Knowledge of Diabetes Mellitus among Students of a Public Secondary School in Southern Nigeria: A Cross-Sectional Study.

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Abstract

Background:
Diabetes Mellitus (DM) is a condition that arises due to high levels of glucose in the blood because of a defect in insulin production or usage. The report shows an increasing prevalence of prediabetes and DM among adolescents and young adults in Nigeria. Compounding the problem is the reported low level of DM understanding among students in secondary schools in Delta State. This study investigated the knowledge of DM among students of Ogbe Secondary School Effurun, Delta State Nigeria.

Methodology:
This was a school-based descriptive cross-sectional study carried out among 400 randomly selected students from junior secondary school one to senior secondary school two. A structured questionnaire comprising of two sections was used to collect the data. The collected data was analyzed and presented in frequency tables and charts while the Chi-Square test was used to analyze socio-demographic variables and knowledge of DM at a P<0.05 level of significance.

Results:
The mean age was 14.68±1.99 years and 260(65.0%) were females. A good number of the respondents 352(88.0%) have heard of DM. About one-third of the respondents, 120(33.0%) do not know what is DM while most 641(90.9%) could not mention any type of DM. Besides, the majority of the respondents do not know the causes of DM 324(45.5%), signs and symptoms of DM 403(55.7%), risk factors of DM 582(81.3%), and complications of poorly managed DM 603(85.2%). The overall knowledge of DM was 3.4%. Bivariate analysis shows a significant association between the class of the respondents and their knowledge of DM.

Conclusion and Recommendation:[a]
In conclusion, while the majority of the respondents have heard of diabetes mellitus, the majority demonstrated a poor understanding of DM. Therefore, the study recommends regular and continuous awareness creation of diabetes mellitus in secondary schools in Delta State and Nigeria.

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1 Introduction

Diabetes Mellitus (DM) is a chronic condition that occurs when there are elevated levels of glucose in the blood because the body cannot produce any or enough of the hormone insulin or use insulin effectively (International Diabetes Federation, 2017). Type 1, type 2, and gestational are the three main types of DM; however, type 1 DM is most common among schoolchildren. The observed ascend-

ing occurrence of DM among the young has been attributed to obesity owing to declining physical activity, raised caloric intake, and deficient information on healthy living (John *et al.*, 2013). The school is a place of learning and educating children to empower them with knowledge. However, evidence shows the incidence of prediabetes and DM among teachers and students in Africa (Kamdema *et al.,* 2019; Nakiriba *et al.,* 2018; Hassan *et al.,* 2019) and Nigeria (Jaja *et al.,* 2015; Okpere and Yarhere, 2012; Oluwayemi *et al.,* 2015). This could be very challenging for the school children because DM among children has been associated with several serious complications; for example kidney disease, eye disease, and nerve damage (Aljehany, 2016). Consequently, these complications could lead to low worth or value of the life of the affected children, confers financial burden on the families of the affected children and the entire health system in general. Inside the school setting, children with DM would struggle to adapt to the required personal and environmental changes required to manage the condition. This is because they are carefree and are usually involved in activities; for instance physical activities, dietary habits such as eating sweets, taking soft drinks and snacks which could be inimical to their health as they could be committed to lifelong glycaemic control through insulin therapy and other relevant medications. In addition, children living with Type-1 DM are at increased risk of depression, anxiety, and eating disorders (Aljehany, 2016; Du Pasquier-Fediaevsky et al., 2005; Wysocki et al., 2005). Furthermore, type-1 DM significantly affects the cognitive function of affected children. Children with DM significantly have lower grades when compared with their peers without DM (Meo *et al.*, 2013; McCarthy *et al.*, 2003). Consequently, the study of DM among school children is very important to prevent its negative consequences. Furthermore, there is a dearth of studies among school children on DM in Delta State Nigeria. Further, since the understanding of DM is a key part of primary prevention, it is therefore pertinent to appraise DM knowledge among post-primary school students in Delta State, to enable the designing of preventive interventional programs. Besides, students in post-primary schools have been shown to exhibit poor knowledge of DM in Nigeria (Ubangha *et al.,* 2016; Okoh and Jaja, 2014; Unadike and Chinenye, 2009). Therefore, this study examined the knowledge of DM among students of Ogbe Sec-

ondary School Effurun, Uvwie Local Government Area, Delta State Nigeria.

2 Methodology

Study Design:

The study adopted a descriptive cross-sectional study design which assessed the knowledge of diabetes mellitus among students of Ogbe Secondary School Effurun, Delta State.

Study Area:

The study setting was Ogbe Secondary School Effurun, Uvwie Local Government Area of Delta State. The study was conducted from November 2019-January 2020. The study participants were recruited in November and December, while the data collection was carried out in January 2020.

Study Population:

The study population consists of male and female students from both junior and senior secondary classes of Ogbe Secondary School in Uvwie Local Government Area of Delta State.

Inclusion Criteria:

The inclusion criteria were that study participants must be students of Ogbe Secondary School in Uvwie Local Government Area of Delta State and must voluntarily agree to participate in the study.

Exclusion Criteria:

The exclusion criteria were:

Students who were not registered students of Ogbe Secondary School

Registered students who were absent during the data collection

Students who did not voluntarily agree to participate in the study

Sample Size Determination:

The minimum sample size was calculated according to the Yaro Yamane's formula for sample size determination for estimating proportion in a finite population (Okolie et al., 2010).

n = z2pq

d2

n= the minimum sample size

z= 1.96 at 95% confidence interval obtained from statistical table of normal distribution.

P=46.0% i.e Level of DM Knowledge among post-primary school students (Ubangha et al., 2016).

q=1.0-p=1- 0.46=0.54

d= degree of accuracy desired (0.05)

n = 1.962 x 0.46 x 0.54

0.052

n= 381

The minimum sample size was increased to 400 students

Sampling Procedure:

A two-stage sampling technique was used for data collection. The first stage involves stratifying into classes (JSS 1, JSS 2, JSS 3, SS 1, and SS 2). The second stage involves using a random selection of the respondents from each of the classes.

Outcome variable:

The outcome variable for this study was knowledge of diabetes mellitus among the students.

An instrument for Data Collection

The instrument for data collection was a questionnaire. The questionnaire comprised of two sections A-B. Section A was socio-demographic characteristics of the students and section B assessed the knowledge of DM among the students

3 Method of data collection

The questionnaire was self-administered from each of the classes during break time. The researcher and other research assistants collected the questionnaire after it was filled by the students.

Validity and Reliability

To ensure validity, the developed questionnaire was analyzed for face, content, and construct validity. Consequently, to test the validity of the developed questionnaire it was reviewed by other lecturers in the Department of Public and Community Health. The questionnaire was critically assessed by experts in the field of medicine to test and improve face validity. The comments and feedback from the experts were reviewed and used to enhance the questionnaire. The Cronbach Alpha reliability technique was used to decide the reliability of the instrument. The reliability score obtained was 0.991.

4 Data analysis:

The collected data was initially sorted out, coded manually, entered into the computer, and analyzed with Statistical Package for Social Sciences version 20.0. Frequency distribution, cross-tabulations, and Chi-square test were performed to test for associations between the variables of interest at a $P < 0.05$ level of significance.

Scales of Measurement

Knowledge Scale

A dichotomous knowledge scale was developed and used to quantify the level of DM knowledge among the students. The sum of the number of test items in the knowledge section of the questionnaire was 17 items. A right answer was scored as 1 while a wrong answer was scored as 0. Therefore, every study participant's knowledge score was categorized between 0-8 as Code 1 and >8-17 as Code 2. Respondents that scored between 0-8=Code 1 were adjudged to have exhibited poor knowledge of DM prevention and >11-23=Code 2 as having good knowledge of DM prevention.

Ethical Consideration

Respects for persons

Ethical clearance was obtained from the Department of Public and Community Health, College of Medical and Health Sciences, Novena University, Ogume to proceed with the data collection. This approval letter was taken to the Principal of Ogbe Secondary School Effurun Delta State, for permission to carry out research in the school.

Autonomy of respondents

The rights of the respondents were respected as they were given free choice to partake or not to partake in the study.

Beneficence

The respondents were assured that the project aimed to assess their level of DM knowledge to provide baseline data in designing DM prevention intervention programs across schools in Delta State.

Confidentiality

The respondents were assured that all information provided was for purely academic purposes and would be treated with the utmost confidentiality. For sake of emphasis, no identifiers such as names will be included in the questionnaire.

5 Results:

Four hundred questionnaires were distributed for the study and retrieved after filling by the selected study participants. After assessment for completeness, all four hundred questionnaires were found to be eligible and included for analysis. Furthermore, only 352 of the respondents affirmed to have heard of DM, so further analysis were carried out only for these 352 respondents. For each of the sections on knowledge the respondents were asked to mention 2 causes, signs and symptoms, risk factors, complications, management and prevention of DM. Been an open ended questions, the analyses was

carried out as multiple response giving a total of 704 i.e 352 for each responses, for 2 responses it will give 704.

According to table 1 below, more of the respondents 172(43.0%) were between ages 13-15 years while most 260(65.0%) were females and the majority 384(96.0%) were Christians. In addition, almost one-third 120(30.0%) were in SS 2 while 352(88.0%) affirmed to have heard of DM, with 135(38.6%) affirming radio to be their source of information. Furthermore, less than half of the respondents 710(42.6%) affirmed that they have recently received training on the prevention of DM in the school.

Knowledge of Diabetes Mellitus among the Students

In table 2, 103(29.5%) defined Diabetes Mellitus as much sugar in the blood while 63(18.0%) defined diabetes mellitus as eating food with high sugar and 40(11.4%) defined diabetes mellitus as the name of a disease and it causes sickness. Furthermore, 11(3.4%) mention HIV/AIDS as a type of DM while 16(2.3%) mentioned adult onset diabetes and Non-Insulin Dependent Diabetes Mellitus as types of DM.

The causes of DM listed by the respondents includes eating much sugar 240(34.1%), High Blood Pressure 28(4.0%), HIV 28(4.0%), Insulin Resistance 23(3.4%) and Poor Lifestyle 23(3.4%) (Table 3).

Analysed with multiple response

According to table 4.4, the signs and symptoms mentioned by the respondents includes Urinating Frequently 83(11.9%), Tiredness 40(5.7%), Stomach Ache 23(3.4%), Swollen Leg 19(2.8%) and Running stomach 16(2.3%).

Analysed with multiple response

In table 5, the risk factors listed by the respondents includes Overweight and Obesity 23(3.4%), Eating food with high sugar 19(2.8%), it can lead to death 7(1.1%), Loss of weight 7(1.1%), High Blood Pressure 7(1.1%) and Playing with Diabetes patients 7(1.1%).

Analysed with multiple response

According to table 6, the complications of poorly managed diabetes mellitus listed by the respondents were Death 28(4.0%), Kidney failure 16(2.3%), Illness 16(2.3%), Loss of weight 11(1.7%), Hearing Impairment 7(1.1%) and Stomachache 7(1.1%).

Analysed with multiple response

In table 7, the ways of management of diabetes mellitus mentioned by the respondents were Monitoring of Blood Glucose 80(11.4%), Reduction of sugar intake 64(9.1%), Use of Drugs 64(9.1%), Healthy Eating 40(5.7%), Doing exercise 11(1.7%) and Following Doctors Prescriptions 7(1.1%).

Analysed with multiple response

According to table 8, ways of preventing DM as listed by the respondents includes Healthy Diet 99(14.2%), Going for regular checkup 35(5.1%), Wash your hand 23(3.4%), Brush your teeth 23(3.4%), Covering your face when your neighbour is coughing 7(1.1%) and Doing exercise regularly 4(0.6%).

Analysed with multiple response

Level of Knowledge of DM among the students

According to figure 1, 96.6% of the respondents demonstrated poor knowledge of diabetes mellitus and 3.4% demonstrated good knowledge of diabetes mellitus.

6   Discussion:

This study measured the knowledge of DM among students of Ogbe Secondary School Effurun, Delta State. Although most of the respondents asserted to be aware of DM, their echelon of knowledge about the disease was poor as they defined Diabetes Mellitus as excess sugar in the blood; however, it is the inability of the body to produce any or enough insulin or utilize the insulin effectively that leads to the hyperglycaemic state. No student was able to define Diabetes mellitus correctly. This is a deficiency in knowledge as DM is often defined as excess sugar in the blood (Amissah *et al.,* 2017), without a proper understanding of what causes hyperglycemia. In addition, only a few of the respondents 16(2.3%) correctly mentioned non-insulin-dependent diabetes mellitus or adult-onset diabetes mellitus as a type of DM with no mention of type-1 or gestational diabetes. Some incorrectly mentioned HIV/AIDS as a type of DM. A similar study carried out among students in Nigeria also reported high levels of awareness of DM but poor knowledge of DM (Omobuwa and Alebiosu, 2014). This level of awareness may be attributed to various information sources the participants may have been exposed to like the radio (38.6%), community (12.5%), television (13.6%), family member (6.8%), health worker (6.8%), and school (21.6%), with radio being the highest DM source of information. The findings of this study also agreed with

Table 1. Socio-Demographic Characteristics of the Respondents

Variable	Frequency (N=400)	Percentage	Knowledge of DM
Age	72	18.0	0.306 (NS)
10-12	172	43.0	
13-15	156	39.0	
16-18			
Sex	140	35.0	0.066 (NS)
Male	260	65.0	
Female			
Religion	384	96.0	0.587 (NS)
Christianity	16	4.0	
Islam			
Class	104	26.0	0.002 (S)
JSS 1	92	23.0	
JSS 2	44	11.0	
JSS 3	40	10.0	
SS 1	120	30.0	
SS 2			
Have you heard of diabetes mellitus	352	88.0	
	48	12.0	
Yes			
No			
If yes, what is your source of information	44	12.5	
	135	38.6	
Community	47	13.6	
Radio	23	6.8	
Television	23	6.8	
Family	80	21.6	
Member			
Health Worker			
School			
Have any member of your immediate family or other relatives been diagnosed with DM	332	83.0	0.528 (NS)
	4	13.6	
	14	3.4	
No			
Yes:Grandparent, Aunt, Uncle or First Cousin (but not own parent, brother, sister or child)			
Yes: Parent, Brother, Sister			
Have you recently received training on prevention of DM in the School	170	42.6	0.640 (NS)
	230	57.4	
Yes			
No			
If yes, When	90	53.3	
<1 years	38	22.7	
1-3 years	42	24.0	
>3 years			

Mean Age: 14.68±1.99 N=Significant NS=Not Significant

Table 2. Knowledge of Diabetes Mellitus Definition

Variable	Frequency	Percentage
Definition of Diabetes Mellitus	**(N=352)**	18.0
Eating of food with high sugar	63	29.5
Much sugar in the blood	103	5.7
Diabetes means when there is too much injuries in some-one body	20	1.1
	3	11.4
Diabetes Mellitus is the injury gotten from excess sugar	40	1.1
Diabetes is a name of a disease and it causes sickness	3	33.0
Diabetes Mellitus are diseases that can transfer from one place to another	120	
Don't Know		
Mention two types of Diabetes Mellitus*	**(N=704)**	2.3
Adult Onset diabetes	16	2.3
Non-Insulin Dependent Diabetes Mellitus	16	3.4
HIV/AIDS	23	0.6
Treatable by a medical professional	4	0.6
Requires a medical diagnosis	4	90.9
Don't Know	641	

*Analysed with multiple response.

Table 3. Knowledge of Causes of Diabetes Mellitus

Variable	Frequency (N=704)	Percentage
Causes of Diabetes Mellitus*	240	34.1
Eating much sugar	4	0.6
Taking Alcohol	23	3.4
Insulin Resistance	23	3.4
Poor Lifestyle	28	4.0
High Blood Pressure	28	4.0
HIV	4	0.6
Polio	7	1.1
Low Cost of Feeding	23	3.4
Fever	324	45.5
Don't Know		

the work of Omobuwa and Alebiosu (2014), where family members or relatives were the least sources of information on diabetes mellitus. According to the findings of the study since some of the respondents already have a family history of DM, family members could be leveraged on and targeted with DM prevention messages for them to act as DM awareness ambassadors for each of their respective families.

Although most students defined Diabetes Mellitus as excess sugar in the blood, they often be-lieved that diabetes is caused by excessive consumption of sugar. However, studies have shown that consumption of sugar alone does not lead to diabetes mellitus (Basu *et al.,* 2013). The findings were comparable to the results of a previous study (Agofure *et al.,* 2018, Agofure *et al.,* 2021). Although this was not directly reflected in other results from Uyo (Unadike and Chinenye, 2009), the low rate of correct responses as to the possible cause of diabetes in all these studies may reflect a misconception handed down in the general populace by

Table 4. Knowledge of signs and symptoms of Diabetes Mellitus

Variable	Frequency (N=704)	Percentage
Signs and symptoms of Diabetes Mellitus*	40	5.7
Tiredness	11	1.7
Injury that does not heal	11	1.7
Dizziness	83	11.9
Urinating Frequently	4	0.6
Excessive thirst and hunger	4	0.6
Weight Loss	11	1.7
Illness	11	1.7
Thirst	19	2.8
Swollen Leg	4	0.6
Glucose in the urine	16	2.3
Running stomach	7	1.1
When you hug somebody	23	3.4
Stomach ache	7	1.1
Kidney problem	7	1.1
Tooth pain	4	0.6
Vomiting	4	0.6
Increased Eating	16	2.3
Coughing	11	1.7
Sneezing	4	0.6
Soft Skin	4	0.6
Itching	403	55.7
Don't Know		

Table 5. Knowledge of risk factors of Diabetes Mellitus

Variable	Frequency (N=704)	Percentage
Risk Factors of Diabetes Mellitus*	4	0.6
It can damage parts of the body	7	1.1
It can lead to death	19	2.8
Eating food with high sugar	7	1.1
Loss of weight	7	1.1
High Blood Pressure	23	3.4
Overweight and Obesity	4	0.6
High level of HDL & Triglycerides	4	0.6
Death	7	1.1
Blindness	4	0.6
Vomiting	7	1.1
Playing with Diabetes people	4	0.6
Sleeping with Diabetes patients	7	1.1
Tooth Pain	7	1.1
Swollen Leg	4	0.6
Spoilt Food	7	1.1
Older Age	582	81.3
Don't Know		

Table 6. Knowledge of poorly managed Diabetes Mellitus

Variable	Frequency (N=704)	Percentage
Complications of Diabetes Mellitus*	4	0.6
Blindness	11	1.7
Loss of weight	16	2.3
Kidney failure	16	2.3
Illness	4	0.6
Weakness	28	4.0
Death	4	0.6
Hypertension	7	1.1
Stomachache	4	0.6
Loss of appetite	7	1.1
Hearing Impairment	603	85.2
Don't Know		

Table 7. Knowledge of management of Diabetes Mellitus

Variable	Frequency (N=704)	Percentage
Management of Diabetes Mellitus*	64	9.1
Reduction of sugar intake	11	1.7
Do exercise	80	11.4
Monitoring of Blood Glucose	64	9.1
Use of Drugs	40	5.7
Healthy Eating	7	1.1
Following Doctors Prescription	7	1.1
By resting	431	60.8
Don't Know		

Table 8. Knowledge of prevention of Diabetes Mellitus

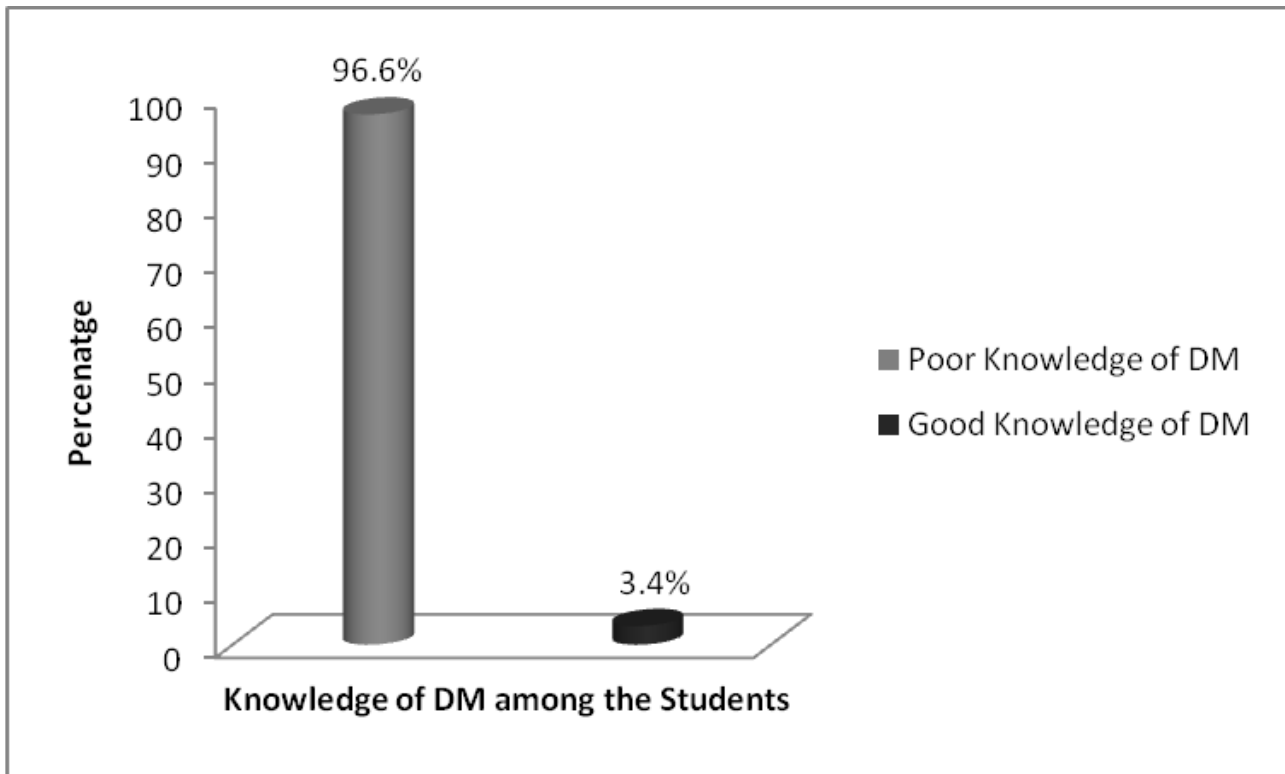| Variable	Frequency (N=704)	Percentage
Prevention of Diabetes Mellitus*	4	0.6
Doing exercise regularly	35	5.1
Going for regular checkup	99	14.2
Healthy Diet	4	0.6
Lose weight	4	0.6
Regular screening in the school	7	1.1
Covering your face when your neighbour is	4	0.6
coughing	23	3.4
Wash your hand	23	3.4
Brush your teeth	501	71.0
Don't Know		

Figure 1. Overall knowledge of Diabetes Mellitus among the Respondents

uninformed educators or an impression that is left after health talks.

Identifications of the symptoms of Diabetes Mellitus are a very important link to early diagnosis. The symptoms are easily recognizable and with awareness should prompt early treatment-seeking behavior. However, it must be noted that 55.7% of the student were deficient in any symptoms of diabetes as in many other studies (Unadike and Chinenye, 2009; Azinge et al., 2013; Nisar *et al.,* 2008; Agofure *et al.,* 2021), the commonest symptom mentioned was excessive passing of urine. Other symptoms mentioned were tiredness, stomach ache, swollen leg, and running stomach. This was, however, higher than the 13% reported by the study in Oghara Delta State and the 29% by the study in Uyo Akwa Ibom State (Unadike and Chinenye, 2009; Azinge *et al.,* 2013).

As highlighted in the findings, there was a knowledge gap of risk factors of Diabetes Mellitus among the students as 81% were deficient in the risk factors associated with DM. The findings were similar to that of a previous study in Nigeria and Delta State (Ubangha *et al.,* 2016; Agofure *et al.,* 2021). Few of the respondents mentioned overweight and obesity, high blood pressure, and loss of weight

as risk factors of Diabetes Mellitus. The common complications of poorly managed diabetes mellitus as listed by the respondents were death, kidney failure, hearing impairment, and weakness, and 82% had no idea of the complications of diabetes mellitus. This shows a deficiency in the knowledge of Diabetes Mellitus complications. A previous study corroborated similar ideas (Agofure *et al.,* 2021).

A good number of the respondents exhibited knowledge of Diabetes Mellitus by underlining the three main points for diabetes management which include dietary, physical activity, and medication. This was similar to the findings of previous studies (Ubangha *et al.,* 2016; Agofure *et al.,* 2021). Some of the respondents also highlighted good personal hygiene as a preventive measure of Diabetes Mellitus and also regular exercise and regular medical checkups. This was similar to the finding of a previous study (Reese, 2003).

Overall, only a few (3.4%) of the respondents demonstrated good knowledge of DM. This finding was lower than that of the study in Lagos Nigeria which reported an overall DM knowledge of 46% (Ubangha *et al.,* 2016). The finding was also lower than that of a study among students in Kuwait which reported an overall DM knowledge of 71.0%

(Al-Hussaini and Mustafa, 2016). This finding represents a knowledge of DM lacuna which must be solved holistically through regular and continuous awareness creation in schools because as the study showed about 17% of the respondents affirmed to have a family history of DM.

7   Conclusion

Generally, most of the respondents demonstrated poor knowledge of DM definition, types, causes, signs and symptoms, risk factors, complications, management, and prevention. This represents a knowledge gap that must be filled with regular and continuous diabetes awareness programs.

Recommendations:

Based on the result of the study the following recommendations were made:

1. Prevention of chronic diseases as a subject in form of general studies should be introduced in post-primary schools from junior secondary school to senior secondary school. This would create more time for teachers to emphasize the risk they pose to students and could help in the adoption of preventive behaviors at an early age.

2. Secondary school teachers should be trained and retrained to improve their knowledge of diabetes and the content they give to the students.

3. Television, radio, social media, and other forms of mass media could play a very important role in the dissemination of information on diabetes, including to young people, who account for a large proportion of the populace. This wide and relative form of knowledge dissemination could be taken advantage of by the government and policy-makers in the education ministry to give the correct information on diabetes.

4. Children should be screened for diabetes mellitus when they are about to enter secondary school and good dietary habits for children and the importance of physical activity should be encouraged.

8   Acknowledgement:

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