

Knowledge of Diabetes Mellitus and Management Practices among Senior High School Teachers in Ghana

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Abstract: ***Background:** Educating teachers on diabetes mellitus is crucial to facilitate the appropriate care of the child with diabetes mellitus. The objectives of this study were (1) to determine the knowledge deficits about diabetes among school teachers in Ghana (2) to determine the knowledge on diabetes management practices among Senior High School teachers. **Methods:** A cross sectional descriptive study was carried out among 215 senior high school teachers from the western and central regions of Ghana. Data was collected using self-administered questionnaires during the period August, 2015 to February, 2016. **Results:** Majority of the teachers (97%) knew that diabetes is as a result of increased blood sugar levels. Majority (81.8%) of the teachers knew that DM can cause complications in other organs and only 20.0%, 15.8%, 7.5% and 21.3% perceived obesity, decreased physical activity, stress and consuming too much sugars and sweets respectively as risk factors of type 2 diabetes mellitus. Majority of the teachers reported television and radio as the main source of information for DM. Only 31% knew the treatment for low blood sugar is to drink some sugar containing drink or eat food, but majority (75%) also knew that exercise lowers blood sugar. The most important DM management practices reported by the teachers were to allow student to see the school nurse upon request; discussing with parent about student condition and school to provide diabetic training for teachers; student to have access to fluids and to have competency in using glucometer. DM management practices that were considered not important by the teachers were preventing diabetic student to take part in school excursions; preventing diabetic student from exercising at school; diabetic student to eat his or her meal anywhere in school; allowing student to perform self-injection of insulin; permission for student to check his/her blood sugar level in school and keeping sugar in class to treat low blood sugar. **Conclusion:** Our study results indicate that teachers have limited knowledge about diabetes management and practices and therefore there is the need of diabetes education training courses for school teachers to enable them to provide adequate care for children with diabetes.*

Keywords: Diabetes Mellitus, Senior High School Teachers, management practices, knowledge, Ghana.

1. Introduction

Diabetes prevalence is increasing globally, and Sub-Saharan Africa is no exception. The world is currently experiencing an epidemic of diabetes mellitus (DM). There were 266,200 cases of diabetes in Ghana in 2015 (IDF, 2015). Diabetes mellitus (DM) is one of the most common chronic childhood diseases (ADA, 2002), and the global incidence of type 1 diabetes in children below 14 years is increasing with an estimated overall annual increase of around 3% (Wild et al, 2004).

The majority of these children attend school and/or some type of day care, where they spend up to 10 hours a day in contact with the staff of the schools and the need for the staff to be knowledgeable in diabetes management, thereby providing a safe school environment. Crucial to achieving blood glucose control is an understanding of the effects of physical activity, nutrition therapy, and insulin on blood glucose levels. Younger children may not be adept at dealing with acute emergencies such as hypoglycemia (low blood sugar) and will be dependent upon the adult caring for them at the time; which in school time is the teacher. Teachers also need to be aware of the dietary needs of children with diabetes and of the need to take extra carbohydrate before exercise.

Diabetes management in school is the school's assistance and support to assure that the student who has diabetes feels safe and secure in the classroom setting, to have a normal

lifestyle and a positive school experience. This can be done through meetings with the family, teachers, other school personnel, health care providers, collectively develop an understanding of diabetes related needs of the individual student and develop individualized action plans for routine care, safety and emergencies (Wagner et al, 2007).

Effective diabetes management at school has numerous positive outcomes. It can promote a healthy, productive learning environment, promote full participation in all curricular and extra-curricular activities, achieve glucose control, and help assure effective response in case of diabetes-related emergency and better academic achievement (ADA, 2012).

Educating teachers on DM is crucial to facilitate the appropriate care of the student with DM. Both parents and the health care team must work together to provide school staff with the information necessary to allow children with diabetes to participate fully and safely in the school experience (ADA, 2012).

Despite the universal advocacy regarding appropriate care for children with diabetes in the school (ADA, 2008), inadequate diabetes knowledge, attitude and management among school personnel and worry about diabetes emergencies at school are still reported. Studies have shown that parents of children with diabetes lack confidence in their teachers' ability to manage diabetes effectively (Nabors et al, 2003; Husband et al, 2001).

A study in Egypt by Ensaf and Gawwad (2008) found that only 18.6 percent of teachers had got good total score of diabetes management practices for their diabetic students. The most frequent practices mentioned were trying to have competency in using glucometer, and allowing students to use restroom as needed. Developing an emergency action plan and monitoring diabetic students during school hours were the least mentioned practices.

A qualitative study in Ghana carried out by Kratzer, J (2012) to look at the structural barriers to coping with type 1 DM showed that parents were worried that teachers wouldn't remember to give their child a snack break at the appropriate times. In that same study, another parent also stated that while physical activity is a recommended component of properly managing diabetes; teachers restricted her daughter from athletic activities enjoyed by the rest of the class. The parents recalled that teachers expressed concern that she can go into a coma, and they did not know how to deal with it.

Studies by Aycan et al (2012) carried out in Turkey also showed that teachers had limited knowledge on diabetes. These studies indicate both a lack of diabetic knowledge and the inadequacy of information offered to teachers.

Studies on knowledge of DM among school teachers are lacking in Ghana and results of such findings may help policy makers to determine diabetes training needs of school teachers and their readiness to assist children in diabetes management when necessary. The aim of the study was to determine the knowledge of diabetes among school teachers in Ghana in order to determine their diabetes training needs and their preparedness to provide adequate care for children with diabetes. The specific objectives were: to determine the knowledge deficits about diabetes among school teachers in Ghana; to determine the knowledge on diabetes management practices among Senior High School teachers.

2. Methodology

A cross-sectional descriptive study was carried out among 215 randomly sampled Senior High School teachers in the Central and Western Regions of Ghana during the period of August, 2015 to February, 2016. Approval for the study was sought by contacting the headmasters and headmistresses of the various schools through personal meeting to orient them about the purpose of the study and get their permission to conduct the study. The inclusion criteria were teachers affiliated to the chosen schools who agree to participate in the study. The exclusion criteria were teachers who declined to participate, incompletely filled questionnaire and non-teaching staff.

A self-administered structured questionnaire was used for data collection. The questionnaire was grouped into three sections. The first section included data about socio-demographic characteristics, teaching experience, subject taught, their position in school, knowledge of any child with diabetes in their class. The second section consisted of questions to assess teachers' knowledge on diabetes, which comprises of 19 YES/NO items entailing types of DM, causes, signs and symptoms of hypoglycemia and hyperglycemia, risk factors, effects of diet and exercise on

blood sugar. In order to correct for "guessing", each question included an option answer, "I don't know".

Teachers' knowledge toward diabetes management practices was assessed using 20 statements, using 4 points Likert scale options (not important, somewhat important, important, and very important). This section elicited the teachers' attitude toward the student with diabetes relevant to the school environment, views about teachers and family responsibility to take care for these students, their role in educating students about DM, their readiness to manage DM emergencies and their willingness to receive training about diabetes. The teachers' management practices scale was developed based on the American Diabetes Association (2012) recommendations for diabetes care in schools (ADA, 2012).

3. Statistical Analysis

Descriptive analysis of the data was done using SPSS version 19 (SPSS Inc, Chicago, IL). Univariate analysis such as proportions and bar graph were conducted to provide a summary on the socio demographic characteristics, sources of information, teachers' knowledge on diabetes mellitus, and diabetes management practices.

4. Results

Table 1: Socio-demographic characteristics of respondents

Characteristics	Frequency(N)	Percent (%)
Age		
20-29	35	17.3
30-39	102	50.5
40-49	48	23.8
50-59	17	8.4
Total	202	100.0
Gender		
Male	176	82.6
Female	37	17.4
Total	213	100.0
Marital status		
Single	66	30.8
Married	143	66.8
Courting	5	2.3
Total	214	100.0
Educational level		
SHS/Vocational	2	0.9
Tertiary/Polytechnic	127	59.1
Postgraduate	86	40.0
Total	215	100.0
Religion		
No religion	4	1.9
Christian	188	87.9
Islam	22	10.3
Total	214	100.0
Years of teaching		
<1 year	14	6.5
1-5 years	68	31.8
6-10 years	38	17.8
11-15 years	41	19.2
16-20 years	30	14.0
>20 years	23	10.7
Total	214	100.0

Subject taught		
Science	59	28.9
Mathematics	29	14.2
Arts/Social Sciences	73	35.8
Business	35	17.2
Vocational/Technical	8	3.9
Total	204	100.0

Demographics of study Respondent's

A total of 215 respondents' (82.6% males; 17.4% females) participated in the study. Majority of the respondents were within the 30-39 age group (50.5%), followed by the 40-49 age group (23.8%) respectively. The mean age of the school teachers was 36.8±8.0 years. Majority (66.8%) were married. The highest educational level of the teachers were tertiary (59.1%), with 40.0% of them with postgraduate education. Majority (31.8%) have taught for 1-5 years; 10.7% with >20 years of teaching experience. Most subjects taught were arts & social sciences and science by 35.8% and 28.9% of the teachers respectively (Table 1).

Sources of information about Diabetes

Figure 1 depicts sources of information about diabetes by the teachers. Majority (28.7%) reported television as the main source of information, followed by radio (21.6%). Majority (81%) of the teachers also reported that diabetes education should be added to the school curriculum.

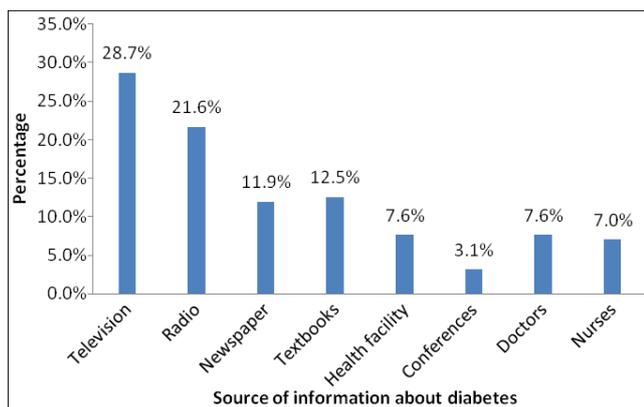


Figure 1: Sources of information about diabetes

Teachers' knowledge on Diabetes Mellitus

Knowledge on elements of DM is shown in Table 2. Majority (97.0%) of the teachers knew that diabetes is as a result of increased blood sugar levels. Majority (39.1%) did not know the types of DM, but 31.9%, 23.0% and 6.0% knew about type 1, type 2 and gestational diabetes mellitus respectively. Frequent urination was identified as a symptom of DM by 67.8% of the teachers, followed by tiredness (53.6%), weight loss (53.2%) and excessive thirst and hunger (46.1%) respectively.

Majority (81.8%) of the teachers knew that DM can cause complications in other organs. Poor wound healing were identified as complication by 84.8% of the teachers, followed by foot ulcers and amputation (76.4%), kidney problems (69.5%), heart problems (65.7%), vision problems (61.2%) and loss of feelings in hands, fingers and feet (56.0%) respectively.

About 136 (35.3%) of teachers perceived family history as an important risk factor for developing DM and only 20.0%, 15.8%, 7.5% and 21.3% perceived obesity, decreased physical activity, stress and consuming too much sugars and sweets respectively as risk factors for DM. Only 88 (42.3%) were able to identify shaking and sweating as a sign of low blood sugar. Only 66 (31.0%) knew the treatment for low blood sugar is to drink some sugar containing drink or eat food, but majority (40.1%) reported that fruit juice raises blood sugar. Majority 159 (75%) also knew that exercise lowers blood sugar.

Teachers' knowledge on diabetes management practices.

Table 3 shows teachers' knowledge on diabetes management practices for children with diabetes. The most very important DM management practices reported by the teachers were to allow student to see the school nurse upon request (60.5%), followed by discussing with parent about student condition (59.7%), and followed by school to provide diabetic training for teachers (57.8%) respectively.

Other practices that were deemed very important by the teachers are student to have access to fluids (49.3%), talking about diabetes with diabetic student and all students (47.9%) and to have competency in using glucometer (46.0%).

Diabetes management practices that were considered not important by the teachers were preventing diabetic student to take part in school excursions (64.8%), preventing diabetic student from exercising at school (57.6%), diabetic student to eat his or her meal anywhere in school (52.2%), allowing student to perform self injection of insulin (42.1%), permission for student to check his/her blood sugar in school (35.2%) and keeping sugar in class to treat low blood sugar (34.6%).

Table 2: Teachers Knowledge on Diabetes Mellitus

Knowledge	Yes Responses N (%)
1. Diabetes is as a result of : Increased blood sugar levels Decreased blood sugar levels	191(97.0) 6(3.0)
2. Types of DM: Type 1 diabetes Type 2 diabetes Gestational diabetes Don't Know	79(31.9) 57(23.0) 17(6.0) 97(39.1)
3. Symptoms of DM: Frequent urination Tiredness Weight loss Excessive thirst and hunger	143(67.8) 111(53.6) 109(53.2) 95(46.1)
4. DM can cause complications in other organs	171(81.8)
5. Complications of DM: Poor wound healing Kidney problems Loss of feelings in hands, fingers and feet Vision problems Heart Problems Foot ulcers and amputation	178(84.8) 141(69.5) 116(56.0) 128(61.2) 138(65.7) 159(76.4)
6. Risk factors for type 2 DM: Obesity Decreased physical activity Family history of diabetes Stress	77(20.0) 61(15.8) 136(35.3) 29(7.5)

Consuming too much sugars and sweets	82(21.3)
7. Shaking and sweating are signs of low blood sugar	88(42.3)
8. Frequent urination and thirst are signs of high blood sugar	120(57.8)
9. How to treat low blood sugar: Exercise Lie down and rest Drink some sugar containing drink or eat food Don't know	69(32.4) 8(3.8) 66(31.0) 70(32.9)
10. Effect of fruit juice on blood sugar: Lowers it Raises it Has no effect Don't know	22(10.4) 85(40.1) 25(11.8) 80(37.7)
11. Effect of exercise on blood sugar: Lowers it Raises it Has no effect Don't know	159(75.0) 3(1.4) 8(3.8) 42(19.8)

Table 3: Teachers Knowledge on diabetes management practices

Management Practices	Frequency %			
	Not important	Somewhat important	Important	Very important
1.To have competency in using glucometer	8(3.7)	22(10.2)	86(40.0)	99(46.0)
2.Allowing student with diabetes to use restroom	31(14.5)	55(25.7)	82(38.3)	46(21.5)
3.Allowing student to perform self injection of insulin	90(42.1)	35(16.4)	50(23.4)	39(18.2)
4.Permission for student to check his/her blood sugar in school	75(35.2)	44(20.7)	51(23.9)	43(20.2)
5.To have competency in insulin injection	15(7.4)	32(15.8)	84(41.4)	72(35.5)
6.Preventing diabetic student from eating sweet at school	19(9.4)	22(10.9)	70(34.7)	91(45.0)
7.Diabetic student to eat his/her meal anywhere in school	109(52.2)	37(17.7)	39(18.7)	24(11.5)
8.Talking about diabetes with diabetic student and all	24(11.4)	18(8.5)	68(32.2)	101(47.9)
9.Make list of diabetic student medications and usage	24(11.4)	31(14.8)	80(38.1)	75(35.7)
10.Reminding diabetic student to take snack at time schedule	16(7.7)	36(17.2)	79(37.8)	78(37.3)
11.Student to see the school nurse upon request	7(3.3)	10(4.8)	66(31.4)	127(60.5)
12.Keeping sugar	72(34.6)	39(18.8)	58(27.9)	39(18.8)

in class to treat low blood sugar				
13.Asking parent to provide glucometer to the school	38(18.1)	38(17.7)	70(33.3)	64(30.5)
14.Observe diabetic student at all day at school	32(15.2)	48(22.7)	82(38.9)	49(23.2)
15.Preventing diabetic student from exercising at school	121(57.6)	39(18.6)	29(13.8)	21(10.0)
16.Discussing with parent about student condition	4(1.9)	14(6.6)	67(31.8)	126(59.7)
17.School should provide diabetic training for teachers	6(2.8)	18(8.5)	65(30.8)	122(57.8)
18.Student to have access to fluids(i.e. water)	4(1.9)	14(6.6)	89(42.2)	104(49.3)
19.Prevent diabetic student to take part in school excursions	136(64.8)	32(15.2)	25(11.9)	17(8.1)

5. Discussion

Studies on the knowledge of DM and its management practices by school teachers in Ghana are not available. Our study provided insights about teachers understanding of DM and how they will manage children with DM in school, which can lay the groundwork for future training of school teachers and policy.

To achieve good blood glucose control, a child must check blood glucose frequently, monitor food intake, take medications and engage in regular physical activity (ADA,2008), and to facilitate the appropriate care of the student with diabetes, the school nurse as well as other school and day care personnel must have an understanding of diabetes and must be trained in its management and in the treatment of diabetes emergencies (NIH,2012;ADA,2012).

Knowledgeable trained personnel are essential if the student is to avoid the immediate health risks of low blood glucose and to achieve the metabolic control required to decrease risks for later development of diabetes complications. Various research studies have shown that children with DM do not have appropriate diabetes care in school (Hayes-Bohn et al,2004; Lewis et al, 2003).

The ADA(2012) has set forth recommendations for school authorities on diabetes care in the school and day care setting, some of which are (1)opportunities for the appropriate level of on-going training and diabetes education for the school nurse (2) Level 1 training for all school staff members, which includes a basic overview of diabetes, recognition of hypoglycaemia and hyperglycemia, blood glucose monitoring, insulin administration and glucagon administration when a school nurse is not available (3) immediate accessibility to the treatment of hypoglycaemia by a knowledgeable adult. (4) accessibility to scheduled

insulin at times scheduled by the healthcare provider (5) a location in the school that provides privacy during blood glucose monitoring and insulin administration (6) permission for the student to check his or her blood glucose level and take appropriate action to treat hypoglycemia in the classroom or anywhere the student is in conjunction with a school activity (7) permission for self-sufficient and capable students to carry equipment, supplies, medication, and snack; to perform diabetes management tasks; and to have cell phone access to reach parent and healthcare provider (8) permission for the student to see the school nurse and other trained school personnel upon request (9) permission for the student to eat a snack anywhere, including the classroom or the school bus, if necessary to prevent or treat hypoglycaemia (10) permission to miss school without consequences for illness and required medical opportunities to monitor the students diabetes management (11) permission for the student to use the restroom and have access to water as necessary (12) an appropriate location for insulin and or glucagon storage, if necessary (13) information on serving size and caloric, carbohydrate, and fat content of foods served in school.

In our study, it was encouraging that majority of the teachers (97%) knew that DM was as a result of increased blood sugar levels, but not the various types of DM and majority (81.8%) knew that DM causes complications in other organs. Knowledge of the visible complications of DM such as poor wound healing, foot ulcers and amputation appeared to be better than knowledge of non-visible complications such as loss of feelings in hands, fingers and feet.

Majority of the school teachers (>50%) were able to recognize frequent urination, tiredness and weight loss as symptoms of DM. The study showed that knowledge regarding the risk factors for type 2 diabetes were poor with only 20.0% and 15.8% of the teachers reporting obesity and decreased physical activity as risk factors of DM. Not able to recognize obesity as a risk factor for diabetes may be due to the fact that overweight is considered as a sign of wealth in poor and developing countries. However, 35.3% were able to state family history as a risk factor for DM.

Our study also showed that majority of the teachers (57.7%) were not able to identify shaking and sweating as a sign of low blood sugar and 69.0% did not know the treatment for low blood sugar is to drink some sugar containing drink or eat food. But majority (75%) knew that exercise lowers blood sugar.

Teachers' DM management practices were usually a reflection of their knowledge, beliefs and perceptions. Despite such perceptions, the most very important DM management practices cited by them were to allow student to see the school nurse upon request; discussing with parent about student condition, whiles they do not consider the rest of the management practices in table 3 as very important.

A reason for the lack of basic knowledge among school teachers includes lack of pre-service and in-service training on DM, since majority (81.0%) of them reported that DM education should be added to the school curriculum and

57.8% stated that the school should provide diabetic training for teachers.

In our study, the main sources of information about diabetes cited by the teachers were television and radio. This may be attributed to the recent awareness on diabetes by the media in Ghana. Doctors and nurses play insignificant role in educating teachers about DM from our study.

Our study is subjected to the following limitations. The low sample size limits the generalization of our findings. Nevertheless, our findings provide highlight what teachers know, and are willing to do for children with diabetes in schools. Also as in any self-administered questionnaire, the respondents' could suffer from recall bias.

6. Conclusion

The results reveal that teachers have inadequate knowledge of the basic facts of diabetes and management of children with diabetes in schools, a situation which could have dangerous consequences for the child with diabetes. Continuous in-service training programs in diabetes should be implemented in schools for teachers, which will prepare them to offer assistance to their students whenever it is needed.

7. Author's Contribution

IA contributed to the study concept and design. IA, NAB, and SE contributed to interpretation and discussion of data. JPC contributed to the data collection and analysis of data.

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