# ASSESSMENT OF KNOWLEDGE AND ATTITUDE ABOUT TYPE II DIABETES AMONG HAUSA-SPEAKING PUBLIC SCHOOL-GOING ADOLESCENTS IN KANO

Zahraddeen Tahir[1], Awotidebe Adedapo Wasiu[1], *Mannir Kassim[2], Mukadas Oyeniran Akindele[1], Usman Usman Zakari[3]

[1]Department of Physiotherapy, Faculty of Allied Health Sciences, Bayero University Kano

[2]The Medical Rehabilitation Therapists (Reg.) Board of Nigeria, North-east Zonal Office, Bauchi

[3]Department of Physiotherapy, Federal Medical Centre Birnin Kudu, Jigawa State, Nigeria

***Corresponding Author:** Mannir Kassim, Email: mannirkassim@yahoo.com

## ABSTRACT

**Background:** Accurate knowledge of Type II diabetes Mellitus (T2DM) is important for early screening and prevention of the disease among individuals. However, evidence is limited on the knowledge and attitude about Type II diabetes among Hausa-speaking public school-going adolescents in Kano, northern Nigeria**.**

**Methods:** This study was cross-sectional survey with a multistage cluster sampling technique involving 425 school-going adolescents aged 11-19 years old in five public secondary schools. The Diabetes Knowledge Questionnaire (DKQ) and Diabetes Attitude Scale-3 (DAS-3) were used to assess the levels of knowledge and attitude about T2DM respectively.

**Results:** None of the participants had a good level knowledge score and only 37.9% of the participants had a satisfactory level knowledge score about T2DM. However, the participants had positive attitude to 'seriousness of Type II diabetes (3.05±0.44), 'need for special training' (4.35±0.5), 'psychological impact of T2DM' (3.93±0.41) and 'autonomy of patients' (3.89±0.45).

**Conclusion**: Despite the positive attitude towards T2DM, the level of knowledge on T2DM among school-going adolescents is still poor. Therefore, school-based programs aimed at improving knowledge of T2DM are needed in public secondary schools in Kano.

**Keywords:** diabetes, attitude, knowledge, adolescents

## Introduction

Type II Diabetes mellitus (T2DM) occurs when insulin secretion is inadequate to meet the increased demand posed by insulin resistance, leading to relative insulin deficiency[1] and is generally associated with other metabolic abnormalities[2]. The chronic complications of diabetes mellitus include accelerated development of cardiovascular diseases, end-stage renal disease, loss of visual acuity, and limb amputations; all of these complications contribute to the excess morbidity and mortality in individuals with T2DM[3]. Unlike Type I diabetes mellitus (T1DM), there is no identified

autoimmune process leading to inadequate insulin secretion in T2DM[2] and inadequate insulin secretion appears to result from genetic, environmental, and metabolic causes and may differ between individuals[2].

T2DM has rapidly evolved from a disease of the Western nations to a global disease; from a disease of affluence to a disease that now afflict the poor; and from an adult-onset disease to a disease that is gaining prominence in the pediatric population[4]. Thirty years ago, T2DM has been thought to be a rare occurrence in children and adolescents. However, in the mid-1990s, investigators began to observe an increasing incidence of T2DM worldwide[5]. In 2011, global estimation on diabetes mellitus shows that, on the average, diabetes affects at least 285 million people worldwide out of which two-thirds occur in developing (low-to middle-income) countries[6].

In the North America, T2DM now accounts for about 15% to 45% of all newly diagnosed cases of diabetes in children and teenagers[7]. T2DM has also been reported in children in Australia[8], United Kingdom[9] and Asian- pacific countries such as Japan[10] and India[11]. Although type 1 DM remains the major form of the disease in children worldwide, it is likely that T2DM will be the predominant form within a decade in many ethnic groups[12]. For instance, among children in Japan, T2DM is already more common than T1DM which accounts for 80% of childhood diabetes[10]. A recent increase in the incidence of T2DM has been reported in children and adolescents in Sub-saharan Africa[13, 14]. In Nigeria, specifically, the burden of T2DM among children presents with a prevalence of 0.1/1000 in 2009 and 10.1/1000 in 2013[15].

This global rise in prevalence of diabetes has been attributed to lifestyle changes as a result of increasing urbanization with resultant reduction in physical activity, increased caloric intake, obesity as well as lack of information on healthy living[16]. Children and adolescents in Nigeria increasingly adopt western lifestyle including the consumption of junk fatty food and food additives. The eroding culture of partaking in farm work and walking long distances, poor culture of daily exercises among community members all contributes to the new era of sedentary lifestyle[17].

However, most children with T2DM are obese or extremely obese at diagnosis and present with glucosuria without ketonuria, absent or mild polyuria or polydipsia and little or no weight loss[18]. In mildest form of type T2DM, a child may present with hyperglycaemia or glycosuria[19]. Whereas, in the severe form of this diabetes, the child may present with polyuria, polydipsia and weight loss[19]. Knowledge of developing the T2DM and understanding of its risk factors has been suggested as the greatest weapon in the fight against T2DM[20]. It has been reported that education is the most effective way to lessen the complication of diabetes and its management[21].

In Nigeria and most developing countries, diabetes mellitus in adolescents is still a huge burden as most children die before they are diagnosed or are misdiagnosed as other childhood illnesses, which mimic diabetes mellitus[22]. Awareness amongst the general population about childhood diabetes is still very low and there is need for improved awareness, knowledge, and

technological capacity in the management of T2DM. Most studies on knowledge of diabetes mellitus in Nigeria have focused on adult populations[22, 23] while few considered adolescents in South-South[24], and South-West regions of Nigeria[25].

However, because of the heterogeneous nature of the adolescent populations in Nigeria small sample sizes inherent in these studies have limited their generalisability to entire Nigeria populations. A recent search of existing literature showed a dearth of studies that describe the knowledge and attitude about T2DM among adolescents mainly in Kano State. Therefore, the objective of this study was to assess the knowledge, attitude and the association between demographic variables with knowledge and attitude about T2DM among Hausa-speaking public school -going adolescents aged 11-19 years in Kano municipal, Nigeria.

## Materials And Methods

### Research design and setting

The research design for this study was a cross-sectional study conducted among school-going adolescents aged 11-19 years attending government public schools in Kano metropolis. The study was conducted in Kano Municipal, the capital city of Kano State. It has area of 17 $km^2$ and 13 wards with a population of 365,525 at the 2006 census. A Hausa land where the major spoken language is Hausa and majority are Muslims. Kano municipal has 30 government secondary schools.

### Ethical approval

Ethical approval to conduct this study was sought from the Health Research Ethics Committee of Kano State Hospitals' Management Board, Nigeria, according to the declaration of the Helsinki. An Introductory Letter was collected from the department of Physiotherapy and taken to the Chairman, Kano State Secondary School Management Board where letter of approval was obtained. Informed consent was obtained from the participant. Informed assent was sought and obtained from students who were less than 19 years. Participants were briefed about the objectives of the study and were allowed to withdraw themselves at any stage of the study.

### Sample size and sampling technique

The formula below was used to estimate the appropriate sample size to correctly determine knowledge and attitudes towards T2DM among school-going adolescents.

$N = Z^2P(1-P)/d^2$ Where:

N= sample size

Z = 1.96

P = 48.6% (proportion of undergraduate student who knew that individuals with T2DM can have good quality of life[26].

D = absolute error (5%)

Base on the estimate of 48.6% of the undergraduate student who knew that individuals with T2DM can have good quality of life[26] at 5% margin of error of the estimate; using the formula above a sample size of 384 was deemed appropriate for this study. Taking into account a 10% non response rate due to incomplete filling of the questionnaire in part, a sample size of 425 school-going Adolescents were recruited into the study.

A cluster sampling technique was used to select five public schools at random from a cluster of 30.

The cluster K[th] was estimated to be six. Thus five cluster of schools (30/6 =5) were conveniently selected from the population of 30 public schools in Kano municipal. In order to know how many will be needed from each cluster; the sample size was divided by the clusters (5). Therefore, n = 425/5; a total of 85 participants were randomly selected using simple random sampling technique (balloting) from each school from students in Junior Secondary School I (JSS I) to Senior Secondary School II (SS II). The selected schools for the study were Rumfa College, Maryam Aloma Muktar Government Girls Secondary School, Kofar Nassarawa Government Secondary School, Sabuwar kofa Government Secondary School and Hassana Sufi Government Girls Secondary School.

**Eligibility criteria**

The criteria for inclusion in the study were; 1) Hausa-speaking students, 2) who attend public school, 3) either in junior or senior secondary classes, and 4) within adolescents' age of 11-19 years. The exclusion criteria participants were; 1) learners with visual disability, 2) individuals who were not proficient in Hausa language, 3) individuals with mental retardation or Downs' syndrome, and 4) unable to provide consent.

**Translation of the Questionnaire**

The Diabetes Attitude Survey questionnaire and Diabetes Knowledge Questionnaire were translated to Hausa by experts from the Languages Department, Faculty of Arts, Bayero University Kano. The purpose of the translation was to explain the contents of the tools to the participants in their proficient language in order to ensure their good understanding and maximum co-operation. These translated versions of questionnaires were administered, and participants who found it difficult to understand how to fill the questionnaire were assisted by the researcher.

**Patient's Diabetes Knowledge Questionnaire.**

The instrument used to assess the level of diabetes knowledge was adopted from Diabetes Knowledge Questionnaire (DKQ)[27]. The questionnaire consisted of 24 questions on knowledge of T2DM regarding causes, diagnosis, prevention and risk factors. The content validity and internal reliability have been reported as good[27].The overall knowledge score is 24 and it is categorized as:

0 – 8 = poor knowledge

9 – 16 = satisfactory knowledge

17 – 24 = good knowledge

**Diabetes Attitude Scale questionnaire (DAS)**

The instrument used to assess the level of diabetes attitude was adopted from Diabetes Attitude Survey questionnaire (DAS-3)[28]. The questionnaire consist 33 questions on attitude toward type 2 diabetes mellitus regarding special training, seriousness of NIDDM, value control, psychological impact and autonomy. The content validity and internal reliability have been reported as good[28].

Scoring: A five-point-Likert scale was used to measure attitude; Strongly-agree = 5; Agree = 4; Undecided = 3; Disagree= 2; Strongly Disagree = 1.Scores for items 2, 3, 7, 11, 13, 15, 16, 23, 26 and 28 were reversed. Final scores were categorized as attitude to 'Need for Special Training', 'Seriousness of T2DM', Value Control', 'Psychological Impact of T2DM' and 'Patient

Autonomy'.

**Demographic and Anthropomorphic Measures**

Socio-demographic form was used to obtain information on age, gender, class, tribe, marital status, smoking status, history of T2DM and any chronic non-communicable disease. Weight and height were measured in light clothing using a weighing scale and stadiometer.

**Data Analysis Procedure**

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 software. Descriptive statistics of mean, standard deviation and percentages were used to summarize the socio-demographic characteristics, anthropometric variables, knowledge and attitude of the participants about T2DM. Chi-square test was used to examine the association between knowledge and categorical variables of attitude, gender, family history of diabetes and BMI categories. Alpha probability value was set at 0.05.

**Results**

**Demographic characteristics, Attitude and Knowledge of the participants**

The study comprises of four hundred and twenty-five (425) participants with 225 (52.9%) male and 200 (47.1%) female. The mean (standard deviation (SD)) age was 15.43(±1.93); 32% were 11 – 14 years old, 49.4% were 15 – 17 years old and 17.9 were 18 – 21 years old. The mean (Standard Deviation (SD)) BMI was 19.07 (± 2.43)Kg/$m^2$; majority (52.2%) had normal BMI, a significant percentage (45.4%) were underweight, which a few (2.4%) were over-weight (Table 1).Overall, on the scale 24.0, the average knowledge score was 7.82 ± 2.93 while attitude was 3.63 ± 0.27 on the scale of 5.

**Knowledge of Diabetes Mellitus**

A correct response for each of the 24 questions on Diabetes Knowledge Questionnaire are presented in Table 3.Only 36.7% of the children knew that T2DM is caused as a result of lack of sufficient effective insulin in the body. About 78% erroneously believed that eating too much sugar and sweet cause T2DM. A significant percentage of the students do not know the correct method of diagnosing diabetes as only 8.2% knew. Around 41.9% of the children knew that diabetes can be inherited from parents. Majority of the participants had no knowledge regarding the correct method of diagnosing T2DM (92%), where around 89% believed that T2DM could be cured (Table 2).

**Knowledge of Type II Diabetes Mellitus by Age**

The knowledge of T2DM by age is presented in Table 4. For most of the questions; late adolescent (18-21) were significantly more knowledgeable about T2DM compared to early and middle adolescents (11-14 and 15-17) respectively ($p<0.05$) (Table 4). For example, half of the adolescents aged 18 years and above compared to about 26% of adolescents aged 11-14 years knew that diabetes is caused by lack of effective insulin (Table 3).

**Relationship between Knowledge and Socio-demographic Variables**

The results of this study showed that older adolescents significantly had satisfactory knowledge compared to younger adolescents (69.7% vs. 19.4%; p-value = 0.001) (Table 5). Moreover, participants who were overweight had a significantly satisfactory knowledge compared to underweight adolescents (70% vs. 31.6%; p-value = 0.01).However, gender difference and history of T2DM were not associated with knowledge of T2DM.

**Participants Attitude about T2DM**

Attitude toward T2DM were categorized into five categories: Special Training, Seriousness of T2DM, Value Control, Psychological Impact of T2DM and Patient's Autonomy. On the scale of 5, attitude toward special training is seen to be positive in both boys and girls (4.49±0.57 and 4.51±0.56 respectively), while attitude toward value control is seen to be negative in both boys and girls (2.81±0.38 and 2.78±0.46 respectively). (Table 5)

**Relationship between Attitude and Age of the Participants**

A strong association exist between attitude and age with p-value = 0.001 in Special training, Seriousness of NIDDM, Value control, Psychological impact and a p-value= 0.006 in Autonomy. (Table 6)

**Table 1: Demographic characteristics, attitude and knowledge of the participants**

| **Age** | **(%)** |
|---|---|
| 11 – 14 | 32 |
| 15 – 17 | 49.4 |
| 18 – 19 | 17.9 |
| Mean(±SD) | 15.43(±1.93)* |
| **Gender** | |
| Boys | 52.9 |
| Girls | 47.1 |
| **Class** | |
| JS1 | 20 |
| JS2 | 20 |
| JS3 | 20 |
| SS1 | 20 |
| SS2 | 20 |
| **BMI** | |
| Overweight | 2.4 |
| Normal | 52.2 |
| Underweight | 45.4 |
| Mean(±SD) | 19.07 (± 2.43)* |
| **Knowledge** | |
| Good | 0 |
| Satisfactory | 37.9 |
| Poor | 62.1 |
| Mean(±SD) | **7.82 ± 2.93*** |
| **Attitude (M+SD)** | |
| Special training | 4.35±0.50* |
| Seriousness of NIDDM | 3.05±0.44* |
| Value control | 2.79±0.42* |
| Psychological impact | 3.93±0.41* |
| Autonomy | 3.89±0.45* |
| **Total** | **3.63 ± 0.27*** |

* are averages of mean ± standard deviation

**Table 2: Score of the Participants Knowledge of Diabetes Mellitus**

| S/N | Questions | Right response (%) |
|---|---|---|
| 1 | Eating too much sugar and sweet causes diabetes | **22.0** |
| 2 | The usual cause of diabetes mellitus is lack of effective insulin | 36.7 |
| 3 | Diabetes mellitus is caused by failure of kidney to keep sugar out of the body | 13.2 |
| 4 | Kidney produce insulin | 12.0 |
| 5 | In untreated diabetes mellitus, the amount of sugar in the blood usually increase | 69.2 |
| 6 | If I am diabetic, my children have higher chance of having diabetes mellitus | 41.9 |
| 7 | Diabetes can be cured | **19.1** |
| 8 | Fasting blood sugar up to 210 is too high | 33.6 |
| 9 | The best way to check my diabetes is by testing my urine | **8.2** |
| 10 | Regular exercise will increase the need for insulin or other diabet es medication | 13.6 |
| 11 | There are two types of diabetes mellitus, type 1 and type 2 | 24.2 |
| 12 | An insulin reaction is caused by too much food | 21.6 |
| 13 | Medication is more important than diet and exercise to control my diabetes | 33.4 |
| 14 | Diabetes often cause poor circulation | 47.5 |
| 15 | Cuts and abrasion on diabetes heal more slowly | 71.1 |
| 16 | Diabetics should take extra care in cutting their toenails | 73.4 |
| 17 | A person with diabetes mellitus should clean wound with iodine and alcohol | 21.2 |
| 18 | The way I prepare my food is as important as the food I eat | 50.6 |
| 19 | Diabetes can damage my kidney | 64.5 |
| 20 | Diabetes can cause loss of feeling in my hands, fingers and feet | 60.9 |
| 21 | Shaking and sweating are signs of high blood sugar | **10.1** |
| 22 | Frequent urination and thirst are signs of low blood sugar | **11.1** |
| 23 | Tight elastic socks are not bad for diabetics | **9.6** |
| 24 | A diabetics diet consist of mainly special food | **7.1** |

**Table 3: Chi-square relationship between Knowledge of T2DM and Age among Participants**

| SN | Questions | Age (years) | | | p-value |
|---|---|---|---|---|---|
| | | 11- 14 (%) | 15-17 (%) | 18-21 (%) | |
| 1 | Eating too much sugar and sweet causes diabetes | 14.4 | 24.8 | 28.9 | **0.021** |
| 2 | The usual cause of diabetes mellitus is lack of effective insulin | 25.9 | 39 | 50 | **0.001** |
| 3 | Diabetes mellitus is caused by failure of kidney to keep sugar out of the body | 5.8 | 15.2 | 21.1 | **0.003** |
| 4 | Kidney produce insulin | 10.1 | 11.9 | 15.8 | 0.467 |
| 5 | In untreated diabetes mellitus, the amount of sugar in the blood usually increase | 60.4 | 71.9 | 77.6 | **0.016** |
| 6 | If I am diabetic, my children have higher chance of h aving diabetes mellitus | 45.3 | 37.6 | 47.4 | 0.204 |
| 7 | Diabetes can be cured | 21.6 | 19.0 | 14.5 | 0.447 |
| 8 | Fasting blood sugar up to 210 is too high | 25.2 | 36.7 | 40.8 | **0.029** |
| 9 | The best way to check my diabetes is by testing my urine | 5.8 | 8.6 | 11.8 | 0.291 |
| 10 | Regular exercise will increase the need for insulin or other diabetes medication | 15.8 | 11.4 | 15.8 | 0.420 |
| 11 | There are two types of diabetes mellitus, type 1 and type 2 | 19.4 | 23.8 | 34.2 | 0.053 |
| 12 | An insulin reaction is caused by too much food | 20.1 | 21.4 | 25.0 | 0.707 |
| 13 | Medication is more important than diet and exercise to control my diabetes | 21.6 | 32.9 | 56.6 | **0.001** |
| 14 | Diabetes often cause poor circulation | 37.4 | 48.1 | 64.5 | **0.001** |
| 15 | Cuts and abrasion on diabetes heal more slowly | 59.7 | 74.8 | 81.6 | **0.001** |
| 16 | Diabetics should take extra care in cutting their toenails | 62.6 | 75.7 | 86.8 | **0.001** |
| 17 | A person with diabetes mellitus should clean wound with iodine and alcohol | 12.9 | 22.4 | 32.9 | **0.002** |
| 18 | The way I prepare my food is as important as the food I eat | 34.5 | 56.7 | 63.2 | **0.001** |
| 19 | Diabetes can damage my kidney | 60.4 | 61.4 | 80.3 | **0.006** |
| 20 | Diabetes can cause loss of feeling in my hands, fingers and feet | 54.7 | 61.4 | 71.1 | 0.062 |
| 21 | Shaking and sweating are signs of high blood sugar | 10.1 | 9.1 | 11.8 | 0.048 |
| 22 | Frequent urination and thirst are signs of low blood sugar | 5.0 | 10.5 | 23.7 | **0.001** |
| 23 | Tight elastic socks are not bad for diabetics | 8.6 | 9.0 | 13.2 | 0.515 |
| 24 | A diabetics diet consist of mainly special food | 8.6 | 7.1 | 3.9 | 0.438 |

**Table 4: Relationship between knowledge and socio -demographic variable of the participants**

| **Age** | Satisfactory (%) | Poor (%) | p-value |
|---|---|---|---|
| 11 – 14 | 19.4 | 80.6 | **0.001** |
| 15 – 17 | 38.6 | 61.4 | |
| 18 – 21 | 69.7 | 30.3 | |
| **Gender** | | | |
| Male | 40.4 | 59.6 | 0.271 |
| Female | 35 | 65 | |
| **BMI** | | | |
| Overweight | 70 | 30 | **0.001** |
| Normal | 41.9 | 38.1 | |
| Underweight | 31.6 | 68.4 | |
| **History of T2DM** | | | 0.614 |
| History | 39.3 | 60.7 | |
| No history | 36.8 | 63.2 | |

Statistical test: Knowledge and age = Pearson correlation; knowledge and gender = Chi -square; knowledge and BMI = Spearman correlation; knowledge and history of T2DM = Chi-square

**Table 5: Association betwee n Diabetes Attitude and Gender using the Independent T -test**

| Attitude | Overall (M±SD) | Boys (M±SD) | Girls (M±SD) | p-values |
|---|---|---|---|---|
| Special training | 4.35 ± 0.50 | 4.49 ± 0.57 | 4.51 ± 0.56 | 0.636 |
| Seriousness of NIDDM | 3.05 ± 0.44 | 3.07 ± 0.48 | 3.03 ± 0.39 | 0.323 |
| Value control | 2.79 ± 0.42 | 2.81 ± 0.38 | 2.78 ± 0.46 | 0.475 |
| Psychological impact | 3.93 ± 0.41 | 3.90 ± 0.44 | 3.93 ± 0.39 | 0.380 |
| Autonomy | 3.89 ± 0.45 | 3.82 ± 0.54 | 3.92 ± 0.46 | 0.047 |
| Total attitude | 3.63±0.27 | 3.64±0.27 | 3.63±0.27 | 0.724 |

NIDDM: Non Insulin Dependent Diabetes mellitus; SD: Standard Deviation. Statistical test; Independent T-test

**Table 6: Relationship between Attitude and Age using the pearson's product moment correlation coefficient**

| Attitude | (r) | p-value |
|---|---|---|
| Special training | 0.207** | 0.001 |
| Seriousness of NIDDM | 0.158** | 0.001 |
| Value control | 0.203** | 0.001 |
| Psychological impact | 0.253** | 0.001 |
| Autonomy | 0.133** | 0.006 |
| Total attitude | 0.324** | 0.001 |

** significant correlation Statistical test: Pearson rho correlation

**Discussion**

The study of the knowledge of diabetes in various populations has become quite significant in young people as part of measure to control the disease. However, knowledge of the disease is not sufficient to battle the menace; it presumes change in behavior, habit and attitudes[29]. Education is an important aspect of this process and through multidisciplinary school-based interventions to bridge the knowledge gap thereby facilitating an increase in the knowledge of T2DM.

This study examined the level of knowledge and attitude about T2DM among Hausa-speaking public school-going adolescents in Kano municipal, also explore the association between knowledge and attitude with demographic variables of age, gender, class and BMI categories. There was very low level of knowledge about T2DM which is associated with age, gender, class and BMI categories.

Majority (62.1%) of the participants had poor knowledge about T2DM, while only 37.9% had satisfactory knowledge and none of the participant had good knowledge. This is in contrast to a study that identified the knowledge gaps and risk factors among adolescents attending a public school in Lagos State where 66% of the respondents were aware of the condition[25]. Another study on knowledge and awareness of diabetes mellitus among adolescents in Port-Harcourt[24] showed a higher level of knowledge with 90% of the respondents being aware of diabetes mellitus. This disparity in figures may be due to the fact that both studies considered only the learners from senior classes and that could explain the reason for the higher level of knowledge. The difference could also be attributed to different outcome measure (DKQ) used to assess the level of knowledge in this study.

Level of class is another factor that influenced the level of knowledge about T2DM in this study. Students at higher classes are seen to have higher level of knowledge than those at lower classes (p= 0.01). This finding is consistent with a study that showed that learners from senior classes have better knowledge as regards diagnoses of diabetes mellitus than their junior counterparts[30]. Similarly, it was observed from this study that increase in level of knowledge is associated with increase in age. In addition, this finding is consistent with a study that

found a relationship between higher age and increased knowledge[20].

Regarding relationship with gender and knowledge of T2DM, some other studies have associated female gender with higher knowledge, while some have associated it with poorer knowledge and some have claimed that gender has no association with diabetic knowledge[31]. The findings of this study identified no significant difference in knowledge between boys and girls (40.3% and 35.0% respectively with p=0.271). This view is also shared by a study conducted in Lagos that observed no gender association with knowledge of T2DM[25].

As regards to the lifestyle risk factors for diabetes mellitus, 41.9% of the respondents had a family history of diabetes mellitus, which is in contrast with (62%) from Oman[32]. This huge discrepancy in Nigerian and International study could be attributed to the fact that the overall prevalence of diabetes mellitus in Nigeria is lower than that found in countries in other continents. And the higher percentage of participants with family history of diabetes obtained from this study in comparison to other Nigeria studies[25,30] may be due to the rapidity in increasing prevalence of diabetes mellitus in Kano State. Despite high percentage of participants with family history of diabetes, there was no significance difference in knowledge between those having family history and those with no family history of T2DM.

In relation to attitude the respondents in this study performed more positively. Most of them had a good attitude toward the disease. The study revealed that there is a significant relationship between age and class level with good attitude. Older students and those at higher classes are seen to have more positive attitude with p= 0.001. This coincides with some other studies that have shown that level of attitude increase in an ascending order of primary education, secondary education and tertiary education with a 0.003 p-value[33]. In contrast to these, a study that was conducted in University of Benin Teaching Hospital, Benin city showed that higher education had no effect on diabetic knowledge and attitude[3]. No significant association was seen to exist between attitude and gender in this study (p=0.724). Even though, this study considered only school-going adolescents, but the outcome corroborates with the results of a study that combined both adults and adolescents a Semi Urban Community in the South-South Region of Nigeria[33].

In 2008, the Center for Disease Control and prevention in a report stated that, children and adolescents are at risk if they are obese, insulin resistant, and have a family history of this disease[35]. Interestingly, in this study level of knowledge is seen to increase with an increasing order of BMI which is dissimilar to previous study where no significant association was found between BMI and level of knowledge (p=0.913)[25]. The reason for the association between knowledge and BMI in this study could be attributed to a higher level of health consciousness among obese/overweight individuals.

**Conclusion**

From the findings of this study it can be concluded that Hausa-speaking public school-going adolescents have poor knowledge but positive attitude towards T2DM. Therefore, a comprehensive health education and promotion program on Diabetes should be well thought-out to improve knowledge, lessen risk factors and to maintain the attitude among these public school-going adolescents.

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