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ASSESSMENT OF UNIVERSITY STUDENTS' KNOWLEDGE OF RISK FACTORS FOR DIABETES TYPE 2 AT HARARE INSTITUTE OF TECHNOLOGY, ZIMBABWE

BY

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Abstract

Diabetes type 2 (DT2) has become a global publ000ic health issue increasingly affecting those aged 18-40 years. Knowledge about diabetes is limited among university students. Yet being a university student is often associated with deviant behaviors which may not promote healthy living, increasing risk for DT2. The purpose of the study was first to determine the socio- demographic variables and related factors associated with limited DT2 knowledge in a university sample of students. Secondly, we compared students' healthy lifestyle with their knowledge on risk factors for DT2 based on American Diabetic Association guidelines. This cross-sectional analytical study interviewed 147 students at HIT using a standardised semi-structured questionnaire between February and March 2021. Descriptive statistics and Chi-square analysis for association were analysed using Epi info version 7. Participants' knowledge was assessed based on correct definition, signs, complications and risk factors for DT2 as defined by American Diabetic Association. Overall, 57.8% (n=85) participants had knowledge on all 4 points assessed. By proportion, the components with the highest percentage of gaps on signs, complications and risks for DT2 were frequent thirst 46% (n=66); weight gain or loss 40% (n=54), frequent urination 36% (n=53); frequent hunger 35% (n=52) limp amputation 40% (n=59). Participants' knowledge on risk factors was limited and was as follows: gestational diabetes 14% (n=20): smoking 18% (n=26); sedentary lifestyle 30% (n=44). Skipping of meals was noted to be a common occurrence; 73% (n=107) did not have lunch; 4.7% had supper only; 23% (n=33) had all three meals. Consumption of sugar sweetened beverages was statistically significant risk factor for DT2 at 95% CI 2.3; 3.2 P value < 0.001. Overall, 21.1% (n=31) engaged in routine physical activity. Increased vigorous activity was strongly significant to college residence at (P>0.003). More males significantly engaged in physical activity than females (P> 0.09). Family history on DT2 was associated with increased physical activity (P< 0.005). In adequate knowledge on DT2 and lack of public health interventions increases DT2 in tertiary institutions. Knowledge gaps on risk factors for DT2 in tertiary institutions need to be addressed.

Key words: Diabetes Type 2: Knowledge: Risk factors: University Students.

Declaration Page

I declare that this dissertation is my original work except where resources have been cited and acknowledged. The work has never been submitted nor will it be submitted to another university for the award of a degree.

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List of Acronyms

AUREC	Africa University Research Committee
DM	Diabetes Mellitus
DT2	Diabetes Type 2
HDP	High Blood Pressure
HIT	Harare Institute of Technology
IEC Material	Information Education Communication Material
LMIC	Low and Medium Income Countries
NCDs	Non Communicable Diseases
PA	Physical Activity
PE	Physical Education
SSB	Sugar Sweetened Beverages
T2DM	Type 2 Diabetes Mellitus
W H O	World Health Organization

Key words; Diabetes Type 2: Knowledge: Risk factors; University Students:

Definition of Key Terms

Diabetes Type 2	A chronic metabolic disorder characterized by insulin deficiency resulting in prolonged hyperglycemia and insulin resistant leading to macro vascular and micro vascular disease (Mukhtar & Yunusa, 2019; Olokoba et al., 2015)
Healthy Lifestyle	Is a way of living which reduces the risk of being seriously ill and having a habit of eating a balanced diet, regular exercises, adequate rest, managing weight and avoiding tobacco and drugs (Attridge et al., 2014; WHO, 2016)
Healthy Physical Activity	A habit of having at least 30 minutes of moderate to vigorous activity daily (Manyanga et al., 2016; Medagama et al., 2018; WHO, 2016).
Healthy body Weight	is a range of weight for height associated with lowest or mortality or normative weight in a population (Medagama et al., 2018)

Normal Body Mass Index	Body weight which ranges between 18.5 and 24.9kg/ m^2. (Dai et al., 2020; Medagama et al., 2018; Woo et al., 2018)..
Sugar Sweetened Beverages	Any liquids that are sweetened with various forms of added sugars which include non-diet soft drinks, flavored juice drinks, energy drinks, sports drinks, sweetened tea and coffee.(Malik et al., 2010; Malik & Hu, 2011; Pomeranz, 2012)

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents the background of the study on assessment of university student's knowledge of risk factors for diabetes type 2 (DT2) at Harare Institute of Technology (HIT). The researcher will describe the research problem, the study objectives and relevant research questions. Study significance, limitations and delimitation of the study will also be defined.

It is estimated that 366 million people have diabetes type 2 worldwide and its prevalence is expected to increase over the coming decades (Fenwick et al., 2013). Similarly the incidences of DT2 among adolescents and youths have considerably increased over the past decades (Amankwah-Poku, 2019). Consequently, the management of diabetes is complex and multifaceted. Many people struggle to meet the high levels of self-care required to attain the optional diabetic goals. One of the barriers to comprehensive control of diabetes has been noted to be lack of knowledge of risk factors and recommended diabetic control goals. Similarly, better knowledge about diabetes is associated with a higher probability to perform self-care activities such as regular exercises and health eating. Likewise, poor knowledge about DT2 have also been associated with higher rates of acute and chronic complications.

Knowledge of risk factors affect decisions about exercises, diet, weight control, prevention and treatment of macro and micro-vascular complications of diabetes (Fenwick et al., 2013). Similarly factors such as older age, low income and lower educational level are associated with poor diabetic knowledge. The American Diabetic Association advocate for patient education programmes on diabetes (Fenwick et al., 2013)

The aim of the study was therefore to assess university students' knowledge on risk factors for DT2. Interventions targeting young people are critical in reducing the incidence of DT2. Colleges and Universities presents one group that has been largely overlooked in the fight against DT2. Colleges and universities can be essential settings for increasing knowledge on risk factors for DT2 and nutritional education.

1.2 Background of the study

The incidence of DT2 in youths presents an important public health issue. Diabetes type 2 is ranked the 8th leading cause of death globally (Mayer-Davis et al., 2017). Globally the incidence of DT2 among youths increased by 7.1% in 2012 (Mayer-Davis et al., 2017) 2017). However, reports from Finland suggest stabilization of type 1 diabetes among youths in 2011 to 2015. This suggest that DT2 is considerably taking precedence over type 1 diabetes.

In Europe, the prevalence of diabetes rose from 5% in 2000 to 9.1% in 2015 among the 20 to 79 age group and a prevalence of 5.7% in Denmark (Mayer-Davis et al., 2017). In the United States of America, the prevalence of diabetes among young people aged between 18 and 24 years was 7.5% (Dunkley et al., 2014a). DT2 is increasingly affecting the younger population. Saeedi et al., (2019) concur that adolescents aged 10 to 19 years have been reportedly developing DT2 in recent decades.

In 2014 the World Health Organization (WHO) reported that 8.5% of the world's population aged 18 years and above were living with DT2 (Aune et al., 2015). Each year 6.8% of total global death is attributed to diabetes (Saeedi et al., 2019). It is anticipated that across the globe NCDs including DT2 will take over mortality from communicable diseases, maternal, perinatal, and nutritional diseases by 2030 (Dunkley et al., 2014a).

The global expenditure on diabetes care in 2017 was $727 billion (Saeedi et al., 2019). Aune et al., (2015) recounts that physical inactivity and obesity are the major drivers of DT2 increasing the prevalence of DT2 worldwide. In a study that measures the health effects of obesity in 195 countries over 25 years found that 107.7 million children globally were obese with a prevalence rate of 5.0 percent (WHO, 2016). World Health Organization predicts that by 2030 diabetes will be the seventh leading cause of death worldwide (WHO, 2016). In the United Kingdom T2D accounts for 86% of deaths and 77% of diseases burden (Saeedi et al., 2019).

The burden of care of T2D attract billions of dollars globally. Management of DT2 is multifaceted and complex owing to acute and chronic complications the disease is associated with. A cost analysis on the burden of care of the disease conducted by the World Economic Forum and Harvard School of Public Health estimated a sum of 9 billion dollars per year in 2011 in England and Wales only (Beagley et al., 2014) . This reflect a fraction of the burden of cost of T2D worldwide.

Global Action Plan on physical activity 2018-2030 also found that inactivity also accounted for 1-3% of national health care costs (WHO, 2016). Similarly about 80% of the world's diabetes-related expenditure occurs in developing countries (Al-Sarayra & Khalidi, 2012). Diabetes type 2 is significantly a global burden which greatly impact on lives and well-being of individuals, families, and societies.

Though previously thought of as an epidemic of developed countries, DT2 has increased at an alarming rate in developing countries (Saeedi et al., 2019). Sub-Saharan Africa accounts for the largest population of undiagnosed diabetes (Saeedi et al., 2019). Over 70% of the world's population with diabetes live in lower- and middle-income countries (LMICs) (Nicole D Ferrian, 2011). The combined effect of poor knowledge, inadequate access, limited healthcare services, and poor resources makes diabetes one of the leading causes of disability and death in LMIC (Nicole Decourcy Ferrian, 2011).

The African region has the highest number of people with undiagnosed DT2 (59.7%) followed by South-Eastern Asia (56.7%). South Africa accounted for 37% of deaths and 21% of years of lost life in 2000 due to T2D (Ferrer & Klein, 2015). Despite several

global and regional initiatives in the control and prevention of T2D and related complications, the greatest number of people living with diabetes are in LMICs (Saeedi et al., 2019). Beagley et al., (2014) concur that 50% of these are undiagnosed. Sub Saharan African region(Saeedi et al., 2019).

In Sub Saharan Africa Nigeria has the largest population with diabetes followed by South Africa, Ethiopia, and Tanzania (Mukhtar & Yunusa, 2019; Rawal et al., 2012) remains the largest population with DT2 followed by South-Eastern Asia and the Middle East

states that DT2 accounts for a third of diabetes adjusted life year burden in developing countries, for example in South Africa 37% of deaths and 21% years of life lost were due to DT2 in 2010 and 28% of deaths in Mozambique.

(World Health Organization, 2015) states that DT2 has great bearing in developing countries where 85% of premature deaths are due to diabetes American Diabetes Association, (2014) further states that 80% of the world's diabetes care-related expenditure occurs in LMICs. This shows the extent of the burden of disease in developing countries. This is further worsened by existing poor health delivery systems and exceptionally limited resources in LMICs.

In Zimbabwe, the prevalence of diabetes is 8.5% an increase from 0.44% four decades after independence in 1980 (Manyanga et al., 2016). This shows that worldwide the disease pattern has substantially changed with a shift from risk for communicable diseases in children towards those of NCDs in adults (Saeedi et al., 2019). It is estimated

that 10 in every 100 people are living with diabetes in Zimbabwe (Manyanga et al., 2016). The disease constituted over 100 000 visits per year in 2017 at one of the largest hospital outpatient departments in Harare, Zimbabwe (Qi et al., 2016). Increasing the cost of care in a very resource limited country. (Mutowo et al., (2014) concur that Zimbabwe has the third highest estimated per-person cost of diabetes care in the SSA region.

In Zimbabwe 47% of young people comprising of 35% women and 12% of men aged 15-49 years were obese, respectively (Mutowo et al., 2014). Obesity was most prevalent among adolescents and youths in tertiary institutions which accounted for 57% (Mutowo et al., 2014). These notable changes suggest that the primary determinants of diabetes are not genetic but environmental factors.

A death rate of 1.4% was also recorded among young people aged 15-24 years in Harare Province, an increase from 0.9% in 2014 (Qi et al., 2016). This reflects the magnitude of the burden of DT2 in the country. In Zimbabwe 57% of adolescents and youths in tertiary institutions were obese in 2013 (Mutowo et al., 2014). Obesity, a precursor of diabetes has become an important public health issue (Aguiar et al., 2014). Universities can thus be primary settings for increasing knowledge on risk factors of T2D.

1.3 Statement of the Problem

Knowledge on risk factors for DT2 among university students at HIT has not been assessed. Much is not known about their knowledge of risk factors for DT2. In 2015 the health team at HIT embarked on an exercise of checking weight, height, body mass index, blood sugar, and blood pressure of students as they enrolled.

The interval was during the orientation of first years and at mid-semester during health and wellness days. The BMI of first years were as follows 15% were underweight with BMI below 18kg/m^2 and 12% were overweight with BMI of 26 to 29kg/m^2 while 11% were obese with a BMI of above 30kg/m^2.

The 2019 health and wellness program revealed that 8.5% were underweight with BMI below 18kg/m^2, 26% were overweight with BMI of 26 to 29kgm^2, and 21% were overweight with BMI above 30kgm^2 of those students who were now in their final year. Although change in weight is expected as these are young adults who are still growing, the percentage of overweight and obese had more than doubled in four years. Therefore, it was important to assess knowledge on risk factors for DT2 among students at Harare Institute of Technology in order to help in the reduction of DT2.

1.4 Objectives of the Study

1.4.1 Broad Objectives

The main purpose of the study was to assess University students' knowledge of risk factors of DT2 at Harare Institute of Technology.

1.4.2 Specific Objectives

1. To determine students' knowledge of risk factors for DT2 at Harare Institute of Technology from January to March 2021.
2. To assess students' healthy lifestyles from January to March 2021.
3. To determine strategies of health education that can increase knowledge level on risk factors for diabetes type 2 in universities.
4. To identify challenges to interventions on reduction of DT2 at Harare Institute of Technology

1.5 Research Questions

The following research questions will be addressed.

1. What are University students' knowledge levels on risk factors for DT2?
2. What are healthy lifestyle variables of University students?
3. What strategies of health education can increase knowledge level on risk factors for DT2 in Universities?

4. What are challenges to interventions on reduction of DT2 in Universities?

1.6 Significance of the Study

Universities and colleges are one group of people that has been left out in the prevention and control of NCDs particularly DT2. Adolescents and youths underestimate the risk of diabetes, yet they are at higher risk of developing the disease (Amankwah-Poku, 2019). Physical inactivity and poor healthy eating habits are prevalent risk factors among university students.

While a considerable increase in prevalence in DT2 has been noted in Zimbabwe, few studies have assessed University students' knowledge on risk factors for DT2. Studies conducted in Zimbabwe are minimal and have not focused on University students' knowledge on risk factors of DT2. While some studies have focused on the prevalence of diabetes, risk factors of obesity, and community awareness of diet needs on hypertension and T2D, these have not been adequate in assessing University students' knowledge level on risk factors of DT2.

The risk for DT2 is associated with certain behaviors which may be a common phenomenon among young adults since they are less likely to perceive themselves to be at risk owing to their age (Reyes-Velázquez & Hoffman, 2011). Knowledge is thus an important step in preventing DT2. Mongiello et al., (2016) found that when people lack knowledge or are unaware of their risk it may deter them from taking appropriate actions necessary to alleviate the problems or prevent them from getting worse as outlined in

behavior models such as Health Belief Model (HBM). Diabetes is often undiagnosed, and many people are unaware of their condition, thus knowledge is an important step towards control of DT2.

1.7 Delimitation

The study setting was chosen to be Harare Institute of Technology. The researcher narrowed the scope of the study to students studying at Harare Institute of Technology. Young adults and adolescents aged 18-30 years were enrolled into the study. Adolescents and young adults are largely left out in health promotion and health education programs particularly on NCDs. This is probably because of their age. The Health Believe Model conceptual framework was used for many of the survey questions.

1.8 Limitations

The study was carried out at Harare Institute of Technology. In Zimbabwe there are many universities and the results could have been more generalized if other universities could have been incorporated into the study. Universities have different settings, programmes, and cultures which may promote or discourage certain healthy lifestyles and behaviors yet they were not included in the study. Moreover, due to time and resource constraints, the researcher was not able to incorporate other institutions for comparison of data. The data that was used in this study was a sample of students enrolled at the Harare Institute of Technology.

1.9 Chapter Summary

In this chapter, the researcher outlined that DT2 is now a global pandemic increasing affecting those aged 18years and above. Young people are often left out in health promotion programs particularly those which deal with the prevention and reduction of NCDs. Yet young people underestimate their risk of DT2 thus predisposing them to risk for disease. A sedentary lifestyle in addition to poor dietary choices characterizes the lifestyle of many students in tertiary colleges making them at risk for DT2. Thus, universities can be principal settings for increasing knowledge levels on risk factors for DT2. Institutions of higher learning can also become centers of influence in the promotion and reduction of NCDs.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Like any other study, this study is focused on global, regional, and national literature relevant to University students' knowledge of risk factors for diabetes type 2. The Health Belief Model (HBM) construct of perceived susceptibility, the severity of potential of illness, benefits of taking preventive measures and barriers to taking action were used to explain the relevance of the framework to the study.

Diabetes is a major public health issue that has reached alarming rates cross the globe. The once thought of disease of the affluent has become the largest global burden. The disease accounts for a very large burden of morbidity and mortality in low and middle-income countries (Saeedi et al., 2019). The management of DT2 is complex and multi-faceted owing to acute and chronic complications.

2.2 Theoretical framework

This study adopted the Health Belief Model (HBM) as a conceptual model to identify risk factors of T2D. The HBM is widely used in defining barriers people face when engaging in programs that focus on disease prevention and the promotion of a healthy lifestyle (Mbanya et al., 2014).

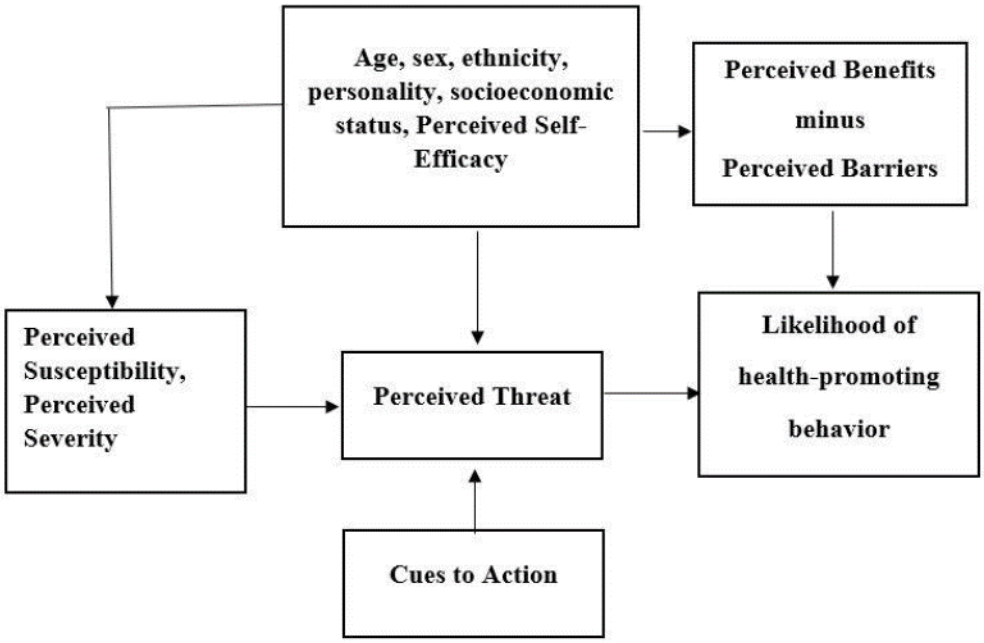

Figure 2.1 Model of health belief model
Adapted from Abraham & Sheeran, 2014

2.2.1 Relevance of the theoretical Framework to the Study

The health belief model was selected as the most suitable model to encourage health promotion behavior change in this study. Abraham & Sheeran, (2014), posited that behavior depends upon three variables namely knowledge, perceived benefits, and perceived susceptibility or severity. For behavior change to occur knowledge is critical since healthy lifestyle depends on what is known as the most acceptable way of life (Ferrer & Klein, 2015). Understanding of perceptions was interpreted based on HBM. There is much to study about university students' knowledge of risks factors for T2D.

The HBM aided on how to increase knowledge of risk factors for DT2 in tertiary institutions.

The model was initially used to explain in general how people failed to identify the disease and participate in disease prevention programs (Ferrer & Klein, 2015). Later the model was used to explore people's behavior concerning illness and adherence to diseases prevention programs (Ferrer & Klein, 2015). The same author state that the HBM defines the perceived risk of an individual's perceived susceptibility to a threat. For this study perceived risk was operationalized as an understanding of identified risk factors that influence the development of T2D such as modifiable factors and non-modifiable factors and the likelihood of developing the disease.

The HBM suggest that for effective behavior change to occur, people must feel threatened by their present behavioral patterns and believe that specific actions will result in the desired outcome (Abraham & Sheeran, 2014). This theory also helps define people at risk and helps outline the consequences of the risk as outlined by several authors on psychology and health education.

Generally making lifestyle changes is complex. To influence positive behavior change, self-efficacy is also a requirement. Ferrer & Klein, (2015) states that for change to be effective the person needs to believe that he or she can make lifestyle changes before the intervention.

The individual must feel capable to overcome perceived barriers to taking action. While an individual's risk perception of developing DT2 and benefits of taking action to

prevent the disease can be affected by demographic variables such as age, sex, ethnicity, and socioeconomic status. Mongiello et al., (2016) states that knowledge, education, and at times training must be provided to boost confidence to enhance good behavior. It is therefore important to focus on the benefits of behavior change particularly in the asymptomatic phase to obtain desired outcome. Thus, HBM helps describes change and continuation of health-related behavior.

2.3 University Students' Knowledge of Risk factors for DT2

The risks factors for DT2 are classified into two groups: - modifiable and non-modifiable factors according to American Diabetic Association (Dunkley et al., 2014b). Modifiable factors are those variables that are amendable or adjustable for the benefit of improving quality of life, while non-modifiable factors are not changeable (Saeedi et al., 2019).

Type 2 diabetes has a major genetic component, which includes age, race and ethnicity, susceptibility loci, and gut genome. (Zhang et al., 2017). Often diabetes is undiagnosed thus knowledge of disease and risk factors is a vital stride in the prevention of DT2. While (Gosławska et al., 2021) suggest that people have knowledge about diabetes, this has not been adequate enough to prevent the disease. Many university students take too lightly the risk for DT2, thus knowledge of disease is important (Ferrer & Klein, 2015).

Wu et al., (2014) state that 40% of first-degree relatives of DT2 may develop diabetes. Thus, having a first-degree relative with DT2 increases one's odds of developing T2DM.

Another component related to genetic factors is gut meta-genome. Studies reveal that different kinds of bacteria in the gut play an important role in regulating blood glucose levels or interacting with their environment increasing the risk for T2D (Wu et al., 2014). An increase in gut bacteria such as clostridia increases membrane transportation of sugars and methane (Afshin et al., 2019). Thus, reducing the risk for T2D. The same author also found that individuals with a hostile gut environment that stimulates defense mechanisms against microbes increase the risk of developing T2D.

Another genetic component is that of ethnicity, certain races or populations tend to be overweight, predisposing them to risk for T2D. The works of (Attridge et al., 2014; Nicole D Ferrian, 2011) reveal that ethnicity is a risk factor for T2D and such ethnicity include Non-Hispanic Black, Hispanic/Latin American, and Asian American, and Alaskan nature. However this information is not known to a number of students in tertiary institutions.

While age is a risk factor for T2D, rising rates of childhood obesity have stemmed at an alarming rate among adolescents and youth increasing the incidences of the disease (Reyes-Velazquez & Sealey-Potts, 2015). The combination of both modifiable and non-modifiable risk factors makes T2D a multifaceted condition which requires several lifestyle interventions (Ayah et al., 2013).

The American Diabetic Association defines low physical activity as exercising less than 5 days per week for 30 minutes (Dunkley et al., 2014b). Related literature states that many young people fail to attain the minimum recommended physical activity goal of 30 minutes per day for 5 days due to inadequate knowledge, lack of health prevention programs, and inadequate or lack of physical activity infrastructure (Nicole D Ferrian, 2011).

As one gets older physical activity declines while the incidence of NCDs for example T2D ensues with age. Although there is nothing an individual can do to delay aging, being energetic can help reduce the risk for T2D (Fenwick et al., 2013). While Dunkley et al., (2014) emphasize the importance of regular exercises, WHO, (2016) found that nearly a quarter of those aged 18 to 34 years old did not engage in any form of physical activity, increasing the risk for T2D. However, it is important to note that small lifestyle changes yield great results.

2.3.1 Industrialization and disease trends

While studies reveal that changes in incidences of T2D have been noted in communities where major variations in diet have ensured (Mongiello et al., 2016) state that changes in disease trends are clearly explained by changes in dietary factors and lifestyle. For example, in LMICs, there has been a major shift in causes of death from health risks associated with poverty, unsafe water, malnutrition and poor sanitation to the rising burden of modifiable diseases (Muthuri et al., 2014). In South Africa, the incidence of

people with DT2 in urban areas is higher than those in rural areas (Lachat et al., 2013). Despite all these variations, a window of opportunities still exists in the control of DT2 by above 50% (Gosławska et al., 2021). Lifestyle interventions have become one of the approaches in the control of DT2.

Many college students engage in poor healthy lifestyles. Mutowo et al., (2014) found that the incidence of obesity increases during adolescents and progresses to adulthood. Knowledge about DT2 is important for behavior change particularly in tertiary institutions where health promotion has shown to be more effective in programs such as HIV and AIDS prevention (Attridge et al., 2014).

Mongiello et al., (2016) states that adolescence is a period of great transitions associated with dietary exploration. These include high taste of sugary and fatty substances, alcohol and tobacco use. These transitions occurring during this period often form long-lasting diet and health behaviors resulting in increased lifetime risk for DT2. Similarly (Alanazi et al., 2018) states that inadequate knowledge on risk factors and complications of diabetes are the most contributing factors for the continued increase in prevalence of DT2 among adolescents and youths across the globe.

While food is a physiological need for creation and maintenance of life (Afshin et al., 2019). Many adolescents and youths underestimate the importance of a balanced diet in relation to biological function of the body. Dietary intakes and eating patterns are of crucial interest particularly that of young adults of childbearing age as it arrays the stages of lifestyles that influence later health (Mongiello et al., 2016). Afshin et al.,

(2019) defined dietary behaviors as eating patterns, food preferences, methods of preparation, cooking, and serving food. Khazrai et al., (2014) further outlined nutrient profiling as the science of classifying foods according to their nutritional composition for reasons related to preventing disease and promoting health. Knowledge of dietary intakes and nutrient profiles is essential as it present different types of foods available and nutrient content. Mismanagement of dietary patterns can lead to nutritional disorders for instance DT2 and other NCDs (Attridge et al., 2014).

Physical inactivity is another risk factor for DT2 (Murray et al., 2012) emphasized the importance of physical activity particularly for those at risk for DT2. Reduction of at least 7% of body weight is recommended for those at risk of the disease (Nicole Decourcy Ferrian, 2011). Despite available literature, this knowledge is not readily available among young people. Public health interventions on DT2 should aim at increasing knowledge of risk factors for DT2 in institutions of higher learning.

2.4 Healthy Lifestyle of University Students

Youth is the period during which key lifestyle modification occurs. High-stress levels encountered in tertiary education contribute to unhealthy eating (Amankwah-Poku, 2019). Many university students consume high fatty and sugary foods as a way to drive stress away when they feel pressurized with academic work (Reyes-Velázquez & Hoffman, 2011). While typical male students choose foods high in fat and fiber, female students choose foods high in sugar (Aguiar et al., 2014)

Being a university student is often associated with freedom and independence to engross in lifestyles and eating habits that may not promote healthy living (Amankwah-Poku, 2019). This explains why (Malik & Hu, 2011) states that food and beverages high in sugar are the main sources of discretionary calories among children, youths, and adolescents. Studies have shown that there has been a noticeable increase in the consumption of Sugar-Sweetened Beverages (SSB) in the past three decades across the globe. For example, in the United States, there has been an increase in consumption of SSB from 3.9% of calories in the 19th century to 3 fold increase in the 21st century (Caro et al., 2020). Several epidemiological studies have assessed the relationship between SSB, obesity and related macro and micro-vascular diseases. Some studies have found positive association, while some have yielded inconsistent results sparking controversy in the field of SSB (Malik & Hu, 2011).

In another study (Amankwah-Poku, 2019) found that young adults are prone to deviant eating patterns which put them at risk for nutrient inadequacies and dietary excess of selected nutrients. Mutowo et al., (2014) found that adolescents and youths' diet is characterized by meal skipping particularly breakfast. Other studies found that SSB and frequent snacking were a common practice among youths (Isa & Masuri, 2011)

In addition college life is characterized by vital social events such as leaving home at an early age before parental nutritional guidelines are internalized and fully comprehended. To some students it is their first time living away from home, hence they may lack experience and knowledge on how to make healthy food choices and craft a healthy food schedule for themselves. At university level, some of the nutritional principles learned

and practiced at home would have been foregone, mostly due to barriers such as inadequate time and income including pressure associated with learning. Thus, embracing a healthy lifestyle becomes a challenge among university students, yet a healthy diet, physical activity, and other interventions are central in the control and prevention of DT2.

2.4.1 Importance of Physical Activity in control of DT2

While literature states health benefits of maintaining a healthy body weight and active living, physical inactivity, unhealthy food and sedentary lifestyle have been on the increase in developing countries (Muthuri et al., 2014). This is because traditional practices such as walking long distances and routine physical practices have been substituted by motorized transport and deskbound lifestyles (Muthuri et al., 2014)).

(Mongiello et al., 2016) found that behaviors contributing to disease are usually pleasurable, motivation to forgo such behaviors is driven by consequences that are associated with that behavior. For instance consumption of SSB is a risk factor for T2D and may result in complication such as blindness. Thus interventions should be targeted at empowering and educating individuals so that they become aware of the implications of their lifestyles.

Muthuri et al., (2014) found that childhood is the critical time to learn basic skills including recommended physical activities for the maintenance of a healthy body and delay onset of disease. This provides an opportunity to learn and modify a healthy

lifestyle while time is still available for restoration of health and reduce the onset of DT2.

While promotion of physical education in primary and secondary schools is the government's mandate, the consensus is that institutions, where physical education (PE) is mandated often, do not prioritize PE in schools. (Manyanga et al., 2016) further emphasize the importance of PE in primary and secondary schools' physical education is an examinable subject in all teacher's colleges. However physical education in universities is not a mandate yet behaviors contributing to DT2 are prevalent in institutions of higher learning.

Sedentary lifestyle has become a public health issue among all age groups. (Manyanga et al., (2016) found that in Zimbabwe about 75% of children and youths spend more than 2 hours a day of indolent. Watching television is the most sedentary habit of children and youths in Zimbabwe. The same author also found that 23% engage in electronic games and 15% in watching television increasing the risk of the disease.

2.4.2 Diet as a Control Measure for DT2

Diet as a control measure for T2D has been known since ancient times. The oldest dietary prescription in the prevention and control of diabetes was recorded in Ebers and Papyrus in approximately 1550 BC (Lachat et al., 2013). Food rich in carbohydrates such as wheat, grains, honey, and berries were recommended (Nicole D Ferrian, 2011). According to American Diabetic Association, four types of diabetic diets have been

identified in the prevention and control of diabetes, namely Mediterranean diet, low carbohydrate high protein diet, vegan and vegetarian diet (Fenwick et al., 2013). Studies revealed that these types of diets demonstrated great improvement in metabolic conditions. However dietary regimens should be provided according to individual taste, cultural and traditional preferences to maximize effectiveness and adherence.

In addition several research studies recommend a consistent fruit diet, vegetables, whole grains, and unprocessed sugars as significant to healthy eating. There has been a widespread manifestation of transitional beverages, food marketing, corporations, and food advertising, enticing young people (Caro et al., 2020). Yet these issues are key determinants of the rise in T2D. . Sugar-sweetened beverages and high-calorie dense food have become increasingly available, affordable, and accessible increasing the risks and burden of care particularly among young people (Muthuri et al., 2014).

2.5 Programs and Strategies which Promote Behavioral Change

Frequently behavioral modification theories such as Tran's theoretical model, Health Belief Model, and Theory of planned Behaviors are used in health intervention (Reyes-Velazquez & Sealey-Potts, 2015). Various authors suggest that multiple theories should be incorporated to design robust interventions while taking cognizance of how culture, environment, and health problems can affect theoretical application (Attridge et al., 2014).

Young people generally like appealing messages which motivate them to change behavior in addition to a friendly healthcare team. Thus, the graphic design of messages is critical. Colorful designs and different fonts grab young people's attention in comparison to black and white (Attridge et al., 2014). Another variable is the context of the message, the use of persuasive messages enhances behavior change. The works of (Medagama et al., 2018) recommend the use of both fear appeals and positive effects to promote health. Fear appeals include threat, evidence indicating that a person is at risk of the threat, and solutions that are effective and easy to perform (Amankwah-Poku, 2019). The hypothesis is that intensified sense of fear will result in behavior change. While Positive affect messages have an emotional benefit appeal which includes a mood component or a subjective feeling (Reyes-Velázquez & Hoffman, 2011). Thus, both fear and positive affect messages are important in ensuring positive behavior change.

The same author recommends the use of both positive affect messages and fear appeal messages. Thus, when designing these messages, it is anticipated that the beneficiaries will conform to the message and benefit from the presented information. An example of an emotional benefit appeal message can motivate people to eat well by showing healthy people engaging in exciting activities, thus a connection is created in the mind of recipients eating well and having fun (Reyes-Velázquez & Hoffman, 2011). Thus, better educational programs, appropriately designed to meet young people's needs are recommended to enhance adherence to health behavior change.

Amankwah-Poku, (2019) cite that behavior change is largely participatory hence health promotion is more likely to be effective if it is participatory. In places where there are

few recreational and public parks fitness and aerobic classes can provide a form of physical activity for example in schools and workplaces. This promotes social support.

Another model is that of regular and coordinated sports activities. There is indisputable evidence of the effectiveness of regular physical activity in primary and secondary prevention of T2D including several chronic diseases (Manyanga et al., 2016). Thus, physical activity is strongly recommended in the prevention and control of TD2 and other NCDs.

While regular exercises improve insulin sensitivity along with a diet rich in vegetables and fruits. Aune et al., (2015) further recount that walking is associated with 3 units lower BMI. Organized various sporting activities, nutrition education and awareness campaigns motivate behavior change and reduction of incidence of T2D.

The use of mass media awareness programs can also lead to change particularly when targeted to specific communities. Dunkley et al., (2014b) found that in the USA mass media segmented messages were effective in increasing physical activity. The same author found that in Germany, England and Australia there was creation of buddy systems and formation of walking partners, small groups, or clubs within their neighborhood for reinforcement and sustenance of PA. The same author states that communications through a newsletter, telephone calls, or email were used to strengthen the walking network. Neupane et al., (2016) advocated for persuasive messages such as do-it-yourself-at-home to promote behavior change.

2.6 Challenges to Intervention of healthy lifestyles in Universities

While the cost of care, life-threatening complications, and failure of existing treatment form some of the challenges associated with control for diabetes (Kiberu et al., 2017). At present, there are probably very few independent organizations that coordinate and support healthy living among children and youths in Zimbabwe (Manyanga et al., 2016). Amid numerous corporates in Zimbabwe only Nestle Zimbabwe partners with the association of primary school heads and Nestle Kids Athletes physical activity program in the promotion of active healthy living in primary schools (Kiberu et al., 2017; Manyanga et al., 2016).

However due to COVID19 pandemic most of athletes and out of school physical activities have been deferred in Zimbabwe. Thrust is being directed towards academic programs as a result of lockdown which have shortened the learning periods. Nevertheless uncertainties about control of DT2, obesity and other NCDs among students in institutions of learning during this period of COVID19 pandemic have become a public health issue.

The Zimbabwe University Sports Association (ZUSA) which promotes physical activity in universities is poorly funded. Priority is often given to academic programs. In addition the association is seasonal hence does not promote regular physical activities within universities. Further to that most universities do not provide curricula for out-of-school play. Participation in ZUSA programs is at individual discretion as learning

continues, disadvantaging those who engage in ZUSA games. While universities are for intellectual and development of skills, the habitual out-of-school play has a clinical application (Kiberu et al., 2017).

2.6.1 Funding of DT2 Prevention Programs

Lack of per capita forms one of the major challenges to T2D prevention measures. Limited resources translate into serious erosion of government capacity in the provision of basic health prevention programs (Danquah et al., 2012). Inadequate equipment, recreational and public parks, lack of social support, and high-priced healthy food deter T2D health promotion programs (Manyanga et al., 2016).

While universities and colleges are mandated to have physical activity infrastructure in place, the state of existing recreational grounds has been an issue of great concern for both students and communities. The maintenance of these structures has been inconsistent over the past decades particularly in developing countries (Manyanga et al., 2016).

While universities are required to promote healthy living there is also great consensus on funding of health promotion programs. Often diabetes research is not effectively supported and lacks public health awareness-raising (Aune et al., 2015). Thus many developing countries lack the capital to fund health promotion and prevention programs (Medagama et al., 2018). Due to low socio-economic constructs associated with LMIC, many populations of all age groups indulge in unhealthy diets, while they are less likely

to seek health care services due to high medical costs. Besieged by a myriad of social and economic confronts adolescents and youths are largely seen as incompetent to adhere to a healthy diet and healthy lifestyles (Ayah et al., 2013). These socio-economic challenges impact worse on students in tertiary institutions as they also have difficulties in securing decent accommodation and food in addition to tuition fees.

The dearth of comprehensive physical activity structures and health facilities structures in most universities suggests lack of promotion of healthy lifestyles in universities (Medagama et al., 2018). Supportive communities and environment are fundamental in influencing university students' choice of physical activities. Universities can thus be centers of influence through provision of facilities that encourage and enable young people to be active. Increasing knowledge level on risk factors for T2D will help both high and low-risk students to recognize the likelihood of T2D and take appropriate measures.

2.7 Chapter Summary

This chapter outlined local, regional, and global literature which supports the importance of knowledge of risk factors for T2D in universities. Knowledge level on risk factors for DT2, barriers associated with interventions of DT2 were outlined. The researcher characterized healthy lifestyle of university students which predisposes them to DT2. Programs of health promotion that can be employed in universities in order to increase

knowledge level on risk factors for DT2 and promote behavior change were also discussed.

Journals, reports, peer-reviewed publications, and research reports were used to identify literature related to the study. HBM construct was used to explain change and continuation of health-related behavior. Public health interventions were outlined. The main objective was to identify appropriate interventions which can contribute to knowledge level in the prevention of T2D in student population in universities.

CHAPTER 3 METHODOLOGY

3.1 Introduction

Research methodology defines procedures and strategies of research. This chapter focused on a cross sectional analytical descriptive research design on assessment of university students' knowledge on risk factors for diabetes type 2. Interviewer administered semi-structured questionnaire was used for data collection. The study setting was Harare Institute of Technology. The population was all registered students at Harare Institute of Technology aged between 18 and 30 years for the period between January and December 2021. A sample size of 147 participants was used. Additional tools which were used for this study were body weighing scale, electronic blood pressure monitor and height and tap measure.

3.2 Research Design

A cross sectional analytical descriptive study was conducted. Across sectional study is a descriptive study where disease and exposure are measured at the same time in a specified population (Gaus, 2017). It provides a snapshot of frequency and characteristics of a disease at a given time in a population (Gaus, 2017). The data can be used to assess the prevalence of acute or chronic conditions in a population.

The design is simple and clear such that it can be repeated by other researchers. Quantitative approach was used on objective measurements and statistical analysis of numeric data. Numerical were used to describe existing phenomenon such as

demographic characteristics, knowledge level of participants on diabetes, risk factors and healthy lifestyle behavior.

3.3 Study Setting

The study was conducted at Harare Institute Technopreneural University (HIT). HIT is located in Harare, the capital city of Zimbabwe 6 km from city center south west of Harare, in Belvedere suburb. The institute was officially opened in 2005. The institute adopted structures from the former Harare Institute of Technology center which offered higher national diploma in technology in 2004. Thus the institute is still in its infancy in terms of infrastructure such as sporting, health and academic facilities.

The university majors in engineering programs. Currently HIT is made up of five schools namely; Allied Health Sciences, Engineering and Technology, Industrial Sciences and Technology, Information and Technology and Business and Management Sciences.

3.4 Study Population

Harare Institute of Technology has a student population of 3011 students. The general age ranges between 18 and 30 years. More males than females are into engineering programs at HIT and are ordinarily Zimbabweans. The institute has limited student residential facilities. It can only house 1120 students into its hostels.

Preference is given to part ones and fours due to the fact that part ones are usually new in Harare and have no clues on where to find decent accommodation with HIT parameter. While part fours are prioritized on the basis that they need more time to concentrate on their projects. The rest of the students are accommodated in the neighboring suburbs of Belvedere and Warren Park as tenants. Only a handful of students commute from surrounding suburbs within Harare and Chitungwiza. In this analysis the study population were all students registered and studying at Harare Institute of Technology for the period between January and December 2021.

3.4.1 Inclusion Criteria

In this investigation all students registered at Harare Institute of technology between January and December 2021 were included in the study. Both males and females, resident and non-resident students who consented were enrolled into the study.

3.4.2 Exclusion Criteria

The researcher excluded all students who had a conformation from a medical practioners of being diagnosed diabetes as their knowledge of diabetes confounded the outcome of the study. All students who had not consented to the study and those who were on attachment were excluded from this study.

5 Sample Size and Sampling Procedure

Harare Institute of Technology has a total of 3 011 students and 5 academic schools as follows; School of Allied Health Sciences has 4 departments. School of Industrial Sciences has 3 departments, School of Business and Management Sciences has 3 departments, School of Engineering and Technology has 4 departments and School of Information Science and Technology has 3 departments.

Therefore, sample size was calculated using the formula below:

$$n = \frac{N}{1+ne^2}$$

¿)

Where n= sample size

e= marginal error = 8.5%

N = Total number of students at Harare Institute of Technology= 3011

Therefore, assuming none response rate of 10%

$$\frac{132}{0.9} = 146.6$$

Therefore, a sample size of 147 was used for the study.

3.5.1 Sampling of Academic Schools and Participants

Sampling is selection of a small group of individuals from the larger group of people from which data is collected for generalization to a larger group of people. A stratified sampling procedure was employed in order to come out with total presentation of academic schools. Thus, all academic schools were written down on large pieces of paper and the papers were pinned onto large boxes according to academic schools or faculties. Then the names of all academic departments were written down on small pieces of papers. The small pieces of papers were then folded and placed in different small bowls according to departmental schools. Then the bowls were placed in labelled large boxes according to academic schools. A volunteer unrelated to the study was asked to pick or fish out two papers from a bowl with fewer departments and three papers from the academic school which had more departments.

Systematic random sampling was employed in selection of participants. A sampling interval was obtained first. Sampling interval is the listing of all items from the population from which the sample will be drawn (Gaus, 2017). Every K^{th} element in a population was selected. The K^{th} element is defined as the sampling interval. Thus sampling interval is the distance between elements in the sample.

$$\text{Sampling interval } K = \frac{\text{Population size}}{\text{Sample size}}$$

—

$$= \frac{3011}{147}$$

$$=20.4$$

Thus the sampling interval was 20 in this study.

Using university registers participants were randomly selected from their respective departments. The first participant was automatically selected on the bases of being the first person on the departmental register and subsequently every 20th participant was systematically selected for inclusion into the study. The selected participants were informed through their class mentor during lectures or through a telephone call. If one of the selected participants refused to participate the next person was enrolled into the study.

3.6 Data Collection Instruments

Data were collected from 147 participants who consented to be interviewed. An interviewer administered semi-structured questionnaire, designed and developed by the researcher with the assistance of resident medical doctor and nurses at the institute clinic was used to obtain data. Knowledge on risk factors for DT2, self- reported data on health

behaviors was collected from recruited participants. The interviewer administered semi-structured questionnaire to obtain participants demographic data, socio economic factors and programs of health education which may help increase university students' knowledge on risk factors for DT2 and challenges to interventions of healthy lifestyle in universities.

A Seca model 767 two in one body weighing scale and height measure was used to obtain weight and height. While an EDAN im8 model multi-parameter patient monitor was used to measure blood pressure, additional information such as hip and waist circumference were obtained using a tape measure. Body mass index was calculated using a scientific calculator using the formula height squared divided by weight.

3.6.1 Validity and Reliability

Validity is a variable that accurately reflects the concept it is intended to measure. Validity is critical in determining methodology.

While reliability is the ability to collect the same data each time in repeated observation of the same phenomena.

3.6.2 Dependent Variables

A dependable variable is an event or an object which rely on another variable or is caused by another variable. Dependent variables in this study were physical activity, eating habits.

3.6.3 Independent Variables

Independent variables are factors which influences another. Independent variables were demographic characteristics such as age, sex, weight and socio economic factors.

3.7 Pretesting of Instruments

Pretesting involves administration of the questionnaire to a very small sample not involved in the study in order to identify any missing or inaccurate data, any problems that may arise for interviewer and subject. Pretesting is necessary for improving the tool, change in wording, formatting ineffective questions and to assess if the questionnaire is relevant. In this study the questionnaire was administered to 10 HIT students who were not involved in the study to test for reliability and validity. Reliability was measured by assessing if the instrument was able to measure and collect the same data consistently according to definition and methodologies and give the same results when measurements are repeated. While validity was assured by assessing if the data accurately reflect the concept it was intended to measure. Evaluation of the questionnaire was done through consultation with expects in public health, the institute health care team and aligning the research instrument to conceptual framework that predict knowledge and risk for T2D and other NCDS.

3.8 Data Collection

The participants were booked and interviews were conducted at either lunch time or when participants were free from lectures. A counselling room at the institute clinic was

booked for the interviews for privacy and confidentiality. Interviews were conducted in both Shona and English depending with the choice of the participant. A written informed consent form was obtained. A semi-structured questionnaire designed by the researcher with the assistance of institute health care team was used to collect data.

Data on participants' demographic variables such as age was obtained. The ages were recorded as absolute figures and continuous variables. Data on knowledge of risk factors for DT2, signs and complications of DT2 were collected. Yes or No options were provided. Participants were asked about their health lifestyles; number of meals consumed per day. Information on types of physical activity and number of days and duration of each activity was also asked. These were recorded as figures and were left as continuous variables. Data were entered on hard copies and later entered onto computer excel spread sheet. The duration of the interview was 30 minutes per session. The whole process of data collection took four weeks.

COVID19 regulations were observed, social distance and wearing of a surgical face mask by both the interviewer and interviewee. Sanitization of hands was practiced at beginning, and at end of each session.

Body weight measuring; participants were advised to take off their shoes and heavy weight clothes. The weight measuring gage was checked to ensure that it was resting at zero mark. Each participant was advised to stand on both feet on the Seca model 767 in a relaxed position with chin horizontal to the feet. Weight was obtained in kilograms.

While still standing on the scale a height measure from the Seca model 767 was pulled up from the back of the participant running adjacent the spine up to the posterior fontanels. The gage was then pressed gently on the posterior fontanels and height was obtained. BMI was obtained by dividing weight by height squared in kg/m^2.

3.9 Data Analysis and Presentation

In this study collected questionnaires were evaluated for completeness and consistence of responses. Questionnaire responses with qualitative data were organized and assessed for content. Data was entered. Epi Info version 7 was used for capturing, cleaning and tabulation of all data collected. Participants' socio-demographic characteristics were described using descriptive statistics, tables and graphs. Risk factors were analyzed using odd ratios, confidence intervals and P values. Descriptive statistics and Chi square were used to determine association between T2D and independent variables.

3.10 Ethical Consideration

Permission to collect data was sought from Harare Institute of Technology University. Proposal review and approval was sought from AUREC, Africa University. Participation in the study was voluntary. A Written informed consent was obtained from participants. Confidentiality was maintained throughout the study, from data collection, analysis, storage and reporting process. Participants who choose to withdraw from the study were allowed to do so and assurance was given that their health care was not going

to be compromised due to their decision. After the study the questionnaires were stored in a lock and key cabinet and data stored in password protected computer files.

3.11 Dissemination of results

The study results were shared with HIT Health care team, and the HIT Directorate. The results were disseminated to participants in 3-4 weeks after data analysis.

3.12 Chapter Summary

A cross sectional analytical descriptive study design was used. The study population were all students enrolled at Harare Institute of Technology for the period between January and December 2021. A sample size of 147 was used. Random stratified sampling was used to obtain faculties and simple random sampling was used to obtain participants. Ethical considerations were observed by obtaining an informed consent from each participant and confidentiality was maintained throughout the study process.

CHAPTER 4 DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter presents the results of the study. Descriptive statistics and Chi-square analysis for association were analysed using Epi info 7 to present socio-demographic characteristics of study participants and factors related to risk for DT2. The data was presented in form of tables and graphs, and conclusive deductions by statistical methods.

4.2 Socio-demographics Characteristics of the Study Participants

Table 4.1 below gives an outline of the study participants' demographic characteristics. A total of 147 were enrolled in this study. 58.5% (n=86) were females and 41.5% (n=61) were males. The age range was 18 to 30 years and the median age was 21. 95% (n=104) of the participants were aged 18 to 25 years.

The participants were not evenly distributed among the level of education. Part ones were 25% (n=37), part two 26% (n=38) and part four 27% (n=39) with a slight drop in Part 3 students 22% (n=33). This drop was attributed to the fact that students go on Internship in part three. 91% (n=134) were college residence and obtained their meals mainly from the institute canteen, the remainder 9% (n=13) were non-resident and partly obtained their meals from the institute canteen and other sources.

The participants were of one religious belief which was recorded as Christianity. None were from the Islam or African Traditional religion. None of the participants smoked.

The participants were of very diverse health lifestyles. 14.2% (n=21) maintained a healthy diet while majority of the participants 85.7% (n=126) had all sorts of diets which included SSB, fried foods and snacking. On physical activity 53.7% (n=79) engaged in WHO recommended physical activity of 30 minutes for 5 days and 46.2% (n=68) did not engage in any form of physical activity. More than half of those who engaged in routine physical activity were males 60.8% (n=48) and 39.2% (n=31) were females. The most common physical activities in which participants engaged in were brisk walking, jogging, basketball, volleyball, tennis and football.

Meal frequency was one of the variables which was assessed and majority of the study participants 73% (n=107) managed to have two meals per day, 22.4% (n=33) had all three basic meals per day while 4.6% (n=7) had only one meal per day which was mainly supper. The major challenge behind eating fewer meals than recommended was lack of money as reported by 74% (n=108) of the participants. None of the study participants skipped meals due to pressure of work nor preferred snacking than the ordinary meals.

Table 4.1 below illustrate the socio-demographic characteristics of the study participants.

Table 4.1 Demographic Characteristics of Study Participants

	n=147		
	Characteristic	Frequency (n)	Percentage
Age	18-20	40	27
	21-25	104	71
	26-30	2	1
	31-35	1	1
Gender	Males	61	41.5
Females	Females	86	58.5
College residence	Yes	134	91
	No	13	9
Smoking	Yes	0	0
	No	147	100
Religion Christian	Yes	147	100
	No	0	0
Level of study	1	37	25
	2	38	26
	3	33	22
	4	39	27
History of DM in the family	Yes	21	14
	No	126	86
Type of family member with	Nuclear	5	23.8
	Extended	16	76.1
Prior Information on Diabetes	Yes	89	60.5
	No	58	39.5
Source of diabetic information	Family	79	53.7
	Social media	11	7.5
	School	13	8.8
	Health facility	9	6.1
Maintaining a healthy diet	Yes	21	14.2

	No	126	85.7
Meal Frequency per day	Three	33	22.4
	Two	107	73
	One	7	4.6
Reasons for eating less than 3	Inadequate funds	109	74.1
	Weight control	13	8.8
	Pressure of work	0	0
	Prefer snacks	0	0
	Adequate funds	25	17
Engaging in routine physical	Yes	79	53.7
	No	68	46.3
	Males	48	60.8
	Females	31	39.2

4.3 Personal health characteristics

Table 4.2 below illustrates the anthropometric measurements of the study participants stratified by gender. The mean weight was 72±12.4 kg (range: 51.6-118.6 kg). The mean BMI was 24.9±4.5 (range: 17.4-45.7). The mean waist circumference was 83.1±8.5 cm (range: 61-118 cm) and mean hip circumference was 98.6±10.9 (range: 90-135 cm).

Table 4.2. Anthropometric measurements of participants

Variable	Male, Mean (SD)	Female, Mean (SD)
Weight (kg)	72.8 (13)	73.2 (12)
Height (m)	1.7 (0.1)	1.7 (0.1)
BMI (kg/m^2)	24.9 (4.5)	25.0 (4.5)
Waist Circumference (cm)	83.3(9.1)	83.1 (8.1)
Hip Circumference (cm)	99.2 (7.9)	98.1 (12.7)
Waist-Hip Ratio	0.8 (0.1)	0.8 (0.2)

SBP (mmHg)	122.3 (10.9)	119.1(9.8)
DBP (mmHg)	75.3(9.2)	73.7 (9.3)

The average BMI of males was 24.9 kg/m^2 which was within normal ranges. Females' body mass index was 25.0 kg/m^2 which was progressing towards obesity. There was no significant difference between male and female blood pressure including waist – hip ratio. The standard deviation of weight was widely dispersed and centrally located at 60.4% and 60.8% for males and females respectively. Height was closely concentrated within the distribution curve and the standard deviation was 0.1.

4.4 Knowledge Level of Study Participants on Risk Factors for DT2

Table 4.3 below outlines the findings of study participants' knowledge level on DT2, signs, complications and risk factors. Approximately 32% (n=47) responded to diabetes being a chronic illness. 29% (n=42) had knowledge on diabetes being characterized by high blood sugar levels. The study participants' knowledge on signs of diabetes was as follows, frequent thirsty 46% (n=66), weight gain or loss was 40% (n=54), frequent urination 36% (n=53), frequent hunger 35% (n=52, and 14.2% (n= 21) of study participants who had family history of disease exhibited a higher knowledge level than those who had no familial history on diabetes.

Complications of diabetes were least known by study participants. 40% (n=59) had knowledge about ulcers and wounds which do not heal easily as a complication of diabetes, 14% (n=20) had knowledge on gradual loss of vision. 18% (n=27) on kidney disease as complications of diabetes. The participants' knowledge level on risk

factors overally were; Age 75% (n=110); Family history 84% (n=123). Unhealthy diet 60% (n=88); Obesity 54% (n=80); Sedentary lifestyle 30% (n=44); Smoking 18% (n=26) Gestational diabetes 14% (n=20);

Table 4.3 below illustrates these findings.

Table 4.3. Knowledge Level on Signs, Complications and Risk Factors for T2D

Variable	Response	
	Yes n (%)	No n (%)
Diabetes is a chronic illness	47 (32)	100 (68)
Type 2 Diabetes can be prevented	52 (35)	95 (66)
Diabetes is associated with high levels of sugar in the	42 (29)	105 (71)
Balanced diet, physical activity can reduce incidence of	47 (32)	100 (68)
Diabetes is characterized by the following signs:		
Weight loss/gain	54 (40)	88 (60)
Frequent urination	53 (36)	94 (64)
Frequent Hunger	52 (35)	95 (65)
Complications of Diabetes:		
Ulcers/ Wounds which do not heal easily	59 (40)	88 (60)
Amputation of Limbs	89 (60)	58 (40)
Kidney Disease	27 (18)	120 (82)
Risk factors for diabetes:		
Unhealthy diet	88 (60)	59 (40)
Sedentary life	44 (30)	103 (70)
Smoking	25 (17)	122 (83)
Obesity	80 (54)	67 (46)
Age above 45	110 (75)	37 (25)
Family History	123 (84)	24 (16)
Gestational Diabetes	20 (14)	127 (86)

4.5 Healthy Lifestyle of Study Participants

In order to further explore the study participants knowledge on risk factors for DT2, their habits towards healthy eating and physical activity behavior was assessed. Daily physical activity was assessed for a 5-day period. Chi Square was used to find out if there was an association between their healthy lifestyle and their knowledge on risk factors for DT2. Figures and tables below gives a summary of these dynamics.

Figure 4.3 below gives an outline of number of meals consumed by study participants per day. Majority of the participants 73% (n=107) had two meals per day which was mainly breakfast and supper. 22.4% (n=33) consumed all 3 meals daily, 4.6% (n=7) skipped two meals and managed to have only supper per day.

Figure 4.2 shows the distribution curve of participants' meal frequency per day.

Population Mean(μ)

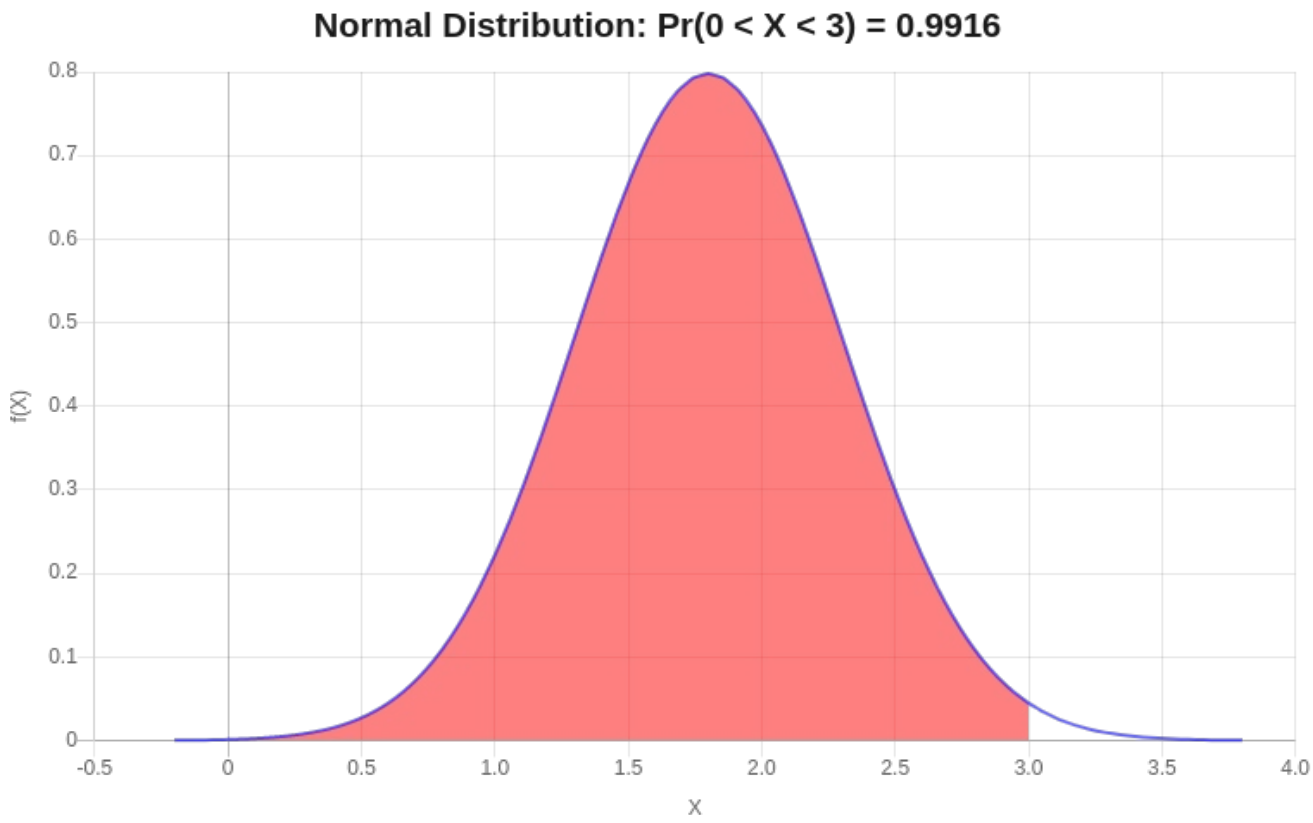

Figure 4.2: Meal Frequency

Figure 4.3 below gives an outline of study participants' healthy eating habits. All study participants ate meat, cereals and starches. Majority of the participants 98% (n=144) had a good flavor of fizzy and syrupy drinks. 78.2% (n=115) consumed fatty food, while 2% (n=3) resisted fatty food and 21.8% (n=32) resisted sugary foods

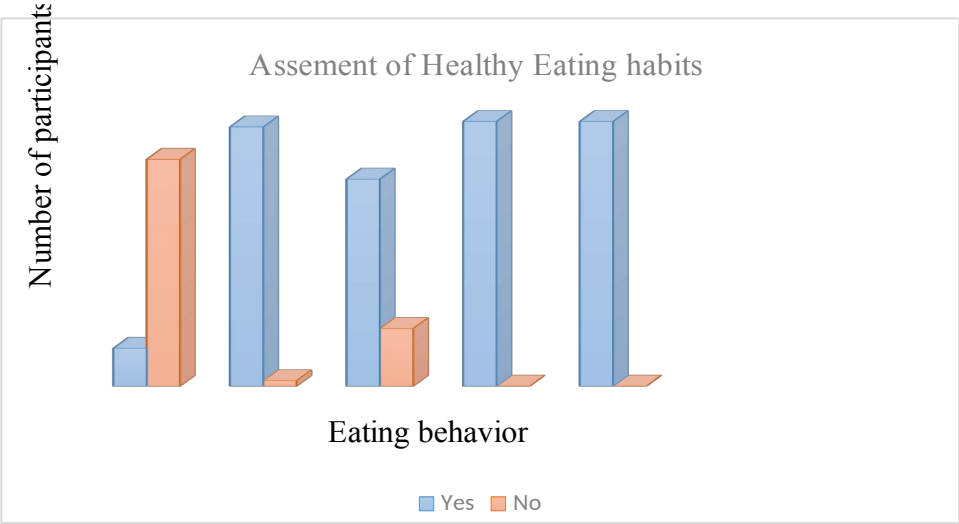

Figure 4.3: Healthy eating Behavior

Figure 4.4 below outlines participants' behavior on consumption of raw and cooked vegetables in a 5 day period.

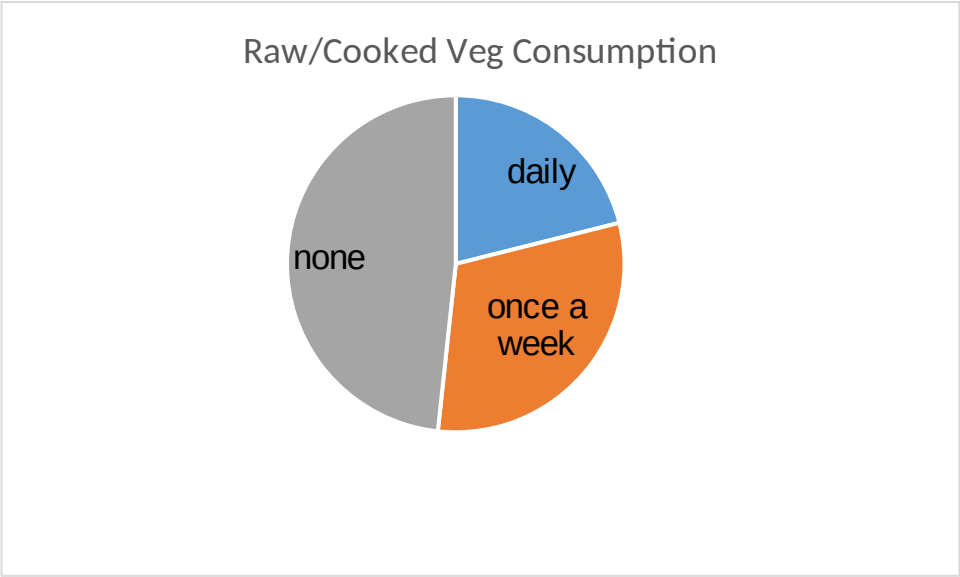

Figure 4.4: Vegetable consumption behavior

Figure 4.4 above illustrates study participants' assessment on vegetable consumption behavior. Majority of the study participants 48% (n=71) did not include both raw and cooked vegetables in their diet. 21% (n=31) ate raw or cooked vegetables for at least 5 days a week. 31% (n=46) ate vegetables once a week. The types of vegetables included lettuce, carrots, cucumbers, peppers, rape, covo or cabbage.

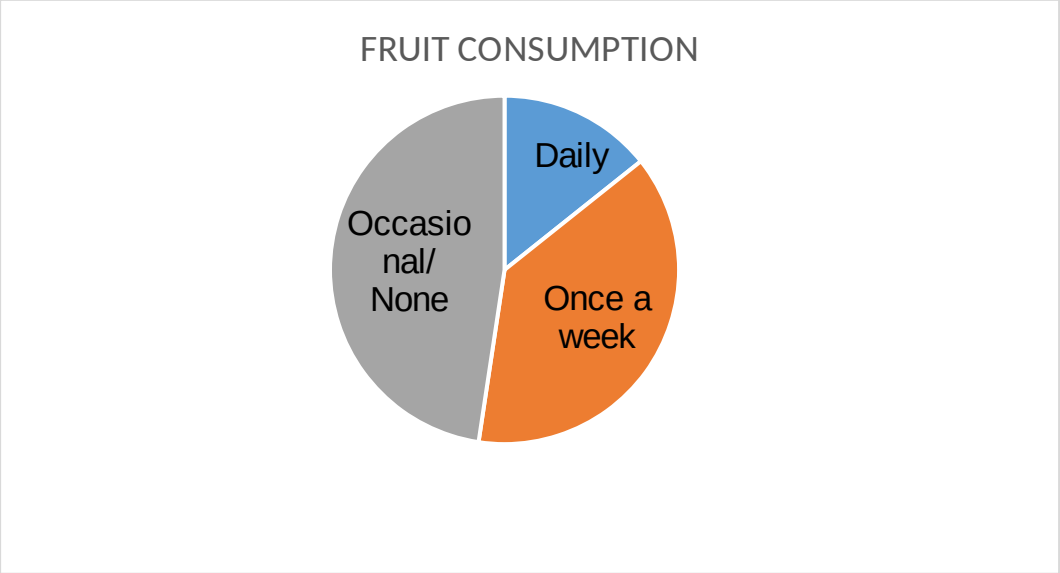

Figure 4.5: Fruits consumption behavior

Figure 4.5 above shows assessment of study participants' daily fruit consumption behavior. 48% (n=70) occasionally or did not eat any form of fruits in a 5 day period. 38% (n=56) included fruits in their diets at least once a week and 14% (n=21) systematically consumed fruits on a daily basis for a period of 5 days a week. The types

of fruits which were regularly consumed included bananas, oranges, apples, guavas, mangoes and local fruits such as nyii and masau when they were in season.

Table 4.4 Study Participants' Physical Activity Behavior

	Frequency (days)					
	Moderate PA			Hard PA		
	5-7	2-3	0-1	5-7	2-3	0-1
Males	18	32	11	16	29	16
Females	14	21	51	7	19	60

Table 4.4 above shows study participants' physical activity behaviour. 42.2% (n=62) had no set routine exercise, with this category being predominantly dominated by females. 21.7% (n=32) of the study participants practised systematically. Overally, more males 55.7% (n=34) had physical activity for at least 5 days a week for at least 30 minutes than female participants.

Table4.5. Programmes which promote Behavior Change

Variable	Yes %	No %
State of art university clinic	146 (99.3)	1 (0.68)
Use of colourful educational leaflets	142 (96.6)	5 (3.4)
Youth friendly health care team	147 (100)	0.0 (0%)
Health corner of university website	146(99.3)	1 (0.68)
Nutrition education and cooking clubs	133(90.5)	14 (9.5)
On campus health and wellness activities	132 (89.8)	15(10.2)
Inclusion of non-examinable health education on NCDs	120 (81.6)	27 (18.4)
Inclusion of sports and physical activity time in university curricular	140 (95.2)	7 (4.8)
State of art sports and gym facilities in universities	147 (100)	0.0 (0%)
Billboards on health promotion on campus	144 (97.9)	3 (2.1)
WhatsApp messages on health promotion of NCDS	126 (85.7)	21 (14.3)

Table 4.5 above illustrates programmes which study participants explored as of assistance to their understanding of DT2 and change of behavior. Overally 99.3% (n=146) of study participants agreed on having state of art health facilities with adequate resources in Universities. 100% (n=147) strongly agreed on having youth friendly health care team for health services. 96.6% (n=142) indicated the importance of colorful IEC material in different font for health promotion on DT2. 95.2% (n=140) strongly agreed on the need for sport time in university curricular for promotion of physical activity and reduction of NCDs. 100% (n=147) agreed on the importance of having modern sports facilities recreational infrastructure.

4.6 Association of Physical Activity and Socio-Demographic Variables

Table 4.4 below illustrates Univariate and multivariate analysis of study participants' socio-demographic data against BMI and BP measurement using Epi info. At OR 1.2, 95% confidence interval (0.6-2.5) P Value > 0.006 there was no statistical significance between age and BMI. Females were statistically obese than males at OR 1.3 95% confidence interval (0.6-2.4) P value > 0.005. A marked statistical significance between age and blood pressure was noted at OR 1.7 95% confidence interval (0.4-7.3) P value > 0.005 thus blood pressure is statistically dependent on age. Family history on diabetes was statistically significant to abnormal blood pressure at OR 0.5 95% confidence interval (0.1-2.5) P value > 0.004.

Before the information was utilized to foster a model, which foresee the issues related to knowledge on risks for T2D amongst study participants, as estimated by age, diet, fitness, gender, BMI and family history, the researcher tested the factors of the investigation for multicellularity. The outcomes demonstrated that all the demographic variables endured no collinearity issues as shown by less relationships among the factors. The connection between BMI and gender had little bearing on the outcome of the experiment so does gender and diet, as these have other factors to be accounted for, example people who are conscious about their diet maintain a healthy BMI.

Table 4.6 Association of Physical Activity and blood pressure

Variable	Characteristic	**Abnormal BMI**	**Normal BMI**	Odds Ratio 95% CI	p-value
Age (years)	≤20	17	23	1.2 (0.6-2.5)	0.006
	>20	41	66		
Marital status	Single	51	77	1.0 (0.4-2.9)	0.009
	Married	7	11		
Gender	Male	26	35	1.3 (0.6-2.4)	0.005
	Female	32	54		
Family history of DM	No	49	77	0.8 (0.3-2.2)	0.007
	Yes	9	12		
		Abnormal BP	**Normal BP**		
Age (years)	≤20	3	37	1.7 (0.4-7.3)	0.005
	>20	5	102		
Marital status	Single	6	122	0.4 (0.1-2.1)	0.003
	Married	2	16		
Gender	Male	4	57	1.4 (0.3-6.0)	0.006
	Female	4	82		
Family History of DM	No	6	120	0.5 (0.1-2.5)	0.004
	Yes	2	19		

Table 4.7. Association of Physical activity and Socio-demographic characteristics

Variable	Characteristic	Moderate physical activity (except walking)		Odds ratio (95% CI)	p-value
		No	Yes		
Age	≤20	23	17	0.6	0.001

				(0.3-1.2)	
	>20	76	31		
Marital status	Single	87	41	1.1 (0.4-3.0)	0.009
	Married	12	67		
Gender	Male	39	22	0.8 (0.4-1.5)	0.009
	Female	60	26		
Family history of DM	No	86	40	1.3 (0.5-3.4)	0.005
	Yes	13	8		
Residence	College resident	90	44	1.1 (0.3-1.2)	0.009
	Non resident	9	4		
		Vigorous physical activity			
Age	≤20	31	9	0.9 (0.4-2.1)	0.008
	>20	85	22		
Marital status	Single	103	25	2.1 (0.7-6.0)	0.002
	Married	12	6		
Gender	Male	44	17	0.5 (0.2-1.1)	0.009
	Female	72	14		
Family history of DM	No	100	26	1.2 (0.4-3.6)	0.007
	Yes	16	5		
Residence	College Resident	105	29	1.5 (0.3-7.2)	0.003
	Non resident	11	2		

The statistical analysis of socio-demographics against physical activity showed that there was statistically inconsistence in physical activity across the socio-demographic characteristics. Those aged > 20 years engaged more in moderate physical activity at OR 0.6, 95% confidence interval (0.3-1.2) P value > 0.001 than those below 20 years of age.

Those who had family history of diabetes statistically engaged in moderate physical activity at OR 1.3, 95% confidence interval (0.5-3.4) P value >0.005 than those who had no family history on diabetes. However, family history had no statistical significance on

vigorous activity compared to moderate physical activity at OR 1.3 95% CI 0.5-7.4 P Value > 0.005.

Increased vigorous physical activity was strongly significant to college resident at OR 0.3, 95% CI 0.-7.2) P value > 0.003. Marital status had also a strong significant bearing on vigorous physical activity where the singles engaged more in vigorous activity than those married at OR 2.1 95% confidence interval (0.7-6.0) P value > 0.002. On gender more males significantly engaged in vigorous physical activity than females at OR 0.5, 95% CI 0.2-1.1 P value > 0.009.

4.7. Chapter Summary

In this chapter the researcher analyzed and presented data in tables and graphs focusing on knowledge of university students' risk for diabetes type 2. A total of 147 students, 61 males and 86 females were enrolled into the study. Basic descriptive statistics, including mean values standard deviations were calculated. Chi-square analysis for association were analyzed. In order to further assess university students' knowledge on risk factors for DT2, association between their healthy lifestyles and physical activities were also assessed in relation to their understanding of risk factors for DT2. Statistical analysis was carried out using Epi Info version 7.0. The study protocol was approved by AUREC and permission to carry out the study was approved by HIT. All participants gave a written consent to participate in the study.

All across both sexes knowledge on diabetes was limited. Physical inactivity and poor healthy eating habits were the most common isolated risk factors for DT2. There was a distinct pattern across all levels on healthy lifestyle behavior with more males engaging in regular physical activity than females P value > 0.09. College residents engaged in more physical activity than non-resident participants OR 1.5 95% CI 0.3-7.2P value >0.003.

Both sexes had low fruits and vegetables consumption and a high affinity for sugary and fat foods. Meal skipping was noted to be prevalent. Majority of the respondents 73% (n=107) did not manage to have all three basic meals a day due to socio-economic factors. Available literature cites these risk factors as high on the list of predisposing factors for DT2.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introductions

In this chapter, the researcher outlined the summary of the study findings and processes. The researcher further discussed on whether the study objectives were met. Recommendations on how best university students can be made to understand DT2 and ensure positive behavior change were furnished to the organization and policy makers, conclusions drawn. Areas for further study were outlined and recommendations done.

5.2 Discussions

5.2.1 Knowledge on risk factors for Diabetes Type 2

Knowledge on risk factors for DT2 were assessed using different variables namely definition, signs, complications and risk factors for T2D according to American Diabetic Association guidelines. These variables formed participants' general knowledge of DT2. The general findings revealed that approximately 32% (n=47) responded to diabetes being a chronic illness. 29% (n=42) of study participants scored on diabetes being characterized by high blood sugar levels. The study also found that study participants' healthy lifestyles were not consistently related to fixed demographic variables. There was indifference on study participants general knowledge on signs of diabetes with the

following; weight gain or loss was 40% (n=54), frequent urination 36% (n=53), frequent hunger 35% (n=52, and frequent thirsty 46% (n=66). It was also noted that family history had influence on participants' knowledge of diabetes. Those who had family history on diabetes exhibited more knowledge level on diabetes symptoms and complications than those who had no family history on diabetes. This could have been that those who had more knowledge had lived with members who had been diagnosed diabetes.

In a similar study in Malaysia, knowledge level was above 64% among university students and less knowledge level was noted on risk factors such as aging and pregnancy (Woo et al., 2018) The study findings in Malaysia were almost similar to the findings of this study where low knowledge levels were noted in gestational diabetes and smoking as risk factors for diabetes.

In a similar study in Nigeria a sample of civil servants recounted poor knowledge level on signs of diabetes (Kyari et al., 2014). In Saudi Arabia also poor knowledge on risk factors, complications and management of DT2 was reported (Alanazi et al., 2018). In Pakistan 41% of students revealed low knowledge level on risk factors (Al- Sarayra & Khalidi, 2012). The need for public education was recommended (Afshin et al., 2019; Carracher et al., 2018).

In a study at Jordan university the fourth year students were more educated about diabetes than the first years signifying the positive impact of higher and tertiary education on diabetes (Al-Sarayra & Khalidi, 2012). However, in this study knowledge

level related to level of education among study participants was insignificant. This could be due to that many of the study participants were studying engineering and industrial manufacturing programs which do not include any health science or social science health related programs in their curricular. The general findings of this study suggest that there is need for more educational programs on diabetes in order to increase knowledge level on risk factors and improve healthy lifestyles and reduce incidence of DT2 in tertiary institutions.

Knowledge gaps were noted in areas such as gestational diabetes, smoking and physical inactivity which scored low indicating poor knowledge level in those extents. Our study findings on knowledge of risk factors among university students were similar to various studies conducted by different researchers. For example in a study by Mufunda and Makuyana (2015) on obesity, knowledge gaps were noted on risk factors for DT2 such as low physical activity, unhealthy diet. In a similar studies conducted in Ghana among university students. Amankwah-Poku, (2019) found that there was relative low knowledge level on risk factors among many student population.

Demographic factors on family history, level of education, age, gender, marital status and healthy lifestyle have been associated with level of knowledge on risk factors, symptoms, and complications of diabetes. For example, in this study it was found that the singles significantly engaged in physical activity than those who were married at 95% CI 0.7-6.0 P value > 0.001. More males engaged in moderate and vigorous physical activity than female at 95% CI 0.2-1.1 P value > 0.009. Being a college resident was

associated with high physical activity than non-college residence at 95% CI 0.3-7.2 P value >0.003. This was similar to studies by Amuta (2016) in Southern USA where males had a more positive behavior in vigorous physical activity.

5.2.2 Health lifestyles

An upsurge in prevalence of obesity has been reported due to rise in socio-economic status, urbanization, low physical activity in Botswana, Namibia and Zimbabwe (Mutowo et al., 2014). In this study females were more progressing towards overweight with a BMI of 25kg/m^2 compared to males who had normal BMI (18 -24.9kg/m^2. Studies have found that 70% of college students tend to gain their weight during their first years (Mongiello et al., 2016). In a similar study the Ghanaians students rated larger body sizes as exceptional for both female and males (Amankwah-Poku, 2019). In many African countries larger body size are considered as an indication of affluence, good living, respect and happiness for both men and women (Obirikorang et al., 2016).

Nonetheless opinions about obesity vary from country to country. Black African society views that physical activity is only for man and if women engage in vigorous physical activity they will not be able to bear children (Medagama et al., 2018). In some black African society slimness is associated with HIV or poverty. Therefore cultural beliefs have a significant role in perception on physical activity and healthy lifestyle. It has been

reported that appropriate perception about one's own weight is necessary for improved weight control (Deepa et al., 2014). Consequently, obesity is a major risk for diabetes, infertility and arthritis. It is important to plan public health policies aimed at controlling and preventing diabetes.

Consumption of SSB was statistically significant risk factor for DT2 at 95% CI 2.34; 3.21 P value > 0.001. A consistent fruit diet, vegetables, whole grains and unprocessed sugars are significant to healthy eating. The findings of this study on fruit consumption were 14% (n=21) consumed fruits like bananas, oranges and local fruits. 21% (n=31) consumed cooked vegetables raw. 38% (n=56) raw vegetables. These findings were much lower than related studies conducted among Chinese medical students where 45.2% were reported eating fruits and 47.9 consuming vegetables (Afshin et al., 2019). This shows inadequate fruit and vegetable consumption for effective prevention of DT2 in both studies. Education should be tailored at health benefits of fruits and vegetables in reduction of DT2.

Skipping of meals and snacking was prevalent in this study. 22.4% (n=33) managed to have all three meals a day and 72.8% (n=107) consumed breakfast and supper while 4.7% (n=7) consumed only supper. High consumption of breakfast in this study was attributed to that accommodation fees include breakfast thus all resident students have pre-paid breakfast compared to non-resident students.

The findings of this study revealed that consumption of breakfast was much higher than those of a similar study conducted in Malaysia where 32% students reported consuming

breakfast (Isa & Masuri, 2011). However the study findings were almost similar to a study conducted in China were 81% of Chinese medical students reported consuming breakfast daily (Assari et al., 2014)). Studies by (Lachat et al., 2013) revealed that increasing frequency of meals particularly breakfast helps in reduction of weight and obesity in adults. In a study conducted in India Deepa et al., (2014)) found that breakfast has a clinical application in the treatment of binge eating disorder and obesity.

The findings on physical activity were that 35.7% males engaged in moderate to hard PA of 30 minutes daily for at least 5 days and 64.3% did not engage in any form of PA at all. Among females. 23.4% engaged in recommended PA of at least 30minutes 5 days a week. The activities ranged from zumba, jogging, brisk walking and organized sport participation.

In a study on PA assessment of young people Manyanga et al., (2016) found that in Zimbabwe about 75% of children and youths spend more than 2 hours a day of indolent. The most sedentary habit of children and youths is watching television in Zimbabwe, 23% engage in electronic games and 15% in watching TV. The same author also found that there were no standard comprehensive structures for promotion of physical activity in many universities. While there is little promotion on PA in universities there is also consensus on existing physical activity and recreational structures in universities. A study done in New Zealand and Australia recommend aerobic and resistant training in addition to diet modification in prevention of DT2 (Aguiar et al., 2014).

However in LMICs including Zimbabwe there are no guidelines on minimal requirements of recreational structures in universities. A lot of disparities have been noted which shows lack of promotion of PA in tertiary institutions. The findings of this study revealed that physical inactivity is prevalent in universities. This is disturbing given that 64.3% did not exercise and 39.6% did not consume any form of vegetables. This suggest the participants had limited knowledge on risk factors for DT2.

5.2.3 Programs of Health Education which may increase knowledge on DT2

Consistent with several authors regarding content of messages and graphic design 82.8% participants suggested that colorful messages with different font would grab young people's attention rather than black and white. Similar to the work of Attridge et al (2014; Lachat et al (2013) messages targeting young people should be colorful and designed with both positive affect and fear appeals in order to effect meaningful change. 95% of study participants indicated that education on diabetes is necessary. 92.5% also specified that they would want a person to report to in the event that they develop symptoms relating to diabetes. 92% of study participants indicated that they would like youth friendly health care team and spacious clinics with various literature and videos screens on diabetes and other NCDs.

The issue of standard health facilities in many universities is a national challenge. Many health facility in most universities are not large enough to meet youth friendly services. While many universities prioritize academic programmes compared to health and life

skills, university clinics are not adequately staffed in Zimbabwe. The staff may thus be overwhelmed to meet comprehensive health promotion and education programs in addition to curative services.

5.3 Limitation

While there are numerous universities in Zimbabwe with different cultures and practices, these could not be included in this study because of time and limited funding.

5.4 Conclusions

From the study findings, it can be concluded that there is significant inadequate knowledge for DT2 among students in tertiary institutions. The study also found that physical inactivity and unhealthy diets was prevalent in universities. It was also found that the programs of health promotions suggested by study participants were evident that there was lack of standardized health promotion and education in universities. It is therefore important to plan public health interventions on a larger scale aimed at reducing the growing incidence of DT2 in institutions of higher learning.

5.5 Recommendations

The researcher recommends that the health care staff at HIT prioritize heath education on DT2 and be integrated in daily care and management of diseases.

Considering high levels of inadequate knowledge on risk factors for DT2 the researcher recommend that the health staff increase frequency of health and wellness programmes so that they reach out many students in particular those who do not frequently visit the clinic.

In view of high incidence of inactivity the researcher recommend that a memorandum of agreement (MOU) between Harare Institute of Technology and Belvedere Technical Teachers College for hiring of sporting grounds in order to promote physical activity and reduce risk for DT2.

The researcher also recommends inclusion of physical activity time and health education on DT2 and other non-communicable diseases in university curricular in order to increase knowledge and prevent DT2.

It may be worthwhile for further research to assess and evaluate on availability of comprehensive structures on physical activities and health facilities in universities.

5.6 Dissemination of the Results

The study findings were shared with the HIT health care team and HIT directorate. The results were disseminated to study participants fourth week after data analysis.

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APPENDIX A - Informed Consent English Version

Good morning/ afternoon.

My name is Joan Mashoko a student at Africa University. I am carrying out a study on Evaluation of knowledge level, risk factors and perceptions on type 2 diabetes among university students of Harare Institute of Technology. This form gives information about the study and will be used to document your willingness to participate in the study.

Purpose the Study

The purpose of the study is to assess knowledge level and risk factors for diabetes among university students and to identify health preventive messages and programmes that will motivate university student to live healthy lifestyles and prevent or delay manifestation of type 2 diabetes.

Benefits, Risk and Discomforts

There are no direct benefits for participating in this study. Finding from this study will be used in designing and improving type 2 diabetes prevention programmes by parent ministries such as Ministry of Health and Child Care, Ministry of Sports Culture and Recreation and Ministry of Higher and Tertiary Education.

Risk of participating in this study are minimal. However it may be possible that you may feel uncomfortable with some of the questions you may be asked. You may choose to skip them or to discontinue the interview process. This will not disadvantage your care at this health facility.

Duration and Procedure

A total of 147 students will be enrolled in this study, should you agree to take part in this study you will undergo a face to face interview for 15 to 20 minutes while completing this form. You will also be asked to sanitize your hands with an alcohol based sanitizer or wash your hand with soap and running water, wear a face mask and maintain social distance in relation to COVID19 regulations throughout the interview process.

Confidentiality

Confidentiality will be maintained throughout the study. No name will appear on the questionnaire. Numbers will be assigned to each questionnaire for coding purposes. Any information obtained in connection with this study will not be linked with participants. The interviews will be conducted in private rooms. Participants who choose to withdraw from the study will be allowed to do so. Assurance will be given that their health care will not be compromised due to their decision. Your name will not be used in any report or publication that may arise from this study. After the study the questionnaires will be stored in a lock and key cabinet and data stored in password protected computer files.

Additional costs

There will be no additional cost for you because of participating in this study save for the time spent while participating in this study.

Voluntary Participation

Participation in this study is purely voluntary, if you decide to withdraw from this study your decision to withdraw will not affect your future health care services in any manner. If you decide to participate you are free to withdraw your consent and stop participating any time without any charges or penalties.

If you have any queries about this research study you can contact Dr. E Mugomeri research supervisor on the following numbers 0776 167 964.

If you have concerns and complains regarding how the research is being conducted you can contact Africa University Research Committee on the following numbers: - +263 20 60024 or +263 20 60065 or email to aurec@africau.edu

Authorization

Before signing this consent form please ask any question on any aspect of this study that is unclear to you. You may take as much time to think about it. Signing this form indicates that l have read and understand the purpose of this study. My participation is purely voluntary. Data collected will be used for the purpose of this study. By signing below l indicate my approval.

Signature of participants …….

Name of person obtaining this consent……

Date ……

APPENDIX B - Statement by the Researcher

I confirm that the participant was given an opportunity to ask question in regard to the study. All questions asked by the participant have been answered according to the best of my ability.

I confirm that the participant has not been coerced into giving consent and the consent has been given freely and voluntarily. A copy of this consent has been provided to the participant.

Name of Researcher: Joan Mashoko.

Signature: Date: 11/11/2021

APPENDIX C:-Questionnaire: English Version

Assessment of University Students' Knowledge of Risk Factors for Diabetes Type 2 at Harare Institute of Technology, Zimbabwe, 2021

Date _____

Questionnaire Number	

Harare Institute of Technology students aged 18- 30 years

SECTION ONE

Qn. 1 Demographic Characteristics

No	Question	Response	Instruction
1.	GPS coordinates		
i.	Date of birth	___/____/____ (DD/MM/YY)	
ii.	Physical address of respondent	_____	
iii.	Institute resident	Yes [ ] No [ ]	
Iv	Age range years	18-20 [ ] 21 -25 [ ] 26- 30 [ ]	***Please tick in***

			appropriate
v.	Please select category that best describes you	Male [ ] Female [ ]	
Vi	Marital status	[ ] Single Married [ ]	
vii.	What's your religion	Christian [ ] Moslem [ ] Other……..	
viii.	Level of study Level 1 Level 2 Level 3 Level 4	 1 [ ] 2 [ ] 3 [ ] 4 [ ]	
ix.	Smoking history	Current smoker [ ] Non-smoker [ ] Last smoked 4 weeks ago [ ]	
x.	Family history on diabetes	Yes [ ] No [ ]	
xi	If yes indicate type of family members with diabetes	Nuclear [ ] Extended [ ]	
xii	Have you heard any information on diabetes before	Yes [ ] No [ ]	
xiii.	Source of information where you learnt about diabetes type 2	Parents [ ] peers [ ] school teacher [ ] social media/ peers [ ] health	

		facility [ ]	
xiv.	Are you Maintaining healthy diet	Yes {] No [ ]	
xv.	Do you Engaging in WHO physical activities	Yes [ ] No [ ]	

SECTION TWO

Q2. Information to Assess Vital Signs

What are your vital signs	BP [ ] mmHg Weight [ ] kg Height [ ] cm Waist circumference [ ] cm Hip circumference [ ] cm	

SECTION THREE

Qn. 3. Information to Access Knowledge Level on Diabetes Type 2

a.) What do you know about diabetes type 2?

	Response	
Variable	Yes	No
Diabetes type 2 is a chronic disease		
Diabetes type 2 is a preventable condition		
Diabetes type 2 is characterized by high levels of blood sugar due to deficiency in insulin secretion or insulin action		

b.). Please indicate how much you know about diabetes signs and symptoms

	Response	
Signs and Symptoms of diabetes include the following	Yes	No
Weight loss / gain		
Frequent urination		
Frequent hunger		
Frequent thirst		

b). Please indicate how much you know about complications of diabetes.

	Response	
Complications	Yes	No
Heart disease/ high BP		
Kidney Failure		
Foot ulcers which do not heal easily		
Eye disease/ poor eye sight		
Stroke		
Hypertension		
Limp amputation		
Others _____		

SECTION FOUR

Qn. 4. Information to Access Risk factors for Diabetes Type 2

	Yes	No
Lack of physical activity		
Unhealthy diet (junk food)		
Sedentary life		
High fat and sugar foods		

Smoking		
Age		
Sex		
Obesity		
Family history on diabetes		
Gestational diabetes		

SECTION FIVE

Qn. 5. Information to assess health lifestyle of study participants

Please tick if your daily diet constitutes the following

Food groups	Response					
	Yes	No	Daily	3days/ week	Once a week	Any other
Cereal and cereal products						
Meat and meat substitutes (legumes)						
Vegetables						
Fruits						
Dairy and dairy products						
Fats and oils						
Fizzy drinks/ sugary foods/ sweets/ chewing gums						
Fried fresh chips, potato crisps						

Qn.5b. Please indicate number of meals you consume per day

Number of meals	Yes	No	Type of meals

3 meals per day			
2 meals per day			
1 meal daily			

Qn.5c. What are the factors which influence the number of meals consumed per day?

Reason	Response
Meals are provided by the college daily	
I have adequate resources to afford all 3 meals	
I have no time to prepare food at home	
I do not have adequate money / food supplies to have more than 2 meals a day	
Do not have enough time to take more meals per day	
I want to lose weight	
I only eat when l feel hungry	
I prefer snacks than meals at home/ canteen	

5d.). Information to assess physical activity behavior

Variable			Frequency				
	1	2	3	4	5	6	7
During the last 7 days, on how many days did you do moderate physical activities like brisk walking, cycling at a regular pace, zumba or doubles tennis?							
During the last 7 days, on how many days did you do hard/ heavy physical activities the ones which made you to breathe harder/ faster e.g. jogging, digging , aerobics cycling							

Qn. 6. Information to assess knowledge on factors which prevent or reduce risk for diabetes type 2

Do the following factors help in prevention of diabetes type 2?

	Response				
Variable	Agree	Strongly agree	Neutral	Disagree	Strongly disagree
Regular exercise 30min at least 5 times a week					
Healthy diet					
Weight control					
Diet high in vegetables and fruits					
Quit smoking					
Regular blood sugar examination					

Regular BP examination					
Regular eye examination					

Qn. 7. Information to assess Barriers to Health lifestyle in Universities

Are the following factors prevent positive health lifestyle behavior

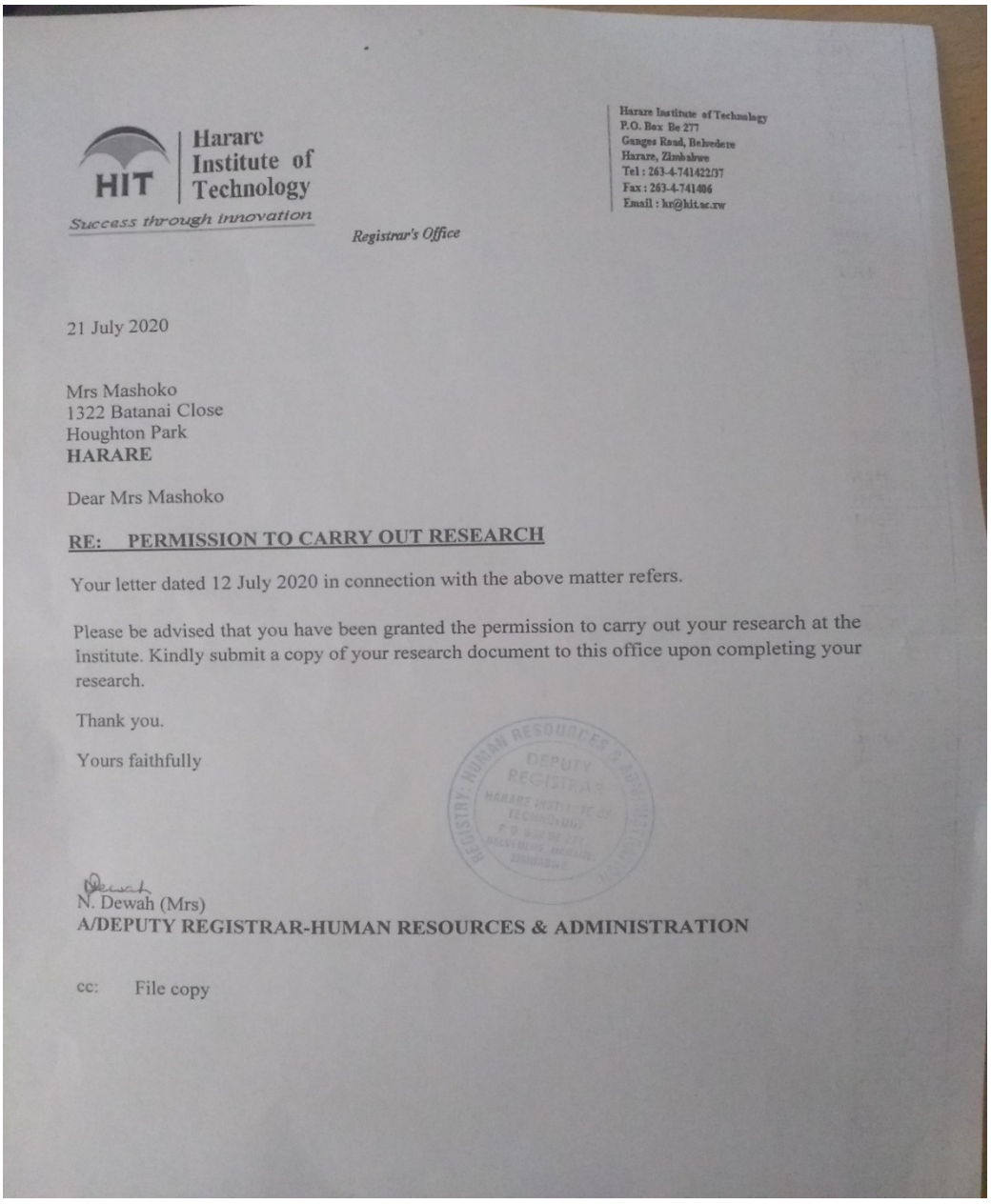
	Response				
Variable	Agree	Strongly agree	Neutral	Disagree	Strongly disagree
Inadequate sporting facilities					
Inadequate time to engage in sport activities					
Lack of inclusion of sport time in curricular					
Meals provided at institute canteen lack high vegetables and fruits content					
Lack of resources to buy fruits daily					
Inadequate health care facilities					
Inadequate comprehensive I.EC material on NCDs including DT2					
Inclusion of non-examinable Health education and health promotion on NCDs					

Qn.9. Information to assess programs which will motivate university students to understand diabetes type 2 and promote behavior change

What health preventive messages and programs do you think will help you understand type 2 diabetes and motivate you to live a healthy lifestyle?

Variable	Response				
	Agree	Strongly agree	Unsure	Disagree	Strongly disagree
Health corner on university website on health promotion programmes.					
Colorful leaflets and charts					
Youth friendly healthcare workers.					
Spacious and modern university health centers					
Health & wellness activity, expo and road shore on diet and exercises					
Nutrition education at universities					
Non examinable Inclusion of health education on NCD and communicable diseases in curricular					
Billboards at universities on healthy lifestyle					
WhatsApp messages on health information					
Inclusion of sports and physical activity time in curricular					
Provision of standard gym and sports facilities in all universities					

APPENDIX D: HIT Authorization Letter to Conduct the Study



HIT Harare Institute of Technology
Success through innovation

Registrar's Office

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21 July 2020

Mrs Mashoko
1322 Batanai Close
Houghton Park
HARARE

Dear Mrs Mashoko

RE: PERMISSION TO CARRY OUT RESEARCH

Your letter dated 12 July 2020 in connection with the above matter refers.

Please be advised that you have been granted the permission to carry out your research at the Institute. Kindly submit a copy of your research document to this office upon completing your research.

Thank you.

Yours faithfully

REGISTRY: HUMAN RESOURCES & ADMINISTRATION
DEPUTY REGISTRAR
HARARE INSTITUTE OF TECHNOLOGY
P. O. BOX BE 277, BELVEDERE, HARARE, ZIMBABWE

N. Dewah (Mrs)
A/DEPUTY REGISTRAR-HUMAN RESOURCES & ADMINISTRATION

cc: File copy