entail vigorous activity for at least 10 minutes at a time, such as hard lifting, excavating, or heavy construction?	Yes………………………………… [ ] No………………………………… [ ]
How many days of a typical week do you engage in vigorous activity as part of your work?	Days……………………………… [ ]
How long do you typically spend engaging in such activities on a typical day?	Hours……………………………… [ ] Minutes……………………………… [ ]
Does your job require you to engage in moderate-intensity activity for a minimum of 10 minutes at a time, such as brisk walking or carrying light loads?	Yes………………………………… [ ] No………………………………… [ ]
How many days of a typical week do you engage in activities of moderate intensity for work?	
How long do you typically spend engaging in moderate-intensity activity on a given day?	Hours……………………………… [ ] Minutes……………………………… [ ]
Your workday is how long?	Hours……………………………… [ ] Minutes……………………………… [ ]

Travel-related Physical Activity: In addition to the things you've already stated, I would like to know how you get to and from different locations, such as work, shopping, the market, church, etc.

Do you commute to and from destinations on foot or by bicycle for at least ten minutes at a time?	Yes………………………………… [ ] No………………………………… [ ]
How many days a week on average do you commute by foot or bicycle for at least 10 minutes?	Days……………………………….. [ ]
How much time do you typically spend riding or walking for transportation?	Hours……………………………… [ ] Minutes…………………..……… [ ]
Non-Work related and Leisure Time Physical Activity: The following questions will inquire about what you do for fun, exercise, or leisure in your free time. Don't describe the physical activities you engage in for job or travel already.	
Do you engage in any prolonged, vigorous, or moderate-intensity physical activity during your free time that lasts longer than 10 minutes?	Yes………………………………… [ ] No………………………………… [ ]
Do you engage in any vigorous exercises for at least 10 minutes at a time during your leisure or free time, such as weightlifting or running?	Yes……………………………….. [ ] No………………………………… [ ]
How many days in a typical week do you engage in strenuous activities for fun or in your spare time?	Days………………………………. [ ]
How long do you typically spend doing this?	Hours……………………………… [ ] Minutes…………………………… [ ]
Do you engage in any moderate-intensity activities during your free time that last at least 10 minutes each? Examples include brisk walking, cycling, and swimming	Yes………………………………… [ ] No………………………………… [ ]
How many days of a typical week do you spend engaging in leisure or free time activities of a moderate intensity?	Days………………………………. [ ]
How long do you typically spend doing this?	Hours……………………………… [ ] Minutes…………………………… [ ]
Sitting/Resting activity: I now want to know how much time you spend sitting or resting throughout the course of the last seven days, excluding sleep. This could be both during work hours and in free time, such as when watching television, reading, visiting friends, or sitting at a desk.	
How much time, excluding sleeping, did you spend sitting or lying down on an average day over the past seven days?	House……………………………… [ ] Minutes…………………………… [ ]

Section E: Obesogenic Environment

The next questions in this part ask about the accessibility, availability, marketing, and advertising of food in your neighbourhood (at home or at work).

Home		
Do you have restaurant, food outlets in your neighbourhood	Yes……………..…….	[ ]
	No…………………….	[ ]
On a monthly basis, how often do you go and buy their foods	Daily………………….	[ ]
	Weekly………………..	[ ]
Is your home far from those restaurant of food outlets	Yes……………………..	[ ]
	No…………………….....	[ ]
Do they deliver the foods or you use transport or you walk to get the area	Yes………………………	[ ]
	No………………………….	[ ]
Did the restaurant advertise or show you their menus or products	Yes………………………	[ ]
	No…………………………	[ ]
After seeing the menus, they showed you, did that make you to go and buy the foods	Yes………………………	[ ]
	No…………………………	[ ]
Workplace		
Do you have restaurant, food outlets in your neighbourhood	Yes……………..……….	[ ]
	No………………………….	[ ]
On a monthly basis, how often do you go and buy their foods	Daily……………………..	[ ]
	Weekly…………………….	[ ]
Is your home far from those restaurant of food outlets	Yes………………………….	[ ]
	No…………………………….	[ ]
Do they deliver the foods, or you use transport, or you walk to get the area	Yes………………………….	[ ]
	No…………………………….	[ ]
Did the restaurant advertise or show you their menus or products	Yes…………………………..	[ ]
	No…………………………….	[ ]
After seeing the menus, they showed you, did that make you to go and buy the foods	Yes………………………….	[ ]
	No…………………………….	[ ]

Appendix D: Informed consent form

FORM OF CONSENT TO TAKE PART IN THE RESEARCH OF MR A.L MASHITA

RESEARCH TITLE: Factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province

I have heard the study's objectives explained, and I comprehend them. I willingly and willingly consent to take part in the study. I am aware that my participation in the study is anonymous and that I can leave at any moment, for any reason, and that doing so won't have any negative effects on me.

Participant's name…………………………………………

Profession………………………………………………….

Participant's signature…………………………………….

Date…………………………………………………………

Appendix E: Letter seeking for permission from Department of Health Limpopo Province

The Head of Department of Health Limpopo

No. 18 College Street

Polokwane

0700

Dear Sir/Madam

REGARDING THE REQUEST FOR AUTHORIZATION TO CONDUCT A STUDY AT YOUR INSTITUTION

I am Audrey Lehlogonolo Mashita, student number: 200501014. I am presently enrolled at the University of Limpopo to pursue a master's degree in public health. I want to perform my research at your facilities in PHCs, therefore please grant me permission. The title of my research is "Factors contributing to obesity among healthcare workers in primary health care facilities sub-district, Limpopo province"

This study will be conducted under supervision of Dr Mphasha M.H from the University of Limpopo. To guarantee that the participants' rights will be upheld and that the research will be conducted in an ethical and competent manner, researcher will need approval from Turfloop Research and Ethics of the University of Limpopo and the Department of Health before the study begins.

Before taking part in the study, the participant's written agreement will be acquired. The study's confidentiality for participants will be upheld. If necessary, the institution will be given access to the study's findings.

Please find a copy of my proposal with the Department of Health Limpopo's and University of Limpopo's ethical approval attached. Please find a copy of my proposal with the Department of Health Limpopo's and University of Limpopo's ethical approval attached

Yours faithfully

A.L Mashita (200501014)

Appendix F: Approval from Department of Health Limpopo Province

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH

Ref	:	LP_2023-01-017
Enquires	:	Ms PF Mahlokwane
Tel	:	015-293 6028
Email	:	Phoebe.Mahlokwane@dhsd.limpopo.gov.za

Audrey Lehlogonolo Mashita

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

FACTORS CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS IN PRIMARY HEALTH CARE FACILITIES IN LEPELLE-NKUMPI SUB-DISTRICT, LIMPOPO PROVINCE

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
   a. Present this letter of permission to the Office District Executive Manager a week before the study is conducted.
   b. This permission is **ONLY for Lepelle-Nkumpi Sub-District.**
   c. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
   d. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   e. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   f. **The approval is only valid for a 1-year period.**
   g. If the proposal has been amended, a new approval should be sought from the Department of Health
   h. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated

_____   13/01/2023
Head of Department   **Date**
pp

Private Bag X9302, Polokwane
Fidel Castro Ruz House, 18 College Street, Polokwane 0700. Tel: 015-293 6000/12. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

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Appendix G: Letter seeking permission to Capricorn district department of health

The District Executive Manager

34 Hans Van Rensburg Street

Polokwane

0700

Dear Sir/Madam

REGARDING THE REQUEST FOR AUTHORIZATION TO CONDUCT A STUDY AT YOUR INSTITUTION

I am Audrey Lehlogonolo Mashita, student number: 200501014. I am presently enrolled at the University of Limpopo to pursue a master's degree in public health. I'm asking for permission to carry out my research in PHCs run by your organizations. The title of my research is "Factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province".

The study will be conducted under supervision of Dr Mphasha M.H from the University of Limpopo. To guarantee that the participants' rights will be upheld and that the research will be conducted in an ethical and competent manner, researcher will need approval from Turfloop Research and Ethics of the University of Limpopo and the Department of Health before the study begins. Before taking part in the study, the participant's written agreement will be acquired. Throughout the study, participant confidentiality will be upheld. If necessary, the institution will be given access to the study's findings.

Please find a copy of my proposal with the Department of Health Limpopo's and Limpopo University's ethical clearance attached.

Yours sincerely

A.L Mashita

Student number: 200501014

Date: 11 July 2022

Appendix H: Approval letter from Capricorn District Office

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH

REF : S.5/3/1/2

ENQ : Mokgohloa KA

TEL : 015 290/9096

FROM : DISTRICT EXECUTIVE MANAGER

TO : AUDREY LEHLOGONOLO MASHITA

SUBJECT : PERMISSION TO CONDUCT RESEARCH ON FACTORS CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS IN PRIMARY HEALTH CARE FACILITIES IN LEPELLE-NKUMPI BUB-DISTRICT,LIMPOPO PROVINCE.

The above matter refers:-

1. Permission to conduct the above study at Capricorn District Health institutions/facilities is hereby granted.

2. Kindly be informed that :
   - In the course of your study there should be no action that disrupts the services.
   - After completion of the Situational Analysis, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - Kindly note that the Department can withdraw the approval at any time.

3. Your cooperation will be highly appreciated.

DISTRICT EXECUTIVE MANAGER

23-02-2023

DATE

Private Bag X9530, Polokwane
Capricorn District Office, 34 Hans Van Ransburg Street, Polokwane 0700. Tel: 015-290 9000. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

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Appendix I: Letter seeking permission to Lepelle-Nkumpi PHC

<div align="right">

Lepelle-Nkumpi Acting Manager

Lebowakgomo

0737

</div>

Dear Sir/Madam

REGARDING YOUR INSTITUTION'S REQUEST FOR PERMISSION TO CONDUCT A STUDY

I am Audrey Lehlogonolo Mashita, student number: 200501014. I am a Master of Public Health student at the University of Limpopo right now. Permission to do my research in your facilities, in PHCs, is what I'm asking for. The title of my research is "Factors contributing to obesity among healthcare workers in primary health care facilities in the Lepelle-Nkumpi sub-district of the Limpopo province".

The study will be conducted under supervision of Dr Mphasha M.H from the University of Limpopo. To ensure that the rights of the participants will be protected and that the research is carried out in an ethical and professional manner, I will acquire approval from the Department of Health Limpopo and the Research and Ethics Committee of the University of Limpopo prior to the study's start. Before taking part in the study, the participant's written agreement will be acquired. Before taking part in the study, participants will provide written consent. The study's confidentiality for participants will be upheld. If necessary, the institution will be given access to the study's findings.

Please find a copy of my proposal with the Department of Health Limpopo's and University of Limpopo's ethical approval attached.

Yours sincerely

A.L Mashita

Student number: 200501014

Date: 11 July 2022

Appendix J: Approval from University of Limpopo

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

---

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 29 November 2022

PROJECT NUMBER: TREC/586/2022: PG

PROJECT:

Title:	Factors contributing to obesity among healthcare workers in primary health care facilities in Lepelle-Nkumpi Sub-District, Limpopo Province.
Researcher:	AL Mashita
Supervisor:	Prof L Skaal
Co-Supervisor/s:	Dr M Mpasha
School:	Health Care Sciences
Degree:	Master of Public Health

PROF D MAPOSA
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:
i)   This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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Appendix K: Proof Editing

NSUKU PUBLISHING CONSULTANCY

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https://nkatekomasinga.com/

University of Limpopo
Department of Public Health
Faculty of Health Sciences
https://www.ul.ac.za/

14/07/2023

CONFIRMATION OF EDITING AND PROOFREADING SERVICES

This letter serves as confirmation that the Masters dissertation titled 'FACTORS
CONTRIBUTING TO OBESITY AMONG HEALTHCARE WORKERS IN PRIMARY HEALTH CARE
FACILITIES IN LEPELLE-NKUMPI SUB-DISTRICT, LIMPOPO PROVINCE' by AUDREY
LEHLOGONOLO MASHITA, was edited and proofread by Nkateko Masinga and her team
at NSUKU Publishing Consultancy.

The plagiarism detection software (WriteCheck) found a similarity percentage of 3%.

Best regards,

Nkateko Priscilla Masinga
Founder and Managing Director, NSUKU Publishing Consultancy