# THE ASSESSMENT OF THE DIABETES MELLITUS AMONG ADOLESCENT STUDENTS IN SECONDARY SCHOOLS WITHIN WESTLANDS DISTRICT

**BY**

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# DECLARATION

## DECLARATION BY THE CANDIDATE

I hereby declare this work to be mine and it is my original work submitted in partial fulfillment of the requirements for the award of a master degree in Public Health of Moi University. It has never been submitted in any academic or non academic institution for any award.

Rurengo Mbuthia Joe

Sign…… Date……

## DECLARATION BY THE SUPERVISORS

This research thesis has been submitted for examination with our approval as the university supervisors.

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## DEDICATION

This thesis is dedicated to my dear wife and son.

## ABSTRACT

**Background:** Non-Communicable Diseases (NCD's) have been an under estimated cause of poverty globally especially in developing countries. Among these NCD's, diabetes has become one of the leading health problems. This can be seen from its rising global prevalence from 171million in 2000 to 285million by 2010 and a projection of 483 million people by 2030. Reports by the World Health Organization (WHO) put the prevalence of diabetes in Africa at about 7million and an increase to about 18.2million by 2030. The goal of this study was to determine the knowledge on diabetes mellitus among adolescent students in Westlands district. Specifically, it established the knowledge of the adolescent students on risk factors associated with diabetes and diabetes management practices among the adolescent students.

**Methodology:** This was cross-sectional study that targeted 7800 students aged between 12 to 19 years. A sample of 271 students was sampled randomly using stratified random sampling technique. For each student selected was interviewed using a structured questionnaire administered by the researcher. The data collected was then entered using SPSS version 17.0 and analyzed using descriptive and inferential statistics.

**Result:** The findings showed that 34% of the students were diabetic. Most of the diabetic students were aged 16 years and above and weighed 57 kgs and above. Significant number of students (31.1%) was overweight and most of them came from well off families (78%). Among the risk factors investigated; stigma, knowledge level, family history were significantly associated with occurrence of diabetes mellitus among students while BMI, physical activities and nutritional behaviour were not. Very few, (29%) of the students sought for medical examinations as a management practice.

**Conclusion and Recommendations:** There are adolescent students with diabetes mellitus. In addition, very few students sought management practices. It was recommended that the Ministries of Health and Education should start increasing awareness and screening of the students for diabetes so that early management can be done.

# TABLE OF CONTENTS

## LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| ADA | American Diabetes Association |
| BMI | Body Mass Index |
| CDC | Center for Disease Control |
| DM | Diabetes Mellitus |
| DKA | Diabetic ketoacidosis |
| GDM | Gestational Diabetes Mellitus |
| IDF | International Diabetes Foundation |
| MDG | Millennium development Goals |
| MOH | Ministry of Health |
| NDS | National Diabetes Strategies |
| NIDDM | Non-Insulin Dependent Diabetes Mellitus |
| NCD’s | Non Communicable Diseases |
| PCOS | Polycystic ovarian syndrome |
| T1DM | Type 1 Diabetes Mellitus |
| T2DM | Type 2 Diabetes Mellitus |
| WHO | World Health Organization |
| WDF | World Diabetes foundation |

## DEFINITION OF OPERATION TERMS

**Morbidity** refers to the prevalence of a disease in a particular percentage of the population.

**Mortality** refers to the condition of being subject to death.

**Prevalence** is a statistical concept referring to the number of cases of a disease that are present in a particular population at a given time.

**Incidences** refer to the number of new cases that develop in a given period of time.

**Risk factors** refer to anything that increases a person's chances of developing a disease.

## ACKNOWLEDGEMENT

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Background information

In the current world health situation, one of the most rising causes of disability and death are the non-communicable diseases (NCD's). Reports by the World Health Organization (WHO), (2014) showed that in 2014 only, a high estimate of approximately 4.3 million people in the whole world died from diabetes related diseases only. In Africa diabetes related mortality accounted for 480,000 despite the high rate of unregistered disease related deaths (International Diabetes Foundation (IDF), (2014). In Kenya, reports by WHO (2011) indicated that diabetes Mellitus alone contributed up to 1.84% (5,483) of the total mortality in that year alone. Previous published annual status reports by the Ministry of Health (MOH) (2007) also conquer with this finding indicating that Diabetes Mellitus contributed to the top twenty causes of morbidity and mortality in Kenya.

The burden of NCD's has perpetuated poverty in many parts of the world leading to recurrent problems in dealing with the poverty levels in many developing countries. Some of the NCD's like diabetes have been estimated to reduce the Gross Domestic Product (GDP) by more than 5% in many low income-earning countries (WHO, 2012).

Currently worldwide, diabetes has become one of the leading health problems among the non-communicable diseases. IDF (2014), reports indicated the diabetes prevalence in the World by the year 2014 to stand at 387 million with a projection of 591 million people by 2035. This number had earlier been projected to rise from 171 million in

2000 to 285 million in 2010 with prevalence of diabetes being higher in men than women, despite having more women with diabetes than men.

Moreover, it is further indicated that there are more people with diabetes living in urban than in rural areas. According to the reports indicated in the IDF atlas, LMCs estimates put the number of people with diabetes in urban areas to be 123 million in 2014, compared to 80 million in rural areas. Projections however, place this discrepancy between 228 million people with diabetes in urban areas and 99 million in rural communities by 2030 (IDF, 2014).

The international diabetes foundation (IDF 2014) shows that about 77% of people with Diabetes Mellitus live in low income countries. In comparison to the global prevalence, the prevalence of diabetes Mellitus in Africa is about 22 million, among the lowest within the regions but with the highest percentage of undiagnosed cases (62.5%) and highest in diabetes related deaths of people under the age of 60years. Previous studies by the WHO (2010) indicated the sharp rise in the incidences rates of diabetes Mellitus reported cases all over the regions due to the changes in the lifestyles, economic climate and increased reporting/ diagnosis.

Reports from the Ministry of Health (2007a) Kenya, indicate that approximately 1.2 million Kenyans (3.3%) live with diabetes and under the current situation, the prevalence is expected to rise to 1.5 million (4.5%) by 2025. The studies also showed a prevalence of 4.2% in the general population with a prevalence rate of 2.2% in the rural areas and as high as 12.2% in urban areas. The prevalence of impaired glucose tolerance is equally high at 8.6% in the rural population and 13.2% in the urban population (MOH, 2007).

However, this is likely to be an underestimation since over 60% of people diagnosed with diabetes do not know they have the disease and are only diagnosed after they present themselves to the health care facilities with seemingly unrelated complaints (IDF, 2009).

The MOH reports (2007b) indicate that in about 53% of all hospital admissions in Nairobi are due to NCDs and diabetes contributes about 27.3% of the total. This scenario is alarming as the adult population in Kenya is developing diabetes at an average of 45-55 years as compared to the developing countries with an average age of 64 years (MOH, 2007b)

According to the WHO, in Africa diabetes as a metabolic disorder is found in a wide variety of atypical forms. For instance, a survey on the information published on diabetes mellitus in African populations used to show that juvenile diabetes mellitus is not rare in African countries contrary to the widely held belief which revealed that most groups included several children and a good number of teenagers (WHO, 2009). The few studies on chronic complications of diabetes in Africa have shown a high prevalence of acute and chronic complications (WHO, 2009). Other studies including those carried out by (Majaliwa, Munubhi & Kaushik, 2007) have also shown the difficulties in the management of diabetes in children leading to early complications of the disease. In adolescent, management of diabetes is harder due to changes in behavior and also stigma from the surrounding. Therefore due to this it has been indicated that Long-term complications are not long-term in Africa, due to the fact that children have been seen to develop complications as early as in pre-pubertal age (Majaliwa et al., 2007).

This has recently been noted in children or populations under 20 years. Earlier studies show that the most prevalent type of diabetes that was known to affect children was the Diabetes Mellitus Type 1 (T1DM) and only 1–2% of children were considered to have Diabetes Mellitus Type 2 (T2DM) or other rare forms of diabetes (American Diabetes Association, 2000). However, recent research indicates that 8–45% of children with newly diagnosed diabetes have non-immune-mediated diabetes but the majority has type 2 diabetes (ADA, 2000).

The prevalence of diabetes in the young by 2010 was estimated to be in thousands and having an annual increase of 3% (IDF, 2010). It is further estimated that annually some 76,000 children under 15 years develop type 1 diabetes worldwide. In this, the incidence rate in those aged between 0-14 years being 100,000 cases per year. Of the estimated 480,000 children with type 1 diabetes, 24% are seen to be coming from the South-East Asian Region, but the European Region, where the most reliable estimates of incidence are available, comes a close second (23%). Africa has been hard to rely on since the records are scanty and sometimes even unavailable. Type 2 diabetes in children and adolescents similarly have been noted to be on the increase in all countries, whether poor or rich. Thus, there is growing recognition that type 2 diabetes in the young is becoming a global public health issue with a potentially serious health outcome (IDF, 2009).

In line with these findings, a lot of research has been commissioned, in particular the Europe and Diabetes study 2000 (EURODIAB, 2000), about diabetes in children but still the disease remains elusive. However, among the different types of diabetes T1DM and T2DM, there is limited amount of information about the epidemiology of

diabetes T2DM in children. This is attributed mostly to the recent recognition of emergence or discovery of this condition (T2DM) in this group (IDF, 2009).

### 1.2 Problem Statement

Diabetes in Kenyan adolescent has been rapidly rising especially in urban areas, attracting the Ministry of Health, World Diabetes Foundation and other Non-Governmental Organizations (NGOs) with an aim to reduce the prevalence. Morbidity in many adolescent is attributed to both T1DM and T2DM at a very high rate. The prevalence of diabetes and its complications among young population leading to mortality have increased due to lack of information leading to missed diagnosis and poor disease management. Therefore due to this, more knowledge is required to ascertain the causes of this sudden increase in diabetes affecting the young population in urban areas and the existing management practices of the disease.

### 1.3 Research Objectives

The overall objective of this study was to assess the diabetes mellitus among adolescent students in secondary schools of Westlands district in Nairobi County. The following were the specific objectives.

- To establish the distribution of diabetes mellitus among adolescent students in Westlands district.
- To establish the knowledge of the students on the risk factors associated with diabetes mellitus in Westlands district.
- To establish the diabetes mellitus management practices among adolescent students in Westlands district.

## 1.4 Research Questions

- What is the diabetes mellitus distribution among adolescent students in Westlands district?
- Do the adolescent students know the risk factors associated with diabetes mellitus in Westlands district?
- Do the adolescent students with diabetes mellitus conduct management practices in Westlands district?

## 1.5. Justification of the study

Due to the rapid increase in the cases of diabetes in the Kenyan adolescent population and Africa as a whole, it is important to ascertain the prevalence of diabetes and the risk factors contributing to this increase. Previous studies carried out by (Edna et al., 2007) indicate that much of the available data in Sub-Saharan Africa is not population-based and is of limited value for making generalizations about Diabetes in adolescents. Consequently, there is great importance in studying these populations and the etiology of diabetes in them (Edna et al., 2007).

## 1.6. Significance of the study

The findings of this study will provide information to all stakeholders involved in prevention and control of diabetes mellitus in Kenya and other countries worldwide. This information on the general occurrence of diabetes mellitus among the adolescents which is an emerging group at risk will be key for Medical Practitioners and public health professionals addressing non communicable diseases issue. The study will also enhance understanding of the risk factors associated with diabetes mellitus among adolescent hence facilitating the prevention of the disease by adequately addressing those risk factors significantly associated with it.

The information from this study will be instrumental among the researchers focusing on preventing diabetes mellitus by contributing towards developing correlation studies that establish cause effect relationship between risk factors and disease among the adolescent and young age. The findings will be important for decisions making process by the government especially the Ministry of Health in charge of implementation of prevention policy on diabetes mellitus.

### 1.7. Limitation of the study

The research was limited to proportion of adolescent students with diabetes mellitus condition within the secondary schools. There was no blood sugar test carried to determine the actual students who had diabetes mellitus. The research got medical records from health teachers indicating students with diabetes mellitus. This data was not adequate to generate prevalence of diabetes mellitus among adolescent students.

### 1.8. Conceptual Framework

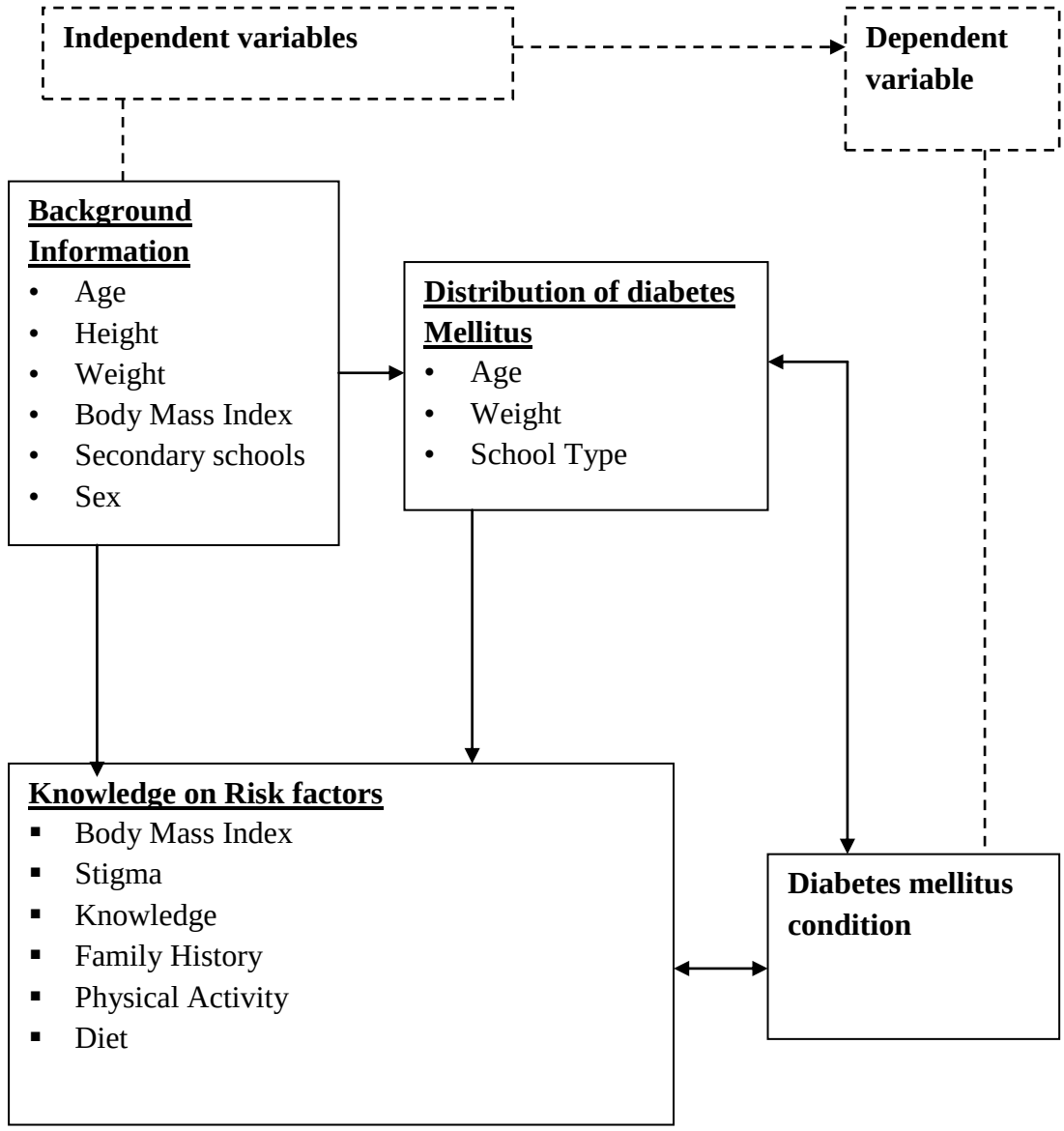


***Figure 1. 1. Conceptual on the Diabetes Mellitus among Adolescents***

***Source: Researcher, 2015***

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Types of Diabetes Mellitus

Diabetes Mellitus is a metabolism disorder in which an individual is diagnosed as having high blood sugar level due to the fact that their body cells do not properly respond to the insulin that is produced or as a result of the body not producing enough insulin. This is further known to be an effect majorly caused by defects in the pancreatic beta cells (Rother, 2007). In the human body it is medically known that glucose is the main source of energy for the body that is got from broken down foods. This glucose passes down through the blood stream after digestion and is absorbed by the cells and turned into energy and this absorption is facilitated by insulin (Rother, 2007).

There are three main types of diabetes classified according to the recent WHO standards. This classification incorporates defining diabetes basing on clinical descriptive criteria and complementary etiological classification (Rother, 2007). Using this classification, there are two general types of diabetes mellitus grouped according to their dependence on insulin; insulin dependent diabetes mellitus (IDDM) and non-insulin dependent (NIDDM) non-insulin requiring (WHO, 2009). The subgroups include;

- Type 1 diabetes (T1DM)
- Type 2 diabetes (T2DM)
- The other type of diabetes commonly known under this group is;
  - Gestational diabetes (GDM)

Worldwide, some of the known risk factors of diabetes include; Advancing age, family history, excessive body weight, excessive alcohol consumption, physical inactivity, stress, unhealthy diet, gestational diabetes mellitus, chronic use of steroids.

In Kenya presently, several risk factors are considered the driving forces of the rising prevalence of type 2 diabetes. These risk factors are majorly associated with urban settings and they include.

- Consumption of refined carbohydrates
- Consumption of high- fat diets
- Lack of physical activity associated with sedentary life style mostly influenced by technology i.e. reduction of physical exercises due to availability of motorized transport, watching computer or television for long hours (IDF, 2010).

Allaying these fears of increasing prevalence of diabetes, the National Diabetes Strategies (DNS) were formulated with an overall goal of preventing or delaying the development of diabetes and improvement of life of the diabetics in the Kenyan population (IDF, 2010). They comprises of eight main directives namely; advocacy, empowerment, resource mobilization and prioritization, capacity building, partnership and coordination, diabetes policies, legislation and regulations, research, monitoring and evaluation.

Type 1 diabetes (T1DM) also known as juvenile diabetes is a type of diabetes mellitus that is as a result of autoimmune destruction of beta cells of the pancreas which are responsible for producing insulin (Cooke & Plotnick, 2008). This then results to the production of little or no insulin for the body to enable it breakdown glucose effectively. Subsequently, this leads to increase in blood and urine glucose due to lack of breakdown of the available glucose in the body. Despite the limited

understanding of the main cause of T1DM there is belief that the disease is due to immunological conditions.

According to Edna et al., (2007) reports, Type 1 Diabetes Mellitus (T1DM) is a growing concern worldwide but while there has been a great improvement in the developed world in terms of the knowledge, epidemiology and management of this condition, there has been little or no improvement in sub-Saharan Africa. Due to this laxity and limited information, the true burden of diabetes disease is not even known. However, studies that have been carried out have shown the difference in the pattern and prevalence of T1DM in the sub-Saharan Africa compared to the western World seems to be present (Edna et al., 2007).

### 2.2. Epidemiology of Diabetes Mellitus

Diabetes is currently the leading health problem among the non-communicable diseases globally. Reports by the IDF put the global prevalence at 171million in 2000 and at 285million by 2010 (IDF, 2010). Recent statistics also, put the prevalence at about 185 million in 2010 with a projection of up to 366 million in 2030 with prevalence being higher in men than women, despite having more women with diabetes than men (IDF, 2010).

In young or populations under 20 years of age, rapid increase of incidence in diabetes cases have been reported in the recent years. Previous studies by the ADA (2000) showed that the most prevalent type of diabetes known to affect children is the T1DM diabetes and only 1–2% of children are considered to have T2DM diabetes or other rare forms of diabetes. However, recent statistics indicate that 8–45% of children with newly diagnosed diabetes have non-immune-mediated diabetes but the majority with T2DM (Wild, Gojka, Anders, Richard & King, 2004). The prevalence of diabetes

among Americans aged 12–19 years in earlier years, between 1988 and 1994 projected by (NHANES III) estimated the prevalence for all types of diabetes to be at 4.1 per 1,000 in this age-group. This high prevalence could be compared with a prevalence of one of the most common inherited disorders in United States of America children that is at 0.3 per 1,000 for cystic fibrosis.

The American Diabetes association (2000) indicated that, current medical cases on children with T2DM are usually diagnosed over the age of 10 years and are in middle to late puberty. Previously, it was usual that most of the time when a child was diagnosed with diabetes was assumed to be T1DM. However, in the last 20 years research has shown T2DM diabetes prevalence to be rapidly rising among children and adolescent. At the current rate of population increase in overweight children, T2DM may be expected to also increase in younger pre-pubertal children (Crosno, 2010).

In Africa, this might not be reflected highly as in the developed countries due to the difference in lifestyles and environment. Diabetes in adolescents and children in Africa has been poorly reported and there is very few published focused research done in the area. Previous published work by Swai et al (1993), in their study indicate that even with the few data available on sub-Saharan African children, diabetes incidence in Tanzania was estimated to be at 1.5/100,000, and an increase in incidence in Sudan from 9.5/100,000 in 1991 to 10.3/100,000 in 1995 was also reported. Moreover, in most of the series, prevalence was found to increase with increasing age. Studies that have been carried out in Africa confirm the particular increasing incidence pattern. Examples are the studies that were carried out in Algeria, Sudan, and Libya that showed increase in incidence in these countries over

the years in (Elamin A, Omer MI, Zein K, Tuvemo T., (1992).; Kadiki & Roaeid, 2000) and Bessaoud et al.,. 1990).

According to the world diabetes foundation, the prevalence of diabetes is apparently low in Africa due to the poor/ improper diagnosis that is often made in the health facilities and also due to lack of awareness (WDF 2007). Therefore due to this, many of the cases die without a diagnosis in an emergency department or at home. In Kenya, the prevalence of both type 1 and type 2 diabetes (T1DM, T2DM) are as high as the other developing countries in the world. However, T2DM also known as non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes which accounts for about 90 to 95 percent of all diagnosed cases of diabetes, is more prevalent than T1DM. Surveys by the DMI indicate high prevalence of DM as high as 11.6% in some rural parts of the country such as Nyeri in central Kenya and Kilifi in the coast province and above 20% among population in the major urban centers.

### 2.3. Risk factors for diabetes mellitus

#### 2.3.1. Diabetes Mellitus Type 1

Donner et al., (2007), indicate that some of the risk factors of T1DM include; Genetics: this is due to the fact that T1DM is a polygenic disease; the interaction of the various genes responsible can contribute to occurrence of this disease. More over it can be spread through generations from parents to their children.

Pathophysiology: this however is a theorized cause since the cause of this diabetes is not clearly known. In this, it is believed that this disease is a virally triggered autoimmune response where an individual’s immune system attacks virus infected cells along with the beta cells in the pancreas.

Type 1 diabetes mellitus cannot be physically manifested immediately and thus some of the indicator symptoms usually develop after a short period despite the fact that beta cell destruction begins years earlier. Unlike other diseases, T1DM can lapse into a life-threatening diabetic coma/ diabetic ketoacidosis (DKA) if not diagnosed and treated. Some of the symptoms of T1DM may include; constant hunger, increased thirst and urination, weight loss, blurred vision, and extreme fatigue (Rother, 2007).

### 2.3.2. Diabetes Mellitus Type 2

Type 2 diabetes (T2DM) also referred to as non -insulin-dependent diabetes mellitus (NIDDM) / adult-onset diabetes is known to be the most common form of diabetes in the world. The T2DM is mostly associated with; obesity, physical inactivity, older age (above 45 years), people with family history of diabetes, previous history of gestational diabetes, and certain ethnicities.

T2DM has been recognized to be frequent in youth populations of native North Americans to which, 30 percent of new cases of diabetes are largely associated with obesity. Studies carried out in Japan show that, T2DM is seven times more common than type 1 among the schoolchildren, and its incidence has increased more than 30 times over the past 20 years. This has been largely attributed to the changes in food patterns and increasing obesity rates.

Currently, children with T2DM are usually diagnosed over the age of 10 years and are in middle to late puberty. In children presenting with T2DM, studies have related the incidences to come more from families with history of T2DM, despite that the prevalence differs depending on the different races (Barrett-Connor et al., 2002). Other studies further indicate that the largest percentage of these children are overweight or obese and present with glycosuria without ketonuria, and little or no

weight loss. Other studies by (Barrett-Connor et al., 2002) also concur with these findings, according to them about 45–80% of patients have at least one parent with diabetes and may have a history of diabetes over several generations. Despite this being the case, diabetes in the patients' parent or other relative may go undetected until the child is diagnosed.

According to CDC (2014), individuals diagnosed with T2DM have their pancreas producing enough insulin, but the body cannot utilize the insulin effectively. They are said to be exhibiting insulin resistance but after some few years the production of insulin decreases.

Some of the known risk factors (causes) of T2DM include the following:

- Medical conditions; hypertension, elevated cholesterol, acromegaly, Cushing's syndrome, thyrotoxicosis, pheochromocytoma, chronic pancreatitis, cancer and drugs.
- Less active lifestyle; sedentary lifestyle has been known to be one of the leading causes of development of early diabetes in children/ adolescent (Legro, Kunselman, Dodson and Dunaif, 2005).
- Genetics; Studies have indicated in concurrence with other studies that diabetes in some adolescent and children has been transmitted to them from their parents and it runs through many generations. It has also been known that genetics is one of the biggest influences in the development of type 2 diabetes mellitus, hence making a person's family history a risk factor for patients (Barrett-Connor et al., 2002). Due to this, the risk of developing diabetes for a first-degree relative of a patient with T2DM is five to ten times higher than that of an age- and weight-matched subject without this family history (Barrett-Connor et al., 2002).

- Obesity; Obesity has a strong association with insulin resistance in normoglycemic persons and more so in T2DM individuals (www.cdc.gov). Other studies done in America by Ogden, Flegal,Carroll and Johnson (2002), indicated an increase in the development of diabetes as the age of the children increased. In these studies, the following figures were reported in the different age groups; 10.4% of children aged 2 to 5 years, 15.3% of children aged 6 to 11 years and 15.5% of adolescents and young adults aged 12 to 19 years.
- Medications e.g. corticosteroids - Cause peripheral insulin resistance and gluconeogensis, Phenothiazines - Inhibit insulin secretion, Protease Inhibitors - Inhibit the conversion of proinsulin to insulin, Beta-blockers - Inhibit insulin secretion etc.
- Pathophysiology; physiological conditions can also lead to development of diabetes. Examples include; increased hepatic glucose production, decreased insulin-mediated glucose transport in muscle and adipose tissues (receptor and post-receptor defects) and or impaired beta-cell function.
- Insulin resistance; insulin resistance has been documented as one of the risk factors for the development of T2DM in many individuals. Of this most of these conditions are diagnosed in women. According to a previous study done by Legro et al., (2005) women who suffered from conditions like Polycystic ovarian syndrome (PCOS) and acanthosis nigricans exhibited high numbers of insulin resistance. In his study involving 254 women with PCOS aged 14-19 exhibited a rate of 13% of glucose intolerance and about 30% to 32% of all PCOS participants had impaired glucose tolerance (Legro et al., 2005).

The symptoms of T2DM develop gradually and they include; fatigue, frequent urination, increased thirst and hunger, weight loss, blurred vision, and slow healing of

wounds or sores. Some people have no symptoms. Treatment of this condition includes lifestyle adjustments, self-care measures, and sometimes medications, in order to control blood sugar levels in the near-normal range and minimize the risk of diabetes-related complications (Rother, 2007).

The other type of diabetes commonly known to exist but does not affect children or < 20 is the gestational diabetes and has also been recognized to pose a danger in the current health life of mothers.

### 2.4. Stigma related to diabetes mellitus

According to Deacon, Stephney and Prosalendis (2006), stigma refers to 'value-based ideology that imposes moral judgements on others to affirm the in-group's safe and moral identity'. This concept of stigma as a fixed attribute, links individual to negative stereotypes towards conceptualizing stigma as an asymmetric social process that devalues relationships. Disease stigma also is seen as the 'negative social ''baggage'' associated with a disease that is not justified by the medical effects of disease on the human body'. (De-Graft Atkins, 2003).

Disease stigma develops due to its perception by individuals or the society as a chronic disease. According to (de-Graft Atkins, 2003) chronic illness causes bodily disruption and reshapes the sufferer's life circumstances and social relationships. Therefore, shattering assumptions about the integrity of one's body and physical capabilities and of one's identity and individuals have to (re) negotiate social roles and responsibilities. These conditions and disabilities become focal points around which self and societal perceptions, attitudes, emotions and responses revolve, and are reshaped (de-Graft Atkins, 2003). Due to this the diabetic is sometimes defined as a social handicap or associated with disability that tends to be more psychological.

Stigmatized diabetic patients are at increased risk of poor adherence and thus, of dangerously poor metabolic control. This means that these patients suffer increased risk of the progressive long-term complications of diabetes of which jeopardize the eyes, kidneys, and cardio-vascular system. In Asian countries the diabetic women than men experience stigma more. A study showed that inferior care to the woman was one of the major causes of the development of disease and also stigma. Also due to the social life style, type 1 diabetes is considered a social stigma for girls; many parents try to hide their daughter's condition from teachers, friends and relatives (Sanjay et al., 2009).

**2.5. Management of diabetes Mellitus**

The IDF in its global guidelines for diabetes mellitus type 2 concludes that 95 % of diabetes care is self managed by diabetics with the assistance of their families. This recognition is reflected in the current terminology of DSME (IDF, 2005). Diabetes self-management education (DSME) has been defined as the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. According to the ADA, the overall objectives of DSME are to support informed decision making, self-care behaviors, problem solving and active collaboration with the health care team and in addition to improve clinical outcomes, health status, and quality of life' (American Diabetes Association, 2007).

Diabetes self-management interventions include the instruction in skills such as weight management, physical exercise, medication management and blood glucose monitoring. Interventions meeting these requirements have been found to improve patterns of disease management and metabolic control among adults with type 2 diabetes (Fagot et al., 2000).

# CHAPTER THREE

# METHODOLOGY

## 3.1 Study Design

This study was a cross-sectional study aimed at determining knowledge on diabetes among adolescent students attending secondary schools in Westlands District of Nairobi County. The study involved the collection of information at particular point of time. It was also applicable because the occurrence of diabetes mellitus and risk factors associated with diabetes mellitus were established at the same time.

## 3.2 Study Area and Target Population

This study was conducted in the Westlands District of Nairobi County. It targeted 12 secondary schools with a total of 7800 students. The study population included adolescent students aged between 12 and 19 years in form 1 to 4 from both private and public schools which were both day and boarding.

**Table 3. 1.** ***Secondary schools in Nairobi West district***

| School | Number of students |
|---|---|
| Loreto Girls | 570 |
| Nairobi School | 1190 |
| Kangemi Day High School | 545 |
| Consolata | 450 |
| Arya Girls High school | 780 |
| Highbridge Secondary School | 480 |
| Lavington Mixed | 266 |
| State House Girls | 1100 |
| Kianda School | 350 |
| Hospital Hill | 674 |
| Kenya High | 1050 |
| St. Georges Girls | 345 |

***Source: DEO Report, 2009.***

### 3.3 Sample Size

A sample is a subset of the study population which has similar characteristics and must be drawn from the study population. To estimate the desired sample size for students, a formula of Cochran (1977) as shown below was used.

$n = z^2pq/d^2$

Where:

n = the desired sample size

z = the corresponding value confidence level of 95% in the normal distribution table.

P = the prevalence of the diabetes mellitus among adolescent age target population derived from the previous studies was 20 %( Legro et al., 2005).

Q = 1 – p

D = the sampling error. It is set at 0.05

Substituting for this would be;

$n = 1.96^2 \times 0.2 \times 0.8/0.05^2$

= 246 students + unresponsive rate of 10% of desired sample size.

= 271 students

### 3.4. Sampling procedure

Purposive sampling was used to sample Nairobi Westlands district from other districts in Nairobi County. The purposive sampling is whereby the sample subjects are selected based on variety of criteria determined by the researcher (Kothari, 2005). In this study, Nairobi West district was selected because it is a cosmopolitan district. Its population belongs to different social economic status ranging from low to high social economic status. Another reason for choosing this district is the fact that it has different types of secondary schools compared to other districts. The 12 secondary schools in Nairobi Westlands district were included in the study.

The study employed stratified sampling technique in selecting the adolescent students. Cochran (1977) stated that stratified sampling involves grouping of a study population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. In this study, sex of the adolescent students was used to classify the student's population into boys and girls in each of the sampled secondary school. A separate list of boys and girls was generated in each secondary school. Then random sampling was applied within the boys and girls subgroups to select each student until a desired number was reached in each school. A random sample from each stratum was taken in a proportionate to the stratum's size compared to the population (table 3.2). The selection process used random method to ensure that each respondent has equal chances of being selected.

**Table 3. 2.** ***Sample Distribution in Secondary Schools***

| School | Number of students | Sample size distribution |
|---|---|---|
| Loreto Girls | 570 | 20 |
| Nairobi School | 1190 | 41 |
| Kangemi Day High School | 545 | 19 |
| Consolata | 450 | 16 |
| Arya Girls High school | 780 | 27 |
| Highbridge Secondary School | 480 | 17 |
| Lavington Mixed | 266 | 9 |
| State House Girls | 1100 | 38 |
| Kianda School | 350 | 12 |
| Hospital Hill | 674 | 23 |
| Kenya High | 1050 | 36 |
| St. Georges Girls | 345 | 12 |
| **Totals** | **7800** | **271** |

**Source:** ***Source: DEO Report, 2009.***

### 3.5 Data Collection Procedure

Data was collected by the researcher from the selected students using structured questionnaire. The researcher sought formal consent from the schools' principals to go ahead with recruitment of students to participate in the study. Upon the official permission from the principal, the researcher was introduced to the teacher in charge of health in the school. The class teacher was also involved in selection of the respondents by producing the class list of the students and introducing the researcher to students in each class.

The selected students were given the introduction to the study and requested to participate voluntarily. Only the students who agreed to participate were interviewed by the researcher. During the interviews the students were left alone with the researcher to facilitate freedom for students to give information freely. In addition, the health teacher provided a list of diabetic students to the researcher.

A structured questionnaire was used. It contained questions on age, gender, weight and height, type of school, educational level and marital status of parents, diabetes, eating habits, family history of diabetes, and knowledge on diabetes mellitus, risk factors and awareness of management.

To measure the height (in metres) of the students, the researcher used the following procedures:

1. The student was asked to remove the shoes; bulky clothing, hair ornaments and that could interfere with the measurement.
2. Then, she/he stood against a straight wall on flat floor, with feet together. As they stood, the researcher ensured that the legs were straight, arms were at sides, and shoulders were level.

3. Then, the student was asked to look straight ahead and that the line of sight was parallel with the floor.
4. The researcher took the measurement while the student stood with head, shoulders, buttocks, and heels touching the flat surface (wall).
5. Using the flat headpiece to form a right angle with the wall and lower the headpiece until it firmly touches the crown of the head, the researcher used the metal tape to measure from the base on the floor to the marked measurement on the wall to get the height measurement.
6. Accurate recording of the height was done and transferred to the questionnaire.

To measure weight (in kilograms) accurately, the researcher used the digital scale as follows:

1. The student was asked to remove shoes and heavy clothing, such as sweaters.
2. Then, he/she was asked to stand with both feet in the centre of the scale.
3. Recording the weight to the nearest decimal fraction was done on the questionnaire.

### 3.6 Validity and Reliability

The researcher pre-tested the questionnaire in Ngara District of Nairobi County with Muslim mixed school to check for validity and reliability. It involved administering the questionnaire to 20 students. The data from pilot study was coded into SPSS Version 17.0 to aid in data analysis.

For reliability of the questionnaire, a reliability coefficient was generated using SPSS that provided step by step commands to generate the Cronbach's Alpha reliability coefficient. A reliability coefficient of 0.837 was generated meaning the questionnaire was reliable.

For validity both the pilot study findings and technical guidance from supervisors was used. The pilot study findings informed redesigning of the questionnaire so that the questions addressed the objectives of the study. The supervisors gave technical inputs in formulating questions that adequately generated information of the study.

### 3.7 Data Analysis

Data collected was entered into SPSS version 17.0 to aid in carrying out statistical analysis. SPSS was used to generate frequency distribution as descriptive statistics for categorical variables such as gender, type of schools, knowledge level, risk factors and management practices among others. To find out the relationship between demographic characteristics, risk factors and diabetes mellitus condition, a cross tabulation was done. For continuous variables such as height, weight, Body Mass Index (BMI) and age, mean and standard deviation was used as descriptive statistics. The data was presented using frequency tables, cross tabulation tables, pie charts and bar graphs.

To find out whether the risk factors investigated in this study were significantly associated with diabetes mellitus condition among the adolescent students, a Chi square test of independence was done as inferential statistics t significance level of 0.05.

Body Mass Index is a number calculated from a person's weight and height. BMI is a fairly reliable indicator of body fatness for most people (WHO, 2009). Using the measurement recorded on height and weight of the sampled students, the researcher calculated BMI for each of the students and recorded in the questionnaire. The score generated was compared with Standard weight categories of the BMI as shown in table 3.3.

**Table 3. 3.** ***The Standard Weight Status Categories Associated with BMI***

| Body Mass Index | Weight Status |
|---|---|
| Below 18.5 | Underweight |
| 18.5 – 24.9 | Normal |
| 25.0 – 29.9 | Overweight |
| 30.0 and Above | Obese |

***Source: WHO, 2009***

### 3.8 Ethical consideration

The ethical considerations required in this study for the acquiring of the required sample from the study subjects were put in place according to the IREC standards. After getting the introduction letter from IREC, the researcher sought for official approval by the National Council for Science and Technology (Appendix III). Further, the researcher sought for official permission from Westlands district Education Office to conduct the study in secondary schools (Appendix I). The researcher sought formal/written consent from schools principals by signing the consent form (Appendix IV) to allow the students participate in the study. All the 12

Secondary schools agreed to participate in the study. From these secondary schools, the researcher interviewed the students who were willing to participate voluntarily. Their names were not recorded in the questionnaire. All the literature reviewed have been cited and referenced accordingly.

# CHAPTER FOUR

# RESULTS AND ANALYSIS

## 4.1. Introduction

This chapter presents the findings on the study on demographic characteristics of adolescent students (4.2), distribution of diabetes mellitus according to age, sex, types of schools and family background (4.3), risk factors associated with diabetes mellitus (4.4) and diabetes mellitus management by the students (4.5). In each of the section, descriptive and inferential statistics have been done where appropriate and results of the analysis presented.

## 4.2. Demographic characteristic of adolescent students

The study focused on the demographic characteristics of the adolescent students that had been associated with diabetes mellitus. The characteristics were age, gender, weight, height, school type and category, school level and family background of the students. The distribution of diabetes mellitus among the students based on these factors was done.

### 4.2.1 Height,Weight and Age of the students

The findings presented on table 4.1 showed that the average height of the students was 2.8 meters (SD = 1.7m) with a minimum of 1.2 meters and maximum of 6 meters. The findings further showed that average weight of the students was 57.4 kilograms (SD = 8.8Kgs) with a minimum of 23 kilograms and a maximum of 85 kilograms. On the age of the students, the findings showed that an average age was 16 years (SD = 1 year) with a minimum of 12 years and a maximum of 20 years.

**Table 4. 1.** ***Descriptive Statistics of the Age, Height, Weight and BMI***

| | **Minimum** | **Maximum** | **Mean** | **Standard deviation** |
|---|---|---|---|---|
| Age( in years) | 12 | 20 | 16 | 1 |
| Height(in meters(m)) | 1.20 | 6.00 | 2.8 | 1.7 |
| Weight(In Kilograms(Kgs) | 23 | 85 | 57.4 | 8.8 |
| Body Mass Index($Kg/m^2$) | 10 | 33 | 22.9 | 3.6 |

### 4.2.2. Secondary schools attended by students

Among these adolescent students, 61% attended public secondary schools and 39% attended private secondary schools(figure 4.1). The findings further showed that 27% attended mixed day schools, 25% boys boarding schools, 21% boys day schools, 15% girls day schools, 10% girls boarding schools and 2% mixed boarding schools(figure 4.2).

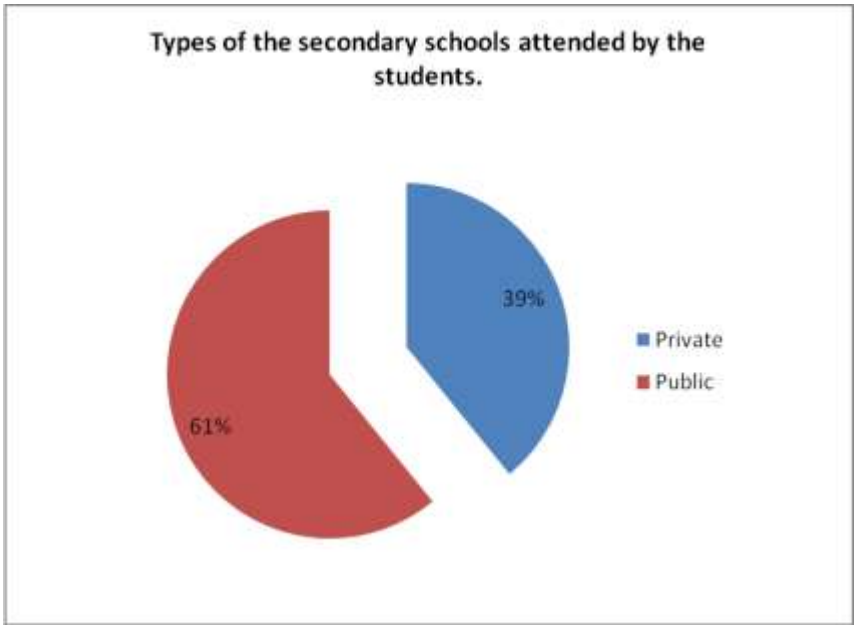


***Figure 4. 1.*** **Type of secondary schools attended by adolescent students**

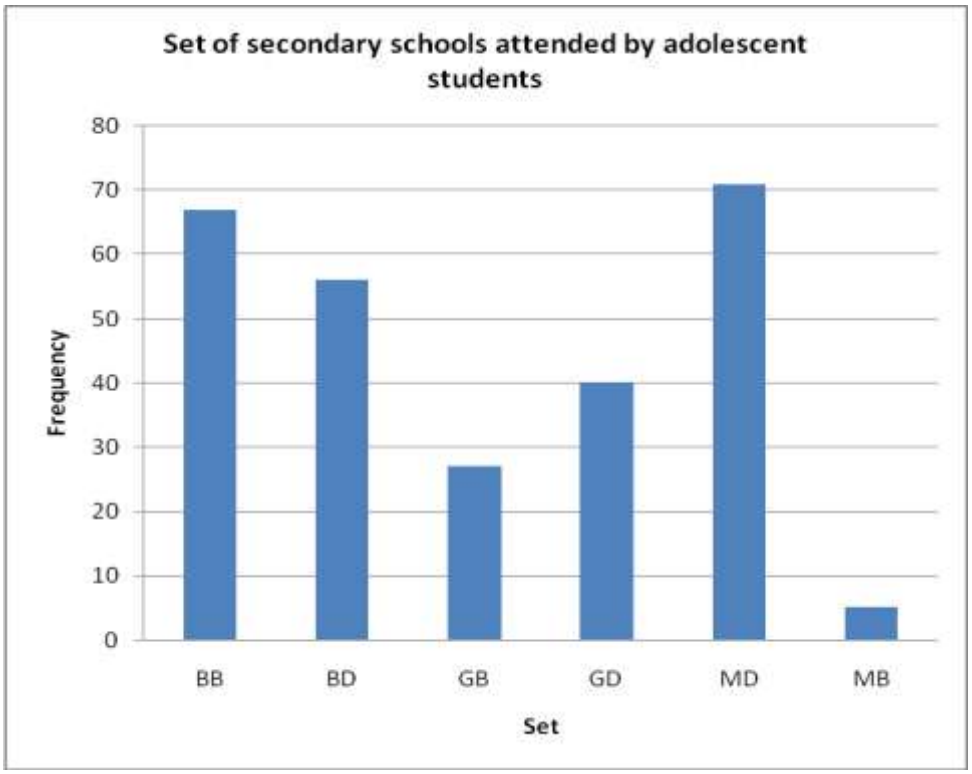


***Figure 4. 2.*** **Set of secondary schools attended by the adolescent students**

### 4.2.3. Gender and schools level of the students

The findings showed that there were 61% male and 39% female students in schools that participated in the study(figure 4.3.) . The findings also showed that 32% were form four, 33% were form two, 19.1% were form three and 15.8% were form one students (table 4.2).

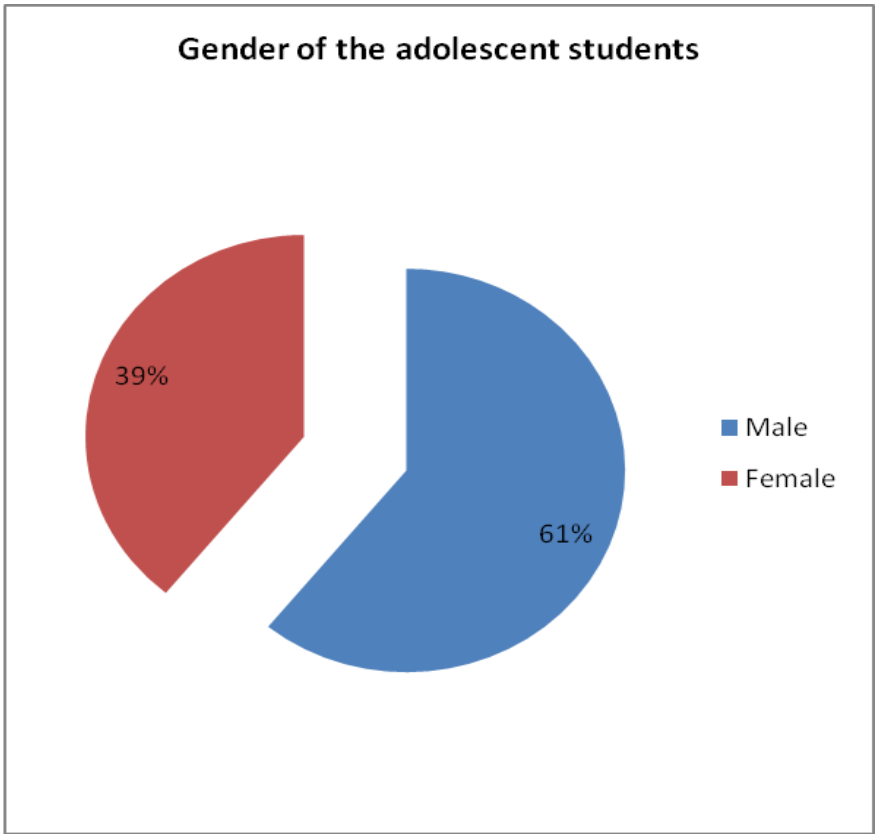


***Figure 4. 3.*** **Gender of the adolescent students**

**Table 4. 2.** ***Students in the School Levels***

| **Level** | **Male** | **Female** | **Total** | **Percent** |
|---|---|---|---|---|
| Form 1 | 24 | 18 | 42 | 16 |
| Form 2 | 36 | 52 | 88 | 33 |
| Form 3 | 20 | 31 | 51 | 19 |
| Form 4 | 25 | 60 | 85 | 32 |
| **Total** | 105 | **161** | **266** | **100** |

### 4.2.4. Distribution of Diabetes Mellitus with demographic characteristic of students

The findings showed that 34% of the adolescent students had diabetes mellitus and 66% had none (figure 4.4).

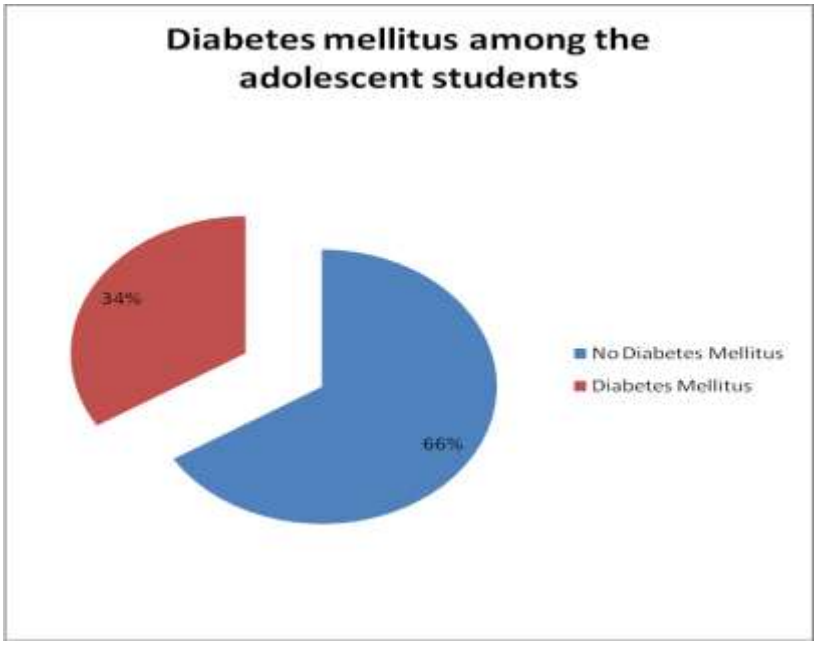


***Figure 4. 4*. Diabetes mellitus among adolescent students**

To find out the distribution of the diabetes mellitus among demographic characteristics of adolescent students, a cross tabulation was done for each characteristics. To carry out cross tabulation between age and weight (continuous variables) and diabetes mellitus (categorical variable), age and weight were transformed into categorical variables with reference to their average score among the students. The findings presented in table 4.3 showed that 73 % of the diabetic students were 16 years (average) and above and 27% were below. On the weight of the students, the findings showed that 60% of the diabetic students had weight average and above and 40% had below average weight (table 4.4).

**Table 4. 3.** ***Diabetes Mellitus Distribution with Age of the Students***

| | | | **Diabetes Mellitus** | | |
|---|---|---|---|---|---|
| | | | **No** | **Yes** | **Total** |
| Age | Average and Above | count | 127 | 66 | 193 |
| | | % | 72% | 73% | 73% |
| | Below Average | Count | 49 | 24 | 73 |
| | | % | 28 % | 27 % | 27% |
| | Total | Count | 176 | 90 | 266 |
| | | % | 100% | 100 % | 100% |

**Table 4. 4.** ***Diabetes Mellitus Distribution with Weight of the Students***

| | | | **Diabetes Mellitus** | | |
|---|---|---|---|---|---|
| | | | **No** | **Yes** | **Total** |
| Weight | Average and Above | Count | 90 | 54 | 144 |
| | | % | 51% | 60% | 54% |
| | Below Average | Count | 86 | 36 | 122 |
| | | % | 49% | 40% | 46% |
| | Total | Count | 176 | 90 | 266 |
| | | % | 100% | 100% | 100% |

The findings also showed that 58% of the diabetic students were male while 42% were female. Among the diabetic students, 42 % were attending boarding schools while 58% were attending day school (table 4.5). The finding further showed that 67% attended public schools while 33% attended private schools (table 4.6).

**Table 4. 5.** ***Categories of the Schools Attended by adolescent Students***

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | **No** | **Yes** | **Total** |
| Categories of the schools | Boarding School | Count | 61 | 38 | 99 |
| | | % | 35% | 42% | 37% |
| | Day School | Count | 115 | 52 | 167 |
| | | % | 65% | 58% | 63% |
| **Total** | | **Count** | **176** | **90** | **266** |
| | | % | 100% | 100% | 100% |

**Table 4.6.** ***School Type Attended by the Adolescent Students***

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| School | Private | Count | 74 | 30 | 104 |
| | | % | 42% | 33% | 39% |
| | Public | Count | 102 | 60 | 162 |
| | | % | 58% | 67% | 61% |
| | Total | Count | 176 | 90 | 266 |
| | | % | 100% | 100% | 100% |

### 4.3. Risk factors associated with Diabetes Mellitus

Diabetes mellitus has several risk factors that have been researched on across all ages of the population and documented especially among the adults. The study had investigated a few of the known risk factors in relation to adolescents. The risk factors

investigated were BMI, stigma, Knowledge level of students, hereditary, physical activity and diet. A Chi square test was conducted between BMI, stigma, Knowledge level of students, hereditary, physical activity and diet and proportion of the students with diabetes mellitus as results presented in table 4.7 below and interpretations done per the risk factor.

**Table 4.7.*Chi Square Test Results of the Risk Factors and Diabetes mellitus***

| Factors | $\chi^2$ | df | P value |
|---|---|---|---|
| BMI | 4.233 | 2 | 0.120 |
| Stigma | 63.650 | 3 | 0.000 |
| Knowledge | 16.636 | 1 | 0.000 |
| Family history | 23.726 | 6 | 0.001 |
| Physical activity | 0.536 | 1 | 0.464 |
| Nutritional Diet | 0.471 | 3 | 0.925 |

### 4.3.1 Body Mass Index

The findings showed that the average BMI of the adolescent student was 23kgs/$m^2$ (SD = 3.6 kgs/$m^2$) with a maximum of 33kgs/$m^2$ and minimum of 10kgs/$m^2$ (table 4.1). The findings further showed that 11% of the diabetic students were overweight compared to 20% of the non diabetic students (table 4.7). A Chi square test carried out to test whether BMI was significantly associated with diabetes mellitus condition among the adolescent students showed that BMI was not significantly ($X^2$(2,n = 266),4.233,p = 0.120) related(table 4.8).

**Table 4. 8.Body Mass Index and Diabetes Mellitus**

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| BMI category | Overweight | Count | 35 | 28 | 63 |
| | | % | 20% | 31% | 24% |
| | Normal | Count | 123 | 55 | 178 |
| | | % | 70% | 61% | 66% |
| | Underweight | Count | 18 | 7 | 25 |
| | | % | 10% | 8% | 10% |
| Total | | Count | 176 | 90 | 266 |
| | | % | 100% | 100% | 100% |

### 4.3.2 Stigma

On the stigma affecting diabetic students, only 8% of the adolescent students reported that there was stigma in the society and 92% did not. A Chi square test done to find out whether stigma was significantly associated with diabetes mellitus condition showed that it was significant($X^2$(3,n = 266),63.650,p = 0.000)(table 4.8).

### 4.3.3 Knowledge level on diabetes Mellitus

The findings showed that 70 % of the adolescent students had knowledge on the diabetes (table 4.9). A Chi square test was carried to find out whether the knowledge level of students was significantly associated with diabetes mellitus condition. The findings showed that knowledge on diabetes mellitus was significantly ($X^2$(1,n = 266),16.636,p = 0.000) associated with diabetes mellitus condition(table 4.8).

**Table 4. 9.** ***Knowledge Level of the Adolescent Student on Diabetes Mellitus***

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Do you know about diabetes? | No | Count | 66 | 14 | 80 |
| | | % | 38% | 16% | 30% |
| | Yes | Count | 110 | 76 | 186 |
| | | % | 63% | 84% | 70% |
| Total | | Count | 176 | 90 | 266 |
| | | % | 100% | 100% | 100% |

### 4.3.4 Family History

The findings further showed 53% of the adolescent students had their relatives with diabetes and believed that family background increases the likelihood of getting diabetes mellitus (table 4.10). A Chi square test done showed that family history was significantly (($X^2$(6, n = 266), 23.726, p = 0.001) associated with diabetes mellitus condition (table 4.8).

**Table 4. 10.** ***Students with Relatives Suffering from Diabetes Mellitus***

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Relative with Diabetes Mellitus | None | Count | 47 | 30 | 77 |
| | | % | 50% | 47% | 49% |
| | Relative | Count | 46 | 34 | 80 |
| | | % | 50% | 53% | 51% |
| Total | | Count | 93 | 64 | 157 |
| | | % w | 100% | 100% | 100% |

### 4.3.5 Physical Activity of the students

Physical activity has been attributed with diabetes mellitus because it affects the weight of the person which subsequently may cause diabetes mellitus. The findings in this study showed that 90% of the diabetic students and 93% of the non diabetic students were involved in physical activities. A Chi square test was done to find out whether physical activity of the students was significantly related with diabetes mellitus condition. The findings presented in table 4.8 showed that it was not significantly ($X^2$(1, n = 266), 0.464, p = 0.536) associated.

**Table 4.11.*Physical Activities and Diabetes Mellitus***

| | | | Diabetes Mellitus | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Physical activity involvement | No | Count | 13 | 9 | 22 |
| | | % | 7% | 10% | 8% |
| | Yes | Count | 163 | 81 | 244 |
| | | % | 93% | 90% | 92% |
| Total | | Count | 176 | 90 | 266 |
| | | % | 100% | 100% | 100% |

### 4.3.6 Nutritional Diet

Diet that students consumed was another risk factor that was investigated. The findings showed that 63% of the adolescent students knew that diet is associated with the diabetes. However, A Chi square test results (table 4.8) showed that diet was not significantly($X^2$(3,n = 266),0.471,p = 0.925) associated with diabetes mellitus.

### 4.4. Management of Diabetes mellitus among Adolescent students

The findings showed that 30% of the diabetic students and 28% of non diabetic students sought physical examination from the doctors (table 4.12).

***Table 4. 12.Diabetic Students Seeking Physician Examination***

| | | Physician Examination | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| Diabetes Mellitus | Count | 127 | 49 | 176 |
| | % | 72% | 28% | 100% |
| | Count | 63 | 27 | 90 |
| | % | 70% | 30% | 100.0% |
| Total | Count | 190 | 76 | 266 |
| | % | 71% | 29% | 100% |

Among the 29% of the adolescent students sought physical examination from the doctor. The findings further showed that they were taken through routine check up on nutritional status, weight measurement and glucose level assessment. The findings presented in Figure 4.5 shows that 39% of the diabetic students had the nutritional assessment done, 57% had their weight checked and 4% had their glucose level checked.

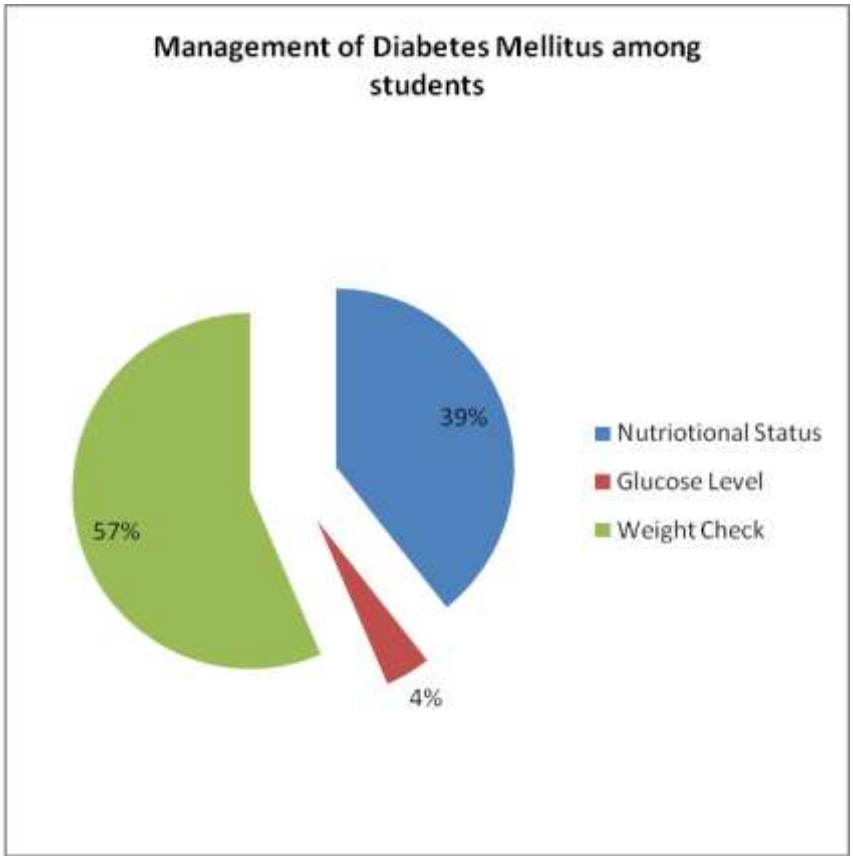


**Figure 4.5. Management practices of diabetes by diabetic students**

# CHAPTER FIVE

# DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Distribution of diabetes mellitus among adolescent students

The findings showed that diabetes mellitus occurred to (34%) among the adolescent students and its distribution varied with characteristics. It was found out that diabetes mellitus occurred more among the students aged 16 years and above. The occurrence also increased among students with 57.4 kg and above. The findings also found out that most of the students who had diabetes mellitus attended day school as compared to those who attended boarding schools.

## 5.2 Risk factors associated with diabetes mellitus

In this study, most risk factor of diabetes Mellitus was significantly associated with the occurrence of the disease while others were not. Stigma on diabetes mellitus, knowledge level on the condition, family history was significantly associated with occurrence of diabetes mellitus among the adolescent students. BMI, physical activities and nutritional behavior of the students were not significantly associated with diabetes mellitus.

### 5.2.1 Body Mass Index

Body mass index (BMI) is the dominant risk factor for diabetes mellitus and increases in BMI in a population have been shown to predict associated changes in the prevalence of diabetes (Ford, Williamson and Liu, 2005). The findings of this study showed that 31% of the students were overweight which corresponded with 34% of them having diabetes mellitus. However, unlike other studies, the findings showed that BMI of the students was not significantly related with diabetes mellitus among the students. The prevalence of diabetes is elevated during puberty coupled with

obesity childhood and adolescence stages (Mohan et al, 2005). Our study showed concurrence with these previous studies since obesity and overweight tend to be seen among the respondents with it being more dominant in diabetic than non-diabetic cases. This could be attributed to eating habits, lifestyle or even inherent from families with history of obesity.

### 5.2.2 Stigma

Presence or experiences of stigma in and outside the school environs were reported by some of the cases that were interviewed and it was significantly associated with diabetes mellitus among students. Some of the cases even indicated to experiencing some form of stigma both in and out of school severally. This might be because school is a powerful influence for most adolescents' lives and school connectedness contributes not only to adolescents' academic outcomes but also to their health and well being (Waters, Cross, & Runions, 2009). While in this set up, most of them tend to value peer relationships and become more conscious of peer perspectives and acceptance (Simpson, 2001).

Due to social pressure, the diabetic adolescent sometimes practice avoidance behaviors to avoid embarrassment and or too much attention hence jeopardizing their health (Yueh-Ling et al., 2010). This situation has also been highlighted in previous research (Davidson, Penney, Muller, & Grey, 2004; Michaud et al., 2009). Adolescents with diabetes also feel stigma or experience discrimination by school personnel (Amillategui *et al*., 2007), since the school regulations interfere with their management making them feel different.

### 5.2.3 Knowledge level of the students

Despite diabetes mellitus being one of the rapidly growing NCDs globally, there has been a great desire to bridge the knowledge gap. The findings showed that most (70%) of the adolescent students had more knowledge on diabetic mellitus. The findings further showed that knowledge on the condition was significantly associated with occurrence of diabetes mellitus among the students. According to previous studies, many people are not aware that they have the disease and many do not know about the disease. A study done in Pakistan only 49% of the subjects could identify the cause of diabetes, similar to the poor knowledge in this study. According to this study, only 44.9% of the respondents had good knowledge on the subject of DM. These results unlike other studies done previously show there is an increasing awareness of the DM than before. In a study by Mohan et al (2005), 25% of the respondents were not aware of the condition while less than 50% did not know the disease is preventable. This rise in the knowledge among the target high risk group (adolescent) as seen can be attributed to the vigorous health education being done in the schools under the guidance of the ministry of health in conjunction with other NGOs.

### 5.2.4. Family background

The findings further showed that the students with relatives who had DM (53%) were diabetic than those who had relatives without DM (49%). The findings also showed that family history was significantly associated with occurrence of diabetes mellitus among the students. A study by Tuomi (2005), in concurrence also showed that T1DM and T2DM frequently co-occur in the same family, thus common genetic susceptibility. Due to this, such mixed family history is associated with intermediate phenotype of diabetes.

### 5.2.5. Physical activity

The findings also showed that there was no difference on physical activities for students with DM (90%) and without DM (92%). This showed that both were involved in physical activities. The findings further showed that physical activity was not significantly associated with occurrence of diabetes mellitus.

### 5.2.6 Nutritional behavior

The findings showed that nutrition behaviour of the students were not significantly associated with occurrence of diabetes mellitus. Food consumption directly contributes to increase in weight. This study found that 31% were overweight that can be attributed to easy availability of low-cost, high-fat and/or high-sugar, low-nutrient foods, perception, limited access to healthy foods that appeal to teens away from home, lack of knowledge (Adolescent Nutrition 2012). The findings showed that majority of the students' parents/guardians were formally and self employed meaning they had steady income and therefore could afford processed foods. Studies carried out in America indicated that healthy foods in school setting were limited thus preempting the students to source alternate foods.

## 5.3 Management

Perception on management of diabetes by the cases interviewed was also found to vary among the respondents with most of the respondent cases finding it difficult. Various aspects affect management of diabetes by the adolescents. The findings showed that very few (30%) diabetic students sought for physician examination and out of which only 4% carry out glucose level testing, 57% carry out weight check and 39% sought for nutritional assessment. According to Adolescent Nutrition (2012), to maintain normal growth and development, individuals with diabetes must establish a

balance between insulin administration, dietary intake, and physical activity on the basis of glucose self-monitoring results. However unlike adults, these tasks present a rather unfamiliar life style for the adolescents due to the rapid and continuous change both biologically and psychosocially in this developmental stage (Lehmkul & Nabors, 2008).Cases with diabetes often experience hardship in balancing dietary intake and insulin dosage that involves a lot of calculation causing unnecessary change in their dietary behaviors. (Yueh-Ling et al., 2010). Also, inadequate diabetes self-management support from the school contributes to poor metabolic levels especially in T1DM students (Lehmkul et al., 2009).

### 5.4 Conclusion

From the study, it is therefore evident that there is association between some of the risk factors i.e. stigma, knowledge and family history of diabetes and the presence of disease among the adolescent. This thus poses a great challenge to the caregivers and the medical practitioners and deems it necessary to understand the relation in order to mitigate the ever-increasing incidence and mortality rates. The adolescent population thus has become an important target group and more focus should be given to them and in depth research done to understand it fully.

### 5.5. Recommendations

In light with the findings of this study, it is important that extra effort needs to be put to ensure this focus group (adolescents) lives a more healthy life. Some of the recommendations made were:

- The primary care givers should be equipped with better knowledge of the risk factors of diabetes and management of diabetes in adolescents in order to provide better care.

- The Ministry of Health in conjunction with the Ministry of Education should put better measures in schools of ensuring healthy eating and living.

### 5.6. Areas for further research

- Further studies should also be carried out to cover some of the aspects this study was not able to cover to cast more light to the effects of some of the risk factors.
- More research should be done to classify the types of diabetes and also draw the exact relation, as a risk factor of diabetes in adolescent.

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# APPENDICES

## Appendix I: Students Questionnaire

Study subject ID.…… Date:……..……..….

**Background Information**

1. Sex: Female ☐ Male ☐ Age: …….

2. School: Private ☐ Public ☐

3. School Type: BB ☐ BD ☐ GB ☐ GD ☐ MD ☐ MB ☐

4. Class: ☐ 1. ☐ 2. ☐ 3. ☐ 4.

**Anthropometric Measurement**

5. Height: …… Weight: …….

6. BMI: ……..

**Diabetes Mellitus condition**

7. Please indicate below which chronic condition(s) you have:

☐ Diabetes type 2 ☐ Diabetes type 1 ☐ High cholesterol ☐ High blood pressure

☐ Heart disease Type of heart disease: …….. ……..

☐ Lung disease Type of lung disease: …… ……..

☐ Other chronic condition Specify: …….. …….

8. If with any of the condition above, how long have you had it (since diagnosis)?

9. Is there any relative/family member that has/suffers from diabetes (tick one)?

☐ Parent ☐ Aunt ☐ Brother/sister ☐ Uncle ☐ Grandparent

10. Did you know or had anybody tell you about diabetes before diagnosis?

☐ Yes ☐ No

11. Have you known any diabetic persons in your society who has suffered stigma/ do you suffer from stigma in school because of your condition?

☐ Yes ☐ No

**Physical Activities**

12. Do you engage yourself in any physical activity? □ Yes □ No □ Sometimes

13. Which physical activities have you been involved in, in the past 6 months?

……..…….

14. For those activities you are involved in, how often do you engage yourself in these activities weekly?

□ Everyday □ Every other day □ Once □ rarely □ Never

**Diet**

15. Do you think diet can cause diabetes?

16. How many meals do you eat in a day? __

17. What kind of foods do you consume most within the week?

□ Pizza, □ Fries/ chips, □ Homemade foods, □ Fried chicken, meat, pork, □. Burgers, Sandwich

**Medical Care**

18. When you visit your doctor, how often you do the following (please circle one number for each question):

**Key: 0= Never ever 1= Some of the times 2= Fairly 3 = Often as possible 4= Always**

1. Get your doctor to make an examination of your nutritional status.....0 1 2 3 4
2. Ask questions about the things you want to know and things you don't understand about your treatment/illness.....0 1 2 3 4
3. Discuss any personal problems related to your illness.....0 1 2 3 4

4. In the past 6 months, how many times did you visit a physician?

   (Except for the hospital emergency department.), _____ visits

5. In the past 6 months, have you been hospitalized because of diabetes or diabetes related complications? □ Yes □ No

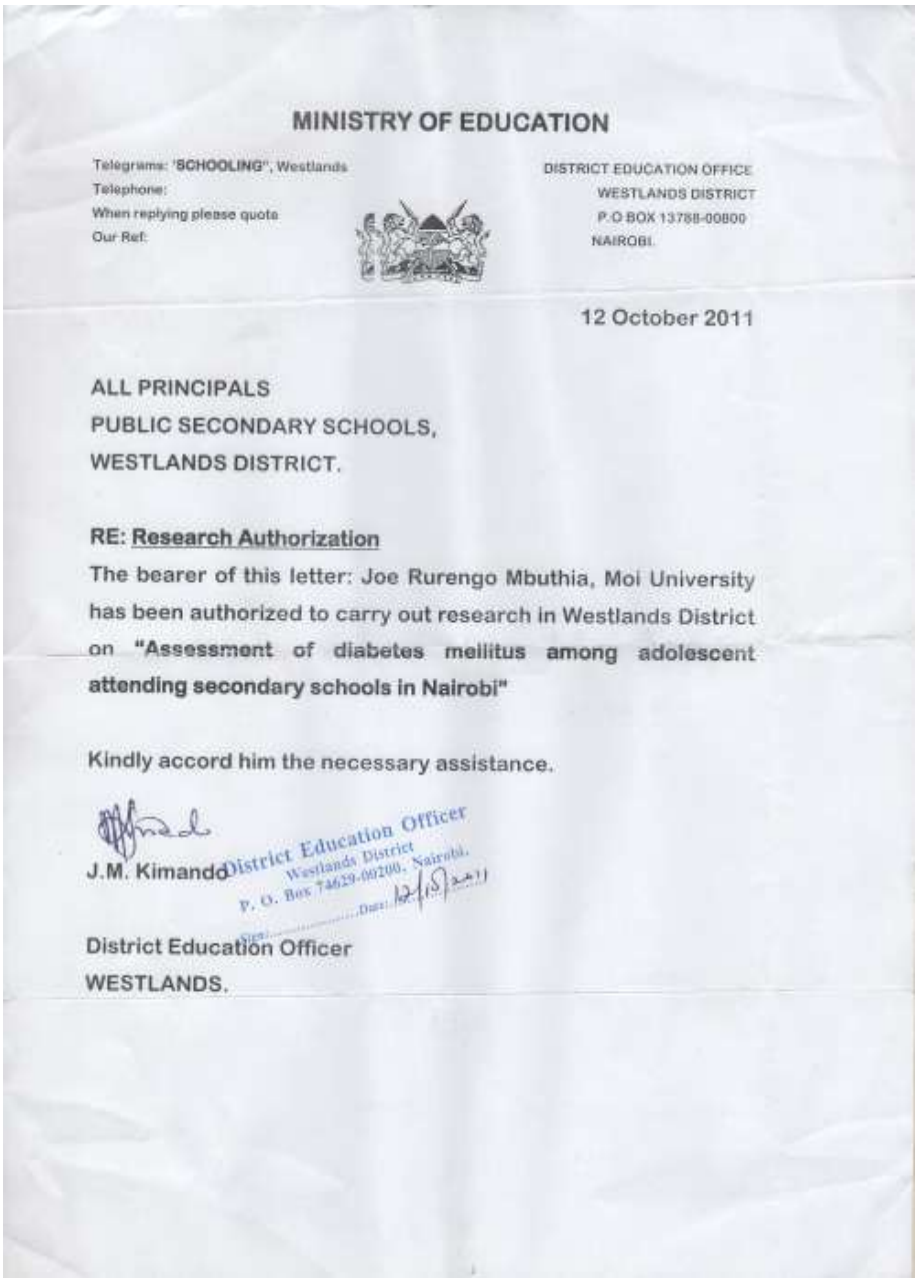
6. When was the last time you had your weight, nutritional status and blood pressure examined? .....

7. How do you find self management of diabetes and its complications?

   □ Easy □ Moderate □ Hard □ Very hard

**Thank you for your help!!**

**Appendix II. IREC official letter**



MINISTRY OF EDUCATION

Telegrams: "SCHOOLING", Westlands
Telephone:
When replying please quote
Our Ref:

DISTRICT EDUCATION OFFICE
WESTLANDS DISTRICT
P.O BOX 13788-00800
NAIROBI.

12 October 2011

ALL PRINCIPALS
PUBLIC SECONDARY SCHOOLS,
WESTLANDS DISTRICT.

RE: Research Authorization

The bearer of this letter: Joe Rurengo Mbuthia, Moi University has been authorized to carry out research in Westlands District on **"Assessment of diabetes mellitus among adolescent attending secondary schools in Nairobi"**

Kindly accord him the necessary assistance.

J.M. Kimando

District Education Officer
Westlands District
P. O. Box 74629-00200, Nairobi.
Sign.....Date: 12/10/2011

District Education Officer
WESTLANDS.

**Appendix III. Ministry of Education Official letter**

MINISTRY OF EDUCATION

Telegrams: "SCHOOLING", Westlands
Telephone:
When replying please quote
Our Ref:

DISTRICT EDUCATION OFFICE
WESTLANDS DISTRICT
P.O BOX 13788-00800
NAIROBI.

12 October 2011

ALL PRINCIPALS
PUBLIC SECONDARY SCHOOLS,
WESTLANDS DISTRICT.

RE: Research Authorization

The bearer of this letter: Joe Rurengo Mbuthia, Moi University has been authorized to carry out research in Westlands District on **"Assessment of diabetes mellitus among adolescent attending secondary schools in Nairobi"**

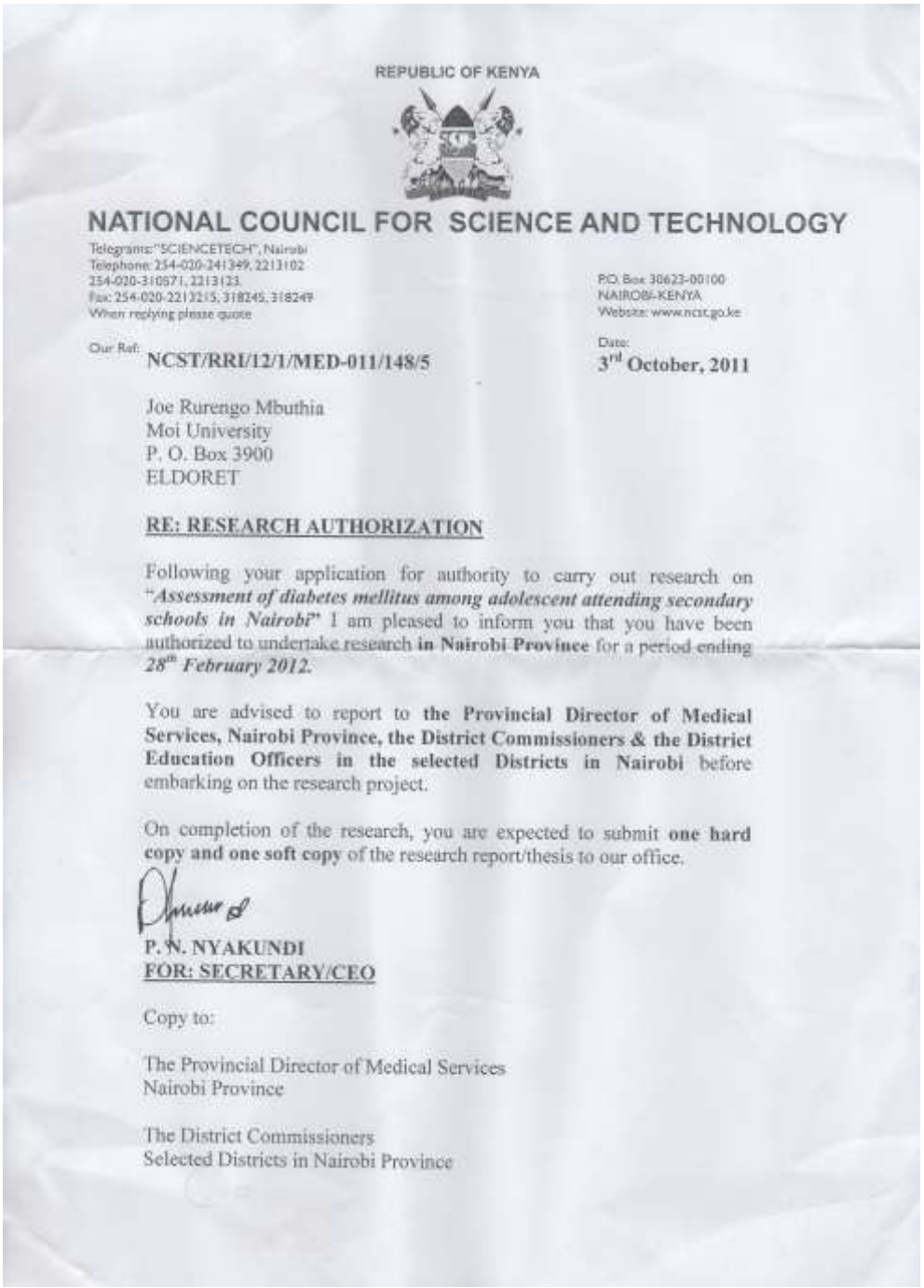
Kindly accord him the necessary assistance.

J.M. Kimando

District Education Officer
Westlands District
P. O. Box 74639-00200, Nairobi.
Sign.....Date: 12/10/2011

District Education Officer
WESTLANDS.

**Appendix IV. National Council for Science and Technology Official letter**



REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254-020-241349, 2213102
254-020-310571, 2213123
Fax: 254-020-2213215, 318245, 318249
When replying please quote

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: NCST/RRI/12/1/MED-011/148/5

Date: 3rd October, 2011

Joe Rurengo Mbuthia
Moi University
P. O. Box 3900
ELDORET

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on "***Assessment of diabetes mellitus among adolescent attending secondary schools in Nairobi***" I am pleased to inform you that you have been authorized to undertake research **in Nairobi Province** for a period ending ***28th February 2012.***

You are advised to report to **the Provincial Director of Medical Services, Nairobi Province, the District Commissioners & the District Education Officers in the selected Districts in Nairobi** before embarking on the research project.

On completion of the research, you are expected to submit **one hard copy and one soft copy** of the research report/thesis to our office.

**P. N. NYAKUNDI**
**FOR: SECRETARY/CEO**

Copy to:

The Provincial Director of Medical Services
Nairobi Province

The District Commissioners
Selected Districts in Nairobi Province