Assessment of the Knowledge, Attitude and Management Practices of Type 1 Diabetes Mellitus among Primary School Teachers in Tabouk City, Saudi Arabia

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ABSTRACT

Background: Diabetes mellitus (DM) is one of the most common chronic childhood diseases. For children, public schools are important locations for secondary prevention interventions to help them minimize their risk for complications associated with DM. Despite the universal recommendations and advocacy regarding appropriate care for children with diabetes in the school, inadequate diabetes knowledge, attitude and management among school personnel, a desire for more flexibility regarding glucose monitoring and timing of food, a need for better nutritional information regarding cafeteria foods, and worry about diabetes emergencies at school were still reported.

Objectives: To assess the school teachers' knowledge, attitude and management practices of the clinical presentation and consequences of type1 diabetes mellitus among children in the primary school.

Subjects and Methods: A cross sectional analytic study was conducted among a representative sample of primary school teachers working in governmental schools in Tabuk, Saudi Arabia, 2011-2012. Stratified random sample technique was adopted according to geographical location of schools. Ten governmental primary schools (5 for boys and 5 for girls) were randomly selected. The researcher invited 250 teachers randomly by proportional allocated stratified technique to participate in the study. A self-administrated Arabic questionnaire, designed by the researcher for diagnosis and management of Diabetes mellitus type 1 has been used. This questionnaire was validated by three consultants (Endocrinology, Internal medicine and family medicine consultants). It included questions covering 3 topics; socio demographic features, general knowledge of diabetes mellitus type 1 with its diagnosis and coexisting conditions, and its complications, management and attitude.

Results: Out of 250 teachers invited to participate in the study, 221 returned completed questionnaire with a response rate of 88.4%. Their mean age was 32.9 ±4.2 years. Only nine teachers (4.1%) reported that they have attended courses or lectures regarding type 1 Diabetes mellitus. overall, the teachers` knowledge of type 1 DM was insufficient in more than half of them (59.3%) and good in 40.7%. Very good and excellent levels of knowledge were not reported in any teacher. Good level of knowledge was reported among 46% of male teachers compared to 35.2% of female teachers. Higher level of education, attending courses/lectures about type 1 DM, older age (26-35 years) and more experience were the main factors associated with better type 1 DM knowledge and practice of teachers.

Conclusion: The results reveal that teachers have inadequate knowledge of some of the basic facts of diabetes and its treatment, a situation, which could have dangerous consequences for the child and complicate his or her schooling in a number of ways.

Keywords: Diabetes Type 1; Knowledge; Attitude; School Teachers; Saudi Arabia.

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INTRODUCTION

Diabetes mellitus (DM) is one of the most common chronic childhood diseases.[1] The global incidence of type 1 diabetes in children below 14 years is increasing with an estimated overall annual increase of around 3%.[2]

The prevalence of type 1 diabetes for Unites States residents aged 0-19 years is 1.7 per 1000.[3] In Saudi Arabia, the incidence rate was estimated among children between 0-14 years in 2003 to be 12.3 cases per 100,000 per year.[2] The overall prevalence of DM (type 1) among Saudis is 0.23%, and the overall prevalence of type 2 is 0.12% in those below the age of 14 years.[4] Medical experts strongly believe that the actual prevalence of DM among children and adolescents in the Saudi Arabia is much higher than that reported. For children and adolescents, public schools are important locations for secondary prevention interventions to help

them minimize their risk for complications associated with DM.[5] 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 meeting 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.[6]

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 glycemic control, help assure effective response in case of diabetes-related emergency and better academic achievement.[6,7] To facilitate the appropriate care of the student with DM, school personnel must have an understanding of DM and must be trained in its management and in the treatment of diabetes emergencies to provide a safe environment. 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.[8,9]

Despite the universal recommendations and advocacy regarding appropriate care for children with diabetes in the school, inadequate diabetes knowledge, attitude and management among school personnel,[10-12] a desire for more flexibility regarding glucose monitoring and timing of food, a need for better nutritional information regarding cafeteria foods,[13] and worry about diabetes emergencies at school were still reported.[11] Studies have shown that parents of children with diabetes lack confidence in their teachers' ability to manage diabetes effectively.[13,14] Attempts have been made to address teachers' knowledge deficits.[15-17] Consequently, diabetes education must be targeted toward teachers, and other school personnel to help them to be in possession of relevant management and interpersonal skills for providing some elements of guidance and counseling relating to students with DM when necessary.[18]

The aim of this study is to assess diabetes related knowledge, attitudes and management practices among school teachers in Tabouk, Saudi Arabia, in order to determine their diabetes training needs and preparedness to provide adequate care for students with diabetes.

METHADOLOGY

A cross sectional analytic study was carried out including representative sample of Arabic-speaker primary school teachers working in governmental schools in Tabuk, Saudi Arabia, 2012-2013, who are present at the time of the study and willing to participate in it. Tabuk is the provincial capital and headquarters of the Governor of the Tabuk region, situated in northwestern Saudi Arabia. It included 128 primary governmental schools (61 for boys and 67 for girls).

The total number of the primary governmental` school teachers in Tabuk is 3175 teachers (1571 male teachers for boys` governmental schools and 1604 female teachers for girls` governmental schools).

Assuming that, from the literature review of the same subject, the poor knowledge of teachers about DM type 1 as average as 20% according to study conducted in Riyadh city, Saudi Arabia, 2008 to assess diabetes-related knowledge, attitudes and management

practices among school teachers.[19] Setting the confidence level of 95% and sample error of 5%, using the Raosoft sample size calculator program, the sample size calculation will be 229 teachers.[20] In order to compensate for drop out, the sample size will be increased to 250 teachers.

Stratified random sample technique was adopted according to geographical location of schools. Ten governmental primary schools (5 for boys and 5 for girls) were randomly selected. The researcher invited 250 teachers randomly by proportional allocated stratified technique to participate in the study. Teachers represented all grades. This followed by using a numbered list of teachers` names in all selected schools through online random number generator software.[21]

A self-administrated questionnaire for diagnosis and management of Diabetes mellitus type 1 was used. It was designed by the researcher in Arabic language. This questionnaire has been validated by three consultants (Endocrinology, Internal medicine and family medicine consultants). It included questions covering 3 topics; socio demographic features, general knowledge of diabetes mellitus type 1 with its diagnosis and coexisting conditions, and its complications, management and attitude.

The first part: Included information on demography and personal characteristics of participants (age, nationality, specialty, scientific degree, years of teaching experience, previous education in school field or other source in DM type 1 and if they had ever requested an evaluation of a child whom they suspected of having DM type 1, or if they ever teach a child who was diagnosed to have DM type 1).

In the second part: It consisted of 10 questions related to common symptoms and complication of diabetes relevant to a teacher's understanding of the problems of the diabetic child. In each case the teacher had to choose between agree, disagree or 'not sure' (this option was included to reduce the incidence of guessing). Teachers were asked not to consult books or colleagues when completing the questionnaire.

The third part: Teachers' attitudes toward diabetes management and education at school measure were developed including 15 statements. In each case, the teacher has to choose between two alternatives and "not sure". This measure elicited their attitude toward diabetic students, should they treated the same as other peers, views about teachers 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. For each item, a score of 1-3 was given with higher score for more favorable attitude.

Self-administrated questionnaires were distributed on selected teachers and collected after half an hour. The data collection was implemented at regular day working hours during the break and free class time according to each teacher in teachers room over 5 weeks period. Each questionnaire took 15 to 20 minutes to be filled. 3 days were spent in each school of the total 10 schools in Tabuk.

A pilot study was conducted in a randomly selected primary school to test if questionnaire is understandable and acceptable. After achieving its aims, the collected questionnaires from this center were omitted from the main study.

Written permissions from Program of Family and Community Medicine and Ministry of Education were obtained before conducting the research. Permission of all primary school

directors and teachers who participated in the study were obtained. The researcher tried his best not to disturb the primary schools; he visited all the schools after arranging with the schools directors. The individual consent from each teacher to participate in the study was a prerequisite for data collection. It was written on front page of questionnaire that (Answering questionnaire means agreement of participation in the study). The data were verified by hand then coded and entered to a personal computer using SPSS software statistical program version 19. Significance was determined at p value < 0.05. Continuous variables were presented as means and standard deviation while categorical variables were presented as frequencies and percentages. Bivariate analysis of mean percentage of knowledge subscale scores with regard to independent variables was done by unpaired t test and one-way analysis of variance (ANOVA) statistical tests. Least significance difference test (LSD) test was used for post hoc comparisons of ANOVA. Teachers` knowledge was categorized according to the mean knowledge score into four categories; insufficient (mean score ≤ 60%), good (mean score 61-75%), very good (mean score 76-85%) and excellent (mean score >85%).

Table 1: Demographic characteristics of the study group (n=221).

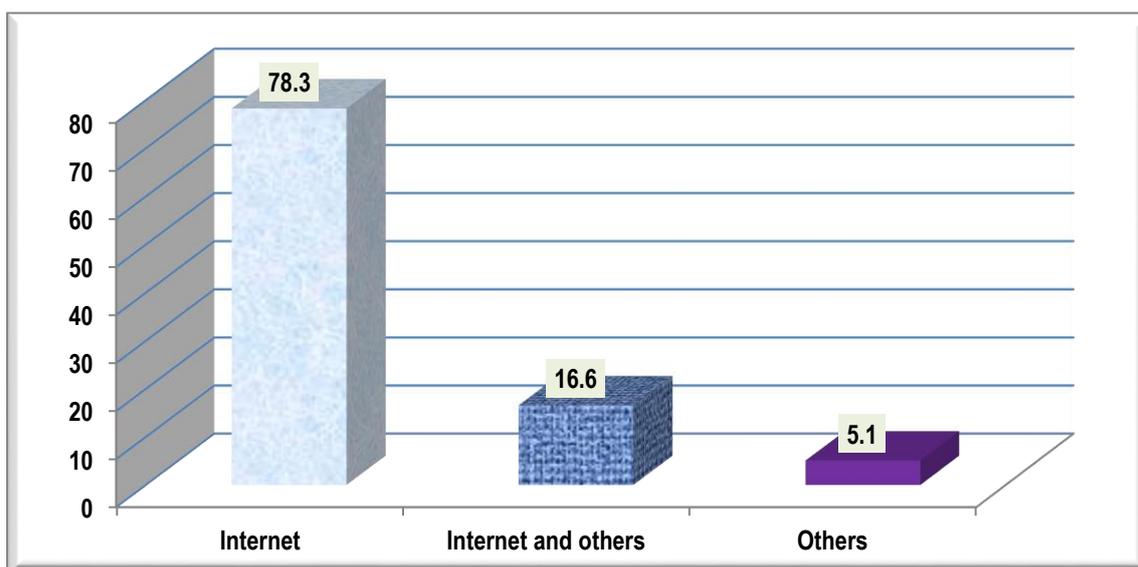| Characteristics	No.	%
Age in years		
≤26	7	3.2
26-35	147	66.5
>35	67	30.3
Mean±SD	32.9 ±4.2	
Gender		
Male	113	51.1
Female	108	48.9
Years of experience		
<5	13	2.9
5-10	118	53.4
>10	90	40.7
Nationality		
Saudi	198	89.6
Non Saudi	23	10.4
Qualification		
University	213	96.4
Diploma	8	3.6
Specialty		
Arabic	88	39.8
Religious	28	12.7
Mathematics	54	24.4
Others	51	23.1
Teaching grade		
1-4	185	83.7
5-6	36	16.3

Figure (1): Teachers` source of information about type 1 Diabetes mellitus.

RESULTS

Out of 250 teachers invited to participate in the study, 221returned completed questionnaire with a response rate of 88.4%.

Table 1 shows that almost two-thirds of the teachers (66.5%) were in the age group 26-35 years. The mean age was 32.9 ±4.2 years. Slightly more than half of them were males (51.1%). The years of experience ranged between 5 and 10 years in more than half of them (53.4%) while they were more than 10 years in 40.7% of them. The majority of them were Saudi (89.6%), and university graduated (96.4%). Mora than one third of them (39.8%) were Arabic teachers while 24.4% taught mathematics. Most of them taught grades one to four (83.7%).

Most of the teachers claimed that they have information about type 1 DM, yet, they were not enough (81%) while 8.1% of them claimed that they had enough information. Twenty-four teachers (10.9%) reported that they had no information about type 1 DM. Only nine teachers (4.1%) reported that they have attended courses or lectures regarding type 1 Diabetes mellitus.

Slightly less than two-thirds of the teachers (62.4%) have heard of type 1 DM. In the majority of those have heard of DM, the source of information was the internet either alone (78.3%) or in combination with other sources as newspapers, media and books

(16.6%) as displayed in figure (1). Only seven teachers (3.2%) reported a history of evaluating type 1 diabetic students.

Table (2) presents the knowledge of the teachers about symptoms, signs and complications of type 1 DM. Most of them recognized that loss of body weight (82.4%), tiredness and/or generalized body ache (81.9%), delayed wound healing (71.5), diuresis (76.5) and polydipsia (78.7%) are the common symptoms of type 1 DM.

Coma was reported correctly as a sign of complicated type 1 DM by 81.4% of the teachers. On the other hand, only 2.3% and 3.2% of the teachers answered correctly that increase body weight and joint pains are not among type 1 DM symptoms. All of the participants wrongly believed that loss of appetite is a symptom of type 1 DM and only 5.9% of them reported that abdominal pain is not a symptom of DM.

As displayed in figure (2), overall, the teachers` knowledge of type 1 DM was insufficient in more than half of them (59.3%) and good in 40.7%. Very good and excellent levels of knowledge were not reported in any teacher. Good level of knowledge was reported among 46% of male teachers compared to 35.2% of female teachers. This difference was statistically significant, p=0.006.

Table 2: Knowledge of the teachers about symptoms, signs and complications of type 1 Diabetes mellitus (n=221).

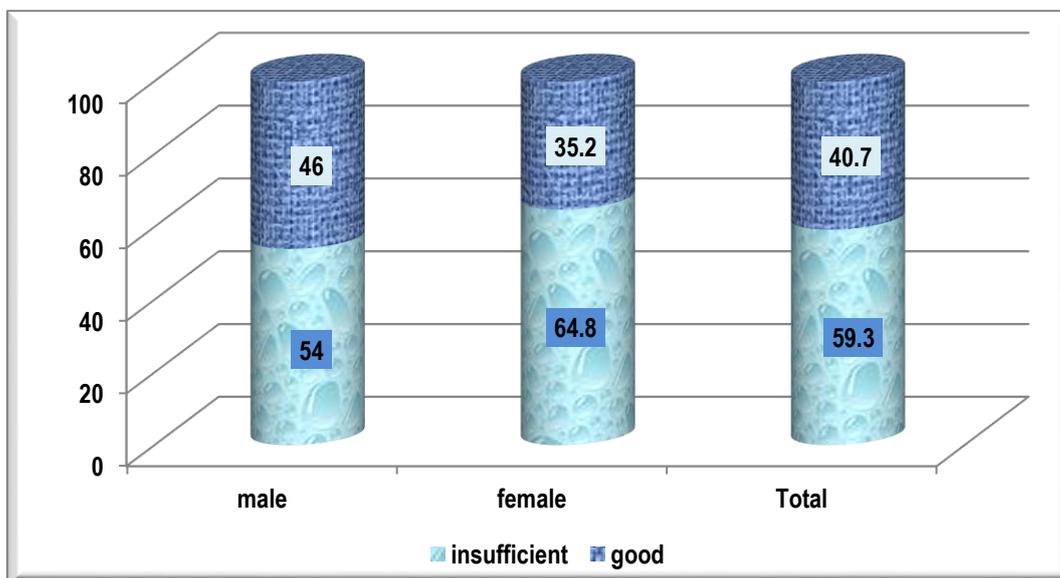| Symptoms	Right answer	
	No.	**%**
Loss of body weight (true)	182	82.4
Tiredness and/or generalized body ache (True)	181	81.9
Delayed wound healing (True)	158	71.5
Diuresis (True)	169	76.5
Polydepsia (True)	174	78.7
Coma (True)	180	81.4
Increase body weight (False)	5	2.3
Loss of appetite (False)	0	0.0
Joint pain (False)	7	3.2
Abdominal pain (False)	13	5.9

Figure (2): level of type 1 DM knowledge among teachers by gender.

FACTORS ASSOCIATED WITH TEACHERS` KNOWLEDGE OF TYPE 1 DM

Demographic Factors

As shown in table (3), the highest knowledge score level was reported among teachers in the age group 26-35 years followed by those over 35 years while the score among young teachers (≤25 years) was the lowest (the mean percentage of knowledge scorers were 50.9±8.8, 45.7±19.1 and 21.4±26.7, respectively. This difference was statistically significant, p<0.001. Similarly, the highest knowledge score level was reported among teachers whose experience ranged between 5 and 10 years followed by those whose experience was more than 10 years while the score among teachers whose experience was less than 5 years was the lowest (the mean percentage of knowledge scorers were 50.4±8.5, 48.0±17.6 and 32.3±22.8, respectively. This difference was statistically significant, p<0.001. Mean percentage of knowledge score was significantly higher among non-Saudi teachers compared to Saudi teachers (56.1±5.0 versus 47.5± 15.0, p=0.007). Mean percentage of knowledge score was significantly higher among university graduated teachers compared to those having Diploma degree (49.4±13.7 versus 20.0± 2.9, p<0.001). Regarding teachers` speciality, the mean knowledge score was higher among Arabic teachers (51.6±14.7)

and teachers of other subjects as Science, Social studies, English, physical education (50±12) than teachers of religious subjects (42.5±16.5) and Mathematics (44.6±13.8), p=0.004. Teachers` gender and grade of teaching were not significantly associated with their knowledge.

DM Type 1 Information and Experience

Table (4) shows that teachers whose main source of information was internet either alone or with other sources had higher knowledge score than those whose main source of information was other than internet as newspapers, media and books (50.8±16 versus 40±5.8, p=0.046). Type 1 DM knowledge was significantly higher among teachers who has attended training DM courses or lectures than those who did not attend such courses or lectures (55.6±5.3 versus 48.1±14.7, p=0.002). Teachers who have heard of type 1 DM had higher level of knowledge about it than those who did not aware of type 1 DM (50.4±15.9 versus 45.1±11.2, p=0.008). Type 1 DM knowledge was significantly higher among teachers who has evaluated DM students than those who did not (60±6.3 versus 48±14.6, p<0.001). Teachers who claimed that they have enough information about type 1 DM had higher level of knowledge about it than those who claimed that they have no information about the diseases (62.2±4.3 versus 45.8±14.8, p<0.001).

Table 3: Mean percentage of score reflecting knowledge of the teachers about type 1 Diabetes mellitus according to their demographic characteristics.

Characteristics	Mean %	SD %	P
Age in years			
≤ 25 (7)	21.4	26.7	
26-35 (147)	50.9	8.8	
>35 (67)	45.7	19.1	<0.001*
Years of experience			
<5 (13)	32.3	22.8	
5-10 (118)	50.4	8.5	
>10 (90)	48.0	17.6	<0.001*
Gender			
Male (113)	47.9	17.1	
Female (108)	48.9	11.2	0.605**
Nationality			
Saudi (198)	47.5	15.0	
Non Saudi (23)	56.1	5.0	0.007**
Qualification			
Diploma (8)	20.0	2.9	
University (213)	49.4	13.7	<0.001**
Speciality			
Arabic (88)	51.6	14.7	
Religious (28)	42.5	16.5	
Mathematics (54)	44.6	13.8	
Others (51)	50.0	12.0	0.004*
Teaching grade			
1-4 (185)	47.8	13.1	
5-6 (36)	51.4	20.0	0.173**

*ANOVA test   ** Student` t-test

Table 4: Mean percentage of score reflecting knowledge of the teachers about type 1 Diabetes mellitus according to their information and training.

Characteristics	Mean %	SD %	P
Source of information			
Internet (108)	50.8	16.0	
Internet and others (23)	50.7	10.2	
Others (7)	40.0	5.8	0.046*
Attending DM type 1 courses			
Yes (9)	55.6	5.3	
No (212)	48.1	14.7	0.002**
DM type 1 awareness			
Yes (138)	50.4	15.9	
No (83)	45.1	11.2	0.008**
Evaluating diabetic student			
Yes (7)	60.0	6.3	
No (214)	48.0	14.6	<0.001**
DM type 1 information			
Yes, enough (18)	62.2	4.3	
Yes, not enough (24)	57.5	4.4	
No (179)	45.8	14.8	<0.001*

*ANOVA test, **Student` t-test

Table 5: Practice and attitude of the teachers towards type 1 Diabetes mellitus (n=221).

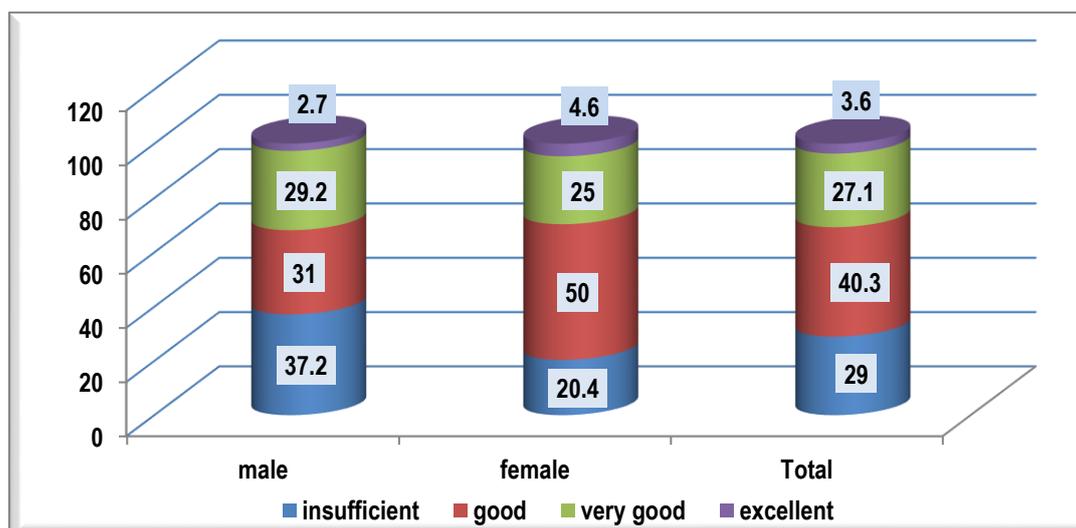| STATEMENTS RELATED TO PRACTICE AND ATTITUDE (RIGHT RESPONSES)	Right answer	
	No.	%
- The blood sugar level increase in untreated cases.	177	80.1
- Insulin leads to lowering of blood sugar level.	180	81.4
- Insulin given in the form of injections.	206	93.2
- Diabetic student needs special precautions before physical activity.	167	76.5
- A diabetic student complains of excessive thirst, vomiting and stomach pain in case of increase in the blood sugar level.	131	59.3
- The school could cope successfully with the aforementioned situation.	121	54.8
- A diabetic student complains of dizziness, sweating, loss of concentration in case of decrease in the blood sugar level.	85	38.5
- The school could cope successfully with the aforementioned situation.	137	62.0
- A diabetic student needs a special meal during school time.	154	69.7
- A diabetic student needs a balanced diet	191	86.4
- A diabetic student should not loss or postpones his meal.	105	47.5
- A diabetic student should have a light snake during school day.	153	69.2
- a diabetic child should be allowed to eat sweet in class	96	43,4
- A diabetic student should allow sharing in social events at or outside school.	47	21.3
- If the diabetic child is ill in school should he be either left on his own or sent home on his own?	206	93.2

Figure (3): level of type 1 DM practice and attitude among teachers by gender.

Table (5) shows the responses of the teachers regarding to questions and statements regarding their practice, experience and attitude towards type 1 DM. The majority of them recognized the following facts; insulin intake in the form of injections (93.2%), if the diabetic child is ill in school, he should neither left on his own nor sent home on his own (93.2%), a diabetic student needs a balanced diet (86.4%), insulin lowers the blood sugar level (81.4%) and in untreated cases, the blood sugar level increases (80.1%).

Contrary to that, 21.3% of them reported that a diabetic student should allow sharing in social events at or outside school and only 38.5% of the teachers recognized that a diabetic student complains of dizziness, sweating, loss of concentration in case of decrease in the blood sugar level.

Less than half of the teachers believed that a diabetic child should be allowed to eat sweet in class (43.3%) and a diabetic student should not loss or postpones his meal (47.5%). More than half of the teachers (54.8%) believed that the school could cope successfully with cases of hyperglycaemia compared to and 62% who believed that the school could cope successfully with cases of hypoglycaemia.

As illustrated in figure (3), overall, the teachers` practice of type 1 DM was insufficient in 29% and good in 40.3% of them. It was very good and excellent in 27.1% and 3.6% teacher, respectively. Good level of practice was reported among 50% of female teachers compared to 31% of male teachers while very good level of practice was reported among 25% and 29.2% of females and males, respectively. This difference was statistically significant, p=0.01.

FACTORS ASSOCIATED WITH TEACHERS` PRACTICE
Demographic Factors

As shown in table (6), the highest practice score level was reported among teachers in the age group 26-35 years followed by those over 35 years while the score among young teachers (≤25 years) was the lowest (the mean percentage of practice scorers were 66.1±14.7, 61±17.5 and 56±12.3, respectively. This difference was statistically significant, p=0.03. Similarly, the highest practice score level was reported among teachers whose experience ranged between 5 and 10 years followed by those whose experience was more than 10 years while the score among teachers whose experience was less than 5 years was the lowest (the mean percentage of practice scorers were 67.6±14, 62.5±15.9 and 46.2±16.3, respectively. This difference was statistically significant, p<0.001. Mean percentage of knowledge score was significantly higher among female teachers compared to male teachers (67.7±11.3 versus 60.9± 18.5, p=0.001). Mean percentage of practice score was significantly higher among university graduated teachers compared to those having Diploma degree (64.9±15.6 versus 46.2± 6.3, p=0.001). Regarding teachers` specialty, the mean practice score was higher among Arabic teachers (68.6±12.4) and teachers of other subjects as Science, Social studies, English, physical education (67.9±19.6) than teachers of religious subjects (56.3±17.4) and Mathematics (57.8±11.8), p<0.001. Teachers who teaching high grades (5-6) had higher practice score of type 1 DM than those teaching grades 1-4 (68.6±12.2 versus 63.4±16.2, p=0.032. Nationality of the teachers was not significantly associated with their practice o type 1 DM.

Table 6: Mean percentage of score reflecting practice and attitude of the teachers towards type 1 Diabetes mellitus according to their demographic characteristics.

Characteristics	Mean %	SD %	P
Age in years			
≤ 25 (7)	56.0	12.3	
26-35 (147)	66.1	14.7	
>35 (67)	61.0	17.5	0.030*
Years of experience			
<5 (13)	46.2	16.3	<0.001*
5-10 (118)	67.6	14.0	
>10 (90)	62.5	15.9	
Gender			
Male (113)	60.9	18.5	
Female (108)	67.7	11.3	0.001**
Nationality			
Saudi (198)	63.6	16.4	0.069**
Non Saudi (23)	69.9	5.6	
Qualification			
Diploma (8)	46.2	9.3	
University (213)	64.9	15.6	0.001**
Speciality			
Arabic (88)	68.6	12.4	
Religious (28)	56.3	17.4	
Mathematics (54)	57.8	11.8	<0.001*
Others (51)	67.9	19.6	
Teaching grade			
1-4 (185)	63.4	16.2	0.032**
5-6 (36)	68.6	12.2	

*ANOVA test   ** Student` t-test

Table 7: Mean percentage of score reflecting practice and attitude of the teachers towards type 1 Diabetes mellitus according to their information and training.

Characteristics	Mean %	SD %	P
Source of information			
Internet (108)	67.0	16.7	
Internet and others (23)	70.7	9.5	
Others (7)	61.5	10.2	0.002*
Attending DM type 1 courses			
Yes (9)	82.1	12.2	
No (212)	63.5	15.4	0.002**
DM type 1 awareness			
Yes (138)	67.8	16.0	
No (83)	58.3	13.3	<0.001**
Evaluating diabetic student			
Yes (7)	76.9	4.9	
No (214)	63.8	15.8	<0.001**
DM type 1 information			
Yes, enough (18)	78.2	2.9	
Yes, not enough (24)	77.2	15.6	
No (179)	61.1	14.9	<0.001*

*ANOVA test   ** Student` t-test

Table 8: Attitude of the teachers towards control of type 1 diabetes mellitus.

Items reflecting attitude	Agree	Disagree
Teachers have an active role in educating their students about type 1 DM.	34 (15.4%)	187 (84.6%)
Teachers should attend training coursed in type 1 DM.	36 (16.3%)	185 (83.7%)

DM Type 1 Information and Experience

Table (7) shows that teachers whose main source of information was internet with other sources had highest practice score than those whose main source of information was internet alone or other sources as newspapers, media and books (70.7±9.5, 67±16.7 and 61.5±10.2, respectively, p=0.002). Type 1 DM practice was significantly higher among teachers who has attended training DM courses or lectures than those who did not attend such courses or lectures (82.1±12.2 versus 63.5±15.4, p=0.002). Teachers who have heard of type 1 DM had higher level of practicing it than those who did not aware of type 1 DM (67.8±16 versus 58.3±13.3, p<0.001). Type 1 DM practice was significantly higher among teachers who has evaluated DM students than those who did not (76.9±4.9 versus 63.8±15.8, p<0.001). Teachers who claimed that they have enough information about type 1 DM had higher level of practicing it than those who claimed that they have no information about the diseases (78.2±2.9 versus 61.1±14.9, p<0.001).

ATTITUDE OF THE TEACHERS TOWARDS CONTROL OF TYPE 1 DIABETES MELLITUS.

Table (8) displays response of the teachers to the items reflecting their attitude towards control of type 1 DM. It shows that the majority of them (84.6%) disagreed that teachers have an active role in the educating their students about type 1 DM and that teachers should attend training courses in type 1 DM (83.7%).

DISCUSSION

Diabetic children spend a large part of each week day with the teacher as the primary supervising adult. Schoolteacher could be a useful source of health information for students but that they themselves would have to possess adequate and accurate knowledge of health issues.[22] Studies have shown that public school teachers' knowledge of diabetes is lacking.[19,23,24] Consistently, the results of the present study highlight inadequate diabetes-related knowledge among the studied sample where 59.3% of them had got insufficient total knowledge level. Warne (2005)[25] also found that, only one third of the secondary school teachers were found to have an adequate overall knowledge of diabetes. In Al-Khobar, Saudi Arabia, Abahussain and El-Zubier (2005)[6] reported lack of understanding of nature of diabetes and knowledge about symptoms of hypoglycemia among female diabetic school teachers and (25%) of them was using certain herbs for the treatment of their DM. Alnasir and Skerman (2004)[22] also found lack of knowledge and attitudes among Bahraini schoolteachers. In Riyadh, a study conducted among primary and intermediate school compounds in Riyadh City showed that 78% of them had got fair total knowledge level.[19]

A partial reason for this lack of basic knowledge among teachers includes lack of pre-service and in-service training on DM. This is evident in the present sample where only 9 out of 221 teachers have attended training courses and lectures in type 1 DM (4.1%). Similar results were found in the studies of Lewis et al. (2003)[27] and Melton & Henderson (2007)[28] where about 17% of schools did not have a staff member with training about diabetes. Similarly, in Riyadh, only 6.8% of teachers reported previous training. Even in case of presence of training, the current nature of the in-service training is based on a lecture setting. This technique works well for the short term gain of information but has its drawback that make the application of the information difficult.[29,30] In the current study, Internet was the main source of information about type 1 DM followed by other sources as booklets, brochures, newspapers and mass media. Such sources are well known to raise awareness and increase knowledge about health issues but seldom changing attitudes, behavior or teach practical skills. There was no role for healthcare providers in educating teachers

about DM. This is similar to what has been reported in Riyadh, where health care providers played insignificant role in educating teachers about DM.[19] Teachers and school should be willing and able to provide DM management and education. It is now well established that teachers' beliefs and attitudes concerning students with special needs have a very powerful influence on their expectations for the progress of such children in mainstream schools. Unfortunately, the present study revealed that the majority of the teachers disagreed that teachers have an active role in the educating their students about type 1 DM and that teachers should attend training courses in type 1 DM. In accordance with that, in a study conducted in Riyadh,[19] teachers had been disagreed on providing diabetes education neither by their own (88.1%), nor by the school request (82.5%). Also they refused to attend diabetes training program (74%) or provide care for diabetic student even after they will be trained (72.9%). These findings might be related to their anxiety and worry to take care of the student or might reflect their rejection to add further responsibilities as they are already overloaded by their educational duties.

Teachers should understand the nature of DM, its complications and how to ensure the safety of the diabetic students. First aid management in case of hypoglycemic attacks could be lifesaving to the affected child. However, studies have shown that many teachers had no specific training in first-aid and 40% never had been trained in CPR, for example, a study has shown that most of the English public school teachers were deficient in both training and knowledge of emergency care.[31] The knowledge of the Saudi teachers was found to be related to various variables. Although male teachers were more knowledgeable than female teachers, yet, female teachers had more score regarding practice and attitude towards diabetic students. Those who had experienced a history of evaluating a diabetic student had better knowledge. The study found that non-Saudi teachers are more knowledgeable than the Saudis. Reasons for this could be related to the fact that they are older and have higher qualification as higher qualified teachers with more experience were more knowledgeable. Finally, teachers over 25 years were more aware than the younger. The last finding could be explained by the fact that those teachers undertake the responsibility of keeping their family members healthy; hence they should be more aware about common health problems.

Only six out of 10 knowledge statements had a correct response rate from 70% onwards of the teachers. These most common forms of diabetic knowledge were loss of body weight, tiredness and bodyache, coma, polydipsia, dieresis and delayed wound healing. However there were also teachers who had wrong diabetic concepts and understanding such as the majority thought that the main presenting symptom of DM is joint pain.

Knowledgeable teachers have the ability of developing the diabetic child's intrinsic motivation towards diabetic awareness. A study showed that patients completing a diabetic education program had improved blood glucose control, greater knowledge and more favorable attitudes.[32] Such favorable health attitudes could be developed and enhanced in school children. Another study reported that both school staff and parents were of the opinion that diabetic pupils need special consideration at school.[33] In addition, teachers in an English study thought that health education programs should contribute to the total curriculum and said that their role mainly opted for the inclusion of health education in all subjects.[34]

Since the prevalence of childhood diabetes is low, while it is high in the adult population, it may indicate that certain factors other than genetic factors play a major role in its apparent increment such as environmental factors, personal attitude and life style.[35] Hence school teachers, if adequately prepared with proper training and knowledge could help in influencing changes in the diabetic children's life style and promote healthy living in all children. This would participate in limiting DM among population.

Teachers' attitudes are usually a reflection of their knowledge, beliefs and perceptions. School teachers therefore, should have proper attitudes and be knowledgeable with regards to health issues in order to provide good care. Unexpectedly, the present findings delineate a significant negative relationship between attitude and knowledge among Saudi teachers. So, more knowledgeable teachers were more critical with themselves and they expressed more unfavorable attitude that might reflect their lack of confidence in DM management and fear of facing the risk of its emergencies and the consequent accountability. This in turn can be explained by lack of efficient practical training. Despite the widespread of such unfavorable attitude, the good thing is that most of the sample (76.5%) agreed that diabetic students deserve special caring way for handling. It is even argued that successful integration and care is only possible where teachers display reasonably positive, empathetic and accepting attitudes towards students with special needs.[36]

It is important to acknowledge that the present study is subjected to the following limitations. The first comes from the questionnaire that considered by teachers as very long, so many refused to fill it because of their classes, impatience, and feeling that nothing will be improved after the research. However, patience of the researcher and repeating visits to schools allow obtaining a considerable response rate. Moreover, our results provide clues that contribute to an understanding of what teachers know, feel and do for diabetes in schools that can lay the groundwork for future training, policy change and advocacy. Second, as any self-reported questionnaire, the respondents could be suffered from recall bias as well as social desirability. However, self-report questionnaires remain the method of choice for this type of assessment, based on limited time requirement, low cost, and reduced likelihood of influencing behavior. Third, although the knowledge, attitudes and management practices measures used in the present study are judged for their face validity, there is a need to be tested in depth for their validity and internal consistency. Finally, based on the previous discussion, the applicability of these data is somewhat limited in the Saudi community, leaving numerous important questions unanswered. For example, is diabetes management effective in settings other than health care centers, hospitals and private practices? Is it cost effective to train teachers in such management? Will teachers' management of diabetes be accepted from Saudi parents with their different cultural, educational, and socioeconomic characteristics? Do education administration and policies support such management? What are the key barriers that obstacle such diabetes management in schools and how would it be best to obviate them?

In conclusion, the results revealed that teachers had inadequate knowledge of some of the basic facts of diabetes and its

treatment, a situation, which could have dangerous consequences for the child and complicate his or her schooling in a number of ways. In addition, unfavorable attitudes toward taking responsibility of diabetes care and education was prevalent. The results may simply reflect a defect of our local system but we suspect that they represent a national problem that is not confined only to children with diabetes mellitus

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