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ASSESSMENT OF DIABETES KNOWLEDGE AMONG DIABETIC CHILDREN AND ADOLESCENT AND ITS EFFECT ON GLYCEMIC CONTROL, IN DIABETIC CENTER, TAIF, KSA

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Abstract:

Background: *Awareness is important for proper self-management and is the foundation of diabetes treatment. Children and adolescents living with diabetes must have sufficient knowledge of diabetes.*

Aim: *This study aimed to assessing knowledge of children and adolescents regard to diabetes and assess the relationship between knowledge and glycemic control in type 1 diabetic children and adolescents in Taif diabetic center, KSA.*

Methods: *This is a cross-sectional analytical study. The study included children and adolescents attending a diabetic center in Taif, KSA. Questionnaire was used to collect data with help from parents and medical files. Knowledge was assessed using Michigan Diabetes Knowledge Test revised true/false version. Data was entered and analyzed using Statistical Package for Social Science (SPSS) version 26.*

Results: *The study included 232 children and adolescents, of whom 54.7% were females. Of all, 86.9% had T1DM. Over half the participants had a positive family history of diabetes (53.9%), and used insulin 1 to 3 times a day (52.2%). Over half of the participants (57.8%) had poor knowledge levels, and 39.7%, and 2.6%, had good and excellent knowledge levels, respectively. Sex significantly associated with diabetes knowledge (P=0.026), as more females (47.2%) had good knowledge than males (30.5%). Maternal education (P=0.018) as well as family income (P=0.001) were significantly associated with knowledge level among participants. Being diagnosed in the last one year only was associated with poorer knowledge than earlier diagnoses (P=0.005). Similarly, more frequent daily insulin use was associated with higher rates of good knowledge (P=0.000). Measuring blood glucose at home was also associated with higher rates of good knowledge (P=0.025), and excellent glycemic control was associated with higher rates of excellent knowledge among participants (P=0.001).*

Conclusion: *The study found positive associations between diabetic knowledge and sociodemographic factors, time of diagnosis, as well as better glycemic control. We recommend further educational emphases for this age group as it is likely to be associated with better prognosis and less complications.*

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INTRODUCTION:

Diabetes is a chronic, progressive metabolic disorder characterized by elevated levels of blood glucose, occurs either when the Beta cells of pancreas does not produce enough insulin , or failure of target tissue to use the insulin effectively ,which leads with time to dangerous complications to the blood vessels, heart , eyes, nerves and kidneys. [1]

In both type 1 and type 2 diabetes, genetic and environmental factors can result in the progressive loss of Beta cells mass and/or function that manifests clinically as hyperglycemia. Once hyperglycemia occurs, patients with all forms of diabetes are at risk for developing the same long term complications. [2]

Globally, diabetes accounts for 11.3 per cent of deaths. Nearly half of those deaths occur in people under the age of 60. [3]

Diabetes is one of the 21st century's fastest-growing diseases and is growing worldwide. In 2000, there were 151 million worldwide figures of adults living with diabetes. In 2009, it had risen to 285 million in 88 per cent. 463 million people today face diabetes. Another 1,1 million children and teens under the age of 20 are living with type 1 diabetes. [3]

In the Middle East and North Africa alone, more than 39 million people have diabetes; by 2045 this will increase to 67 million. In 2017, there were 3,852,000 diabetes cases in Saudi Arabia. [3]

Intensive insulin regimens should be used to treat most children and adolescents with type 1 diabetes, either through multiple daily doses or continuous subcutaneous insulin infusion. All children and adolescents with type 1 diabetes can track their own glucose levels multiple times a day (up to 6–10 times a day), including premeal, prebedtime, And in particular situations such as exercise, driving or the occurrence of symptoms of hypoglycemia, as required for health. A1C goals need to be individualized over time and reassessed. And lower targets may be realistic based on an evaluation of the benefits / risks. For many children an A1C of < 7 per cent (53 mmol / mol) is ideal. [2]

Different risk factors and challenges associated with glycemic control have been identified. Some of these include socio-demographic variables such as child age, socio-economic status and composition of the family. Certain factors related to diabetes, such as length of diabetes, adherence and involvement of caregivers in the care of the child were also significantly associated with glycemic control. [4]

Diabetes imposes a significant economic burden on patients, national health systems and nations. In Saudi Arabia, people diagnosed with diabetes, on average, have spending on medical care that is ten times higher ($3,686 vs. $380) than what expenditure would be if diabetes was not present. Population age 45-60 is responsible for 45 per cent of the costs of diabetes, With the remaining population under the age of 15, the percentage is 3.8%, the age between 15 and 44 is 27.5% and the age of 60 and above is 23.8%. The actual national healthcare burden because of diabetes is likely to exceed the $0.87 billion estimated in this study. [5]

Knowledge, attitude and practice (KAP) regarding diabetes vary widely depending on socioeconomic conditions, cultural beliefs and habits. Comprehension of these variables is important when developing diabetes prevention and management strategies. [6]

Awareness is important for proper self-management and is the foundation of diabetes treatment, patients need the awareness to change their behavior and also enhance glycemic control and improve the quality of life of children and their families, ideally to reduce the risk of the complications associated with it. Several studies report that diabetes awareness is low in developing and underdeveloped countries and that knowledge should be strengthened by ongoing education of health care professionals. [7]

Participants living with diabetes need to evaluate the KAP levels to help establish strategies and methods for effective health education in the future. [6, 8-16]

This study aimed to assessing knowledge of children and adolescents regard to diabetes and assess the relationship between knowledge and glycemic control in type 1 diabetic children and adolescents in Taif diabetic center with a view to identifying the knowledge gaps and making appropriate recommendations.

Rationale:

For many years, most patients have suffered from diabetes, lacking knowledge of the disease and self-care. Knowing the current knowledge of diabetes mellitus patients is important for designing well-targeted strategies to strengthen and reduce the burden of diabetes treatment.

In addition there is no similar studies has been conducted in Taif and that’s motivate the researcher to study this issue.

Aim of the study:
Assessment of diabetes knowledge among diabetic children and adolescent and study and explore its effect on glycemic control.

Objectives:
1) Assess the level of diabetes knowledge among diabetic children and adolescent.
2) Study the relationship between the level of diabetes knowledge and glycemic control.

Methodology:
Study design:
Cross-sectional study design was adopted.

Study area:
Town of Al-Taif, western Saudi Arabia. Lying on a tableland southeast of Mecca at an elevation of 6,165 feet (1,879 metres), it is the country's principal summer resort. [17]

It has a population of 1,750,000 people, is the 5th largest city in Saudi Arabia. [18]

Study setting:
The study was conducted in Taif Endocrine and diabetes center at Taif city. Taif Endocrine and diabetes center established in 2015 it is a specialized center to provide health and educational care to diabetes and endocrinologists patients.

Study population:
The target populations are children and adolescents who are attending at the diabetic clinic for children and adolescents at Taif Endocrine and diabetes center. This clinic runs once every week on Mondays since its inception in 2015.

Sample size:
Based on patient affairs statistics in TDC, the researcher found that the total number of children and adolescents visiting the diabetes clinic for children and adolescents was 232. We took all the patients registered in pediatric clinic.

Inclusion criteria:
Attendees of pediatric clinics at TDC.
- Age from 5 years to 18 years.
- Cooperative children and adolescents.
- Parental consent for participation.

Exclusion criteria:
- Younger than 5 or older than 18 years old.
- Non-cooperative children and adolescents.

Data collection tool:
Using a formal interview questionnaire, data was collected and included the socio demographic and background information, and knowledge of child / adolescent diabetes: This was assessed using the diabetes knowledge test (DKT), developed by the Michigan Diabetes Research Training Center (MDRTC). Diabetes Awareness is made of 20 true / false statements about diabetes. Concerning diagnosis, treatment, complications and lifestyle changes, and covered knowledge of optimal rates of glucose control, hypoglycemia and microvascular and macrovascular complications, diet and exercise. This questionnaire has been translated into Arabic language and Approved by 2 consultants. Glycemic control was assessed by glycosylated hemoglobin (HbA1C).

Data entry and analysis:
Data was entered and analyzed using Statistical Package for Social Science (SPSS) version 26. Descriptive analysis was performed and data was presented as frequencies and percentages, as well as means and standard deviations. Chi-squared test was used for inferential statistics. P-value equals to or less than 0.05 was regarded significant.

Ethical considerations:
A permission from family medicine program, MOH at Taif city to conduct the research was obtained. Individual consent was filled by participants in the questionnaire. Approval by research and ethical committee were obtained.

RESULTS:

The study included 232 children and adolescents, of whom 54.7% were females. As shown in table 1, half of the participants were aged 15-17 years. Over half of participants were middle in birth order (51.3%). Unlike mothers (20.3%), nearly half the participants' fathers had university education (45.7%), and were occupied (60.3%), where maternal occupation rate was however higher (81%).

Table 2 shows characters of disease among participants. Of all, 86.9% had T1DM, and the diagnosis was done 1-5 years ago in 35.8% of participants. Over half the participants had a positive family history of diabetes (53.9%), and used insulin 1 to 3 times a day (52.2%). The majority of participants (96.6%) reported that they use home measurements of blood sugar.

Table 3 demonstrates levels of knowledge of DM among participants. Over half of the participants (57.8%) had poor knowledge levels, and 39.7%, and

2.6%, had good and excellent knowledge levels, respectively.

Table 4 shows the factors associated with diabetes knowledge among participants. Sex significantly associated with diabetes knowledge (P=0.026), as more females (47.2%) had good knowledge than males (30.5%). Maternal education (P=0.018) as well as family income (P=0.001) were significantly associated with knowledge level among participants. Being diagnosed in the last one year only was associated with poorer knowledge than earlier diagnoses (P=0.005). Similarly, more frequent daily insulin use was associated with higher rates of good knowledge (P=0.000).

Measuring blood glucose at home was also associated with higher rates of good knowledge (P=0.025), and excellent glycemic control was associated with higher rates of excellent knowledge among participants (P=0.001).

Table 1: Sociodemographic characters of the participants (n=232)

Parameter		Frequency (%)
Age, y	**7-**	56 (24.1%)
	11-	60 (25.9%)
	15-17	116 (50%)
Sex	**Female**	127 (54.7%)
	Male	105 (45.3%)
Birth order	**First**	57 (24.6%)
	Middle	119 (51.3%)
	Last	56 (24.1%)
Father's educational level	**Illiterate**	28 (12.1%)
	Reads & writes	13 (5.6%)
	Primary	23 (9.9%)
	Intermediate	29 (12.5%)
	Secondary	33 (14.2%)
	University	106 (45.7%)
Mother's educational level	**Iliterate**	40 (17.2%)
	Reads & writes	13 (5.6%)
	Primary	38 (16.4%)
	Intermediate	79 (34.1%)
	Secondary	15 (6.5%)
	University	47 (20.3%)
Father's occupation	**Not occupied**	92 (39.7%)
	Occupied	140 (60.3%)
Mother's occupation	**Not occupied**	44 (19%)
	Occupied	188 (81%)
Average monthly family income (SAR)	**Less than 3000**	45 (19.4%)
	3000 to 7000	67 (28.9%)
	7000 to 10000	44 (19%)
	More than 10000	76 (32.8%)

Table 2: Disease history and characters among participants (n=232)

Parameter		Frequency (%)
Type of DM	**Type 1**	202 (86.9%)
	Type 2	30 (12.9%)
Diagnosed …	**Within the last year**	21 (9.1%)
	5-1years ago	83 (35.8%)
	5-10 years ago	69 (29.7%)
	More than 10 years ago	59 (25.4%)
Family history of DM	**No**	107 (46.1%)
	Yes	125 (53.9%)
Frequency of insulin use	**1-3 times**	121 (52.2%)
	More than 3 times	95 (40.9%)
	Insulin pump	16 (6.9%)
Home measurement	**No**	4 (1.7%)
	Sometimes	4 (1.7%)
	Yes	224 (96.6%)
Chronic diseases	**No**	200 (86.2%)
	Yes	32 (13.8%)
HbA1C control	**Unknown**	24 (10.3%)
	Excellent	12 (5.2%)
	Good	66 (28.4%)
	Poor	130 (56%)

Table 3: Knowledge levels using DKT-TF among participants (n=232)

Parameter		Frequency (%)
Knowledge level	**Poor**	134 (57.8%)
	Good	92 (39.7%)
	Excellent	6 (2.6%)
Score (%)	**Mean ± SD (Min-Max)**	58±16 (10-90)

Table 4: Factors associated with knowledge level among participants (n=232)

Parameter		Knowledge level			P-value
		Poor	Good	Excellent	
Age, y	**7-**	35 (62.5%)	19 (33.9%)	2 (3.6%)	0.365
	11-	38 (63.3%)	22 (36.7%)	0 (0%)	
	15-17	61 (52.6%)	51 (44%)	4 (3.4%)	
Sex	**Female**	65 (51.2%)	60 (47.2%)	2 (1.6%)	0.026
	Male	69 (65.7%)	32 (30.5%)	4 (3.8%)	
Birth order	**First**	32 (56.1%)	22 (38.6%)	3 (5.3%)	0.372
	Middle	72 (60.5%)	44 (37%)	3 (2.5%)	
	Last	30 (53.6%)	26 (46.4%)	0 (0%)	
Father's educational level	**Illiterate**	18 (64.3%)	10 (35.7%)	0 (0%)	0.271
	Reads & writes	9 (69.2%)	4 (30.8%)	0 (0%)	
	Primary	16 (69.6%)	7 (30.4%)	0 (0%)	
	Intermediate	16 (55.2%)	10 (34.5%)	3 (10.3%)	
	Secondary	16 (48.5%)	16 (48.5%)	1 (3%)	
	University	59 (55.7%)	45 (42.5%)	2 (1.9%)	
Mother's educational level	**Illiterate**	29 (72.5%)	11 (27.5%)	0 (0%)	0.018
	Reads & writes	6 (46.2%)	6 (46.2%)	1 (7.7%)	
	Primary	24 (63.2%)	11 (28.9%)	3 (7.9%)	
	Intermediate	34 (43%)	43 (54.4%)	2 (2.5%)	
	Secondary	10 (66.7%)	5 (33.3%)	0 (0%)	
	University	31 (66%)	16 (34%)	0 (0%)	

Father's occupation	**Not occupied**	62 (67.4%)	28 (30.4%)	2 (2.2%)	0.055
	Occupied	72 (51.4%)	64 (45.7%)	4 (2.9%)	
Mother's occupation	**Not occupied**	24 (54.5%)	18 (40.9%)	2 (4.5%)	0.630
	Occupied	110 (58.5%)	74 (39.4%)	4 (2.1%)	
Average monthly family income (SAR)	**Less than 3000**	36 (80%)	9 (20%)	0 (0%)	0.001
	3000 to 7000	30 (44.8%)	34 (50.7%)	3 (4.5%)	
	7000 to 10000	18 (40.9%)	25 (56.8%)	1 (2.3%)	
	More than 10000	50 (65.8%)	24 (31.6%)	2 (2.6%)	
Type of DM	**Type 1**	114 (56.4%)	83 (41.1%)	5 (2.5%)	0.507
	Type 2	20 (66.7%)	9 (30%)	1 (3.3%)	
Diagnosed …	**Within the last year**	18 (85.7%)	3 (14.3%)	0 (0%)	0.005
	1-5 years ago	41 (49.4%)	40 (48.2%)	2 (2.4%)	
	5-10 years ago	37 (53.6%)	32 (46.4%)	0 (0%)	
	More than 10 years ago	38 (64.4%)	17 (28.8%)	4 (6.8%)	
Family history of DM	**No**	57 (53.3%)	48 (44.9%)	2 (1.9%)	0.295
	Yes	77 (61.6%)	44 (35.2%)	4 (3.2%)	
Frequency of insulin use	**1-3 times**	76 (62.8%)	45 (37.2%)	0 (0%)	0.000
	More than 3 times	54 (56.8%)	40 (42.1%)	1 (1.1%)	
	Insulin pump	4 (25%)	7 (43.8%)	5 (31.3%)	
Home measurement	**No**	4 (100%)	0 (0%)	0 (0%)	0.025
	Sometimes	2 (50%)	1 (25%)	1 (25%)	
	Yes	128 (57.1%)	91 (40.6%)	5 (2.2%)	
Chronic diseases	**No**	107 (53.5%)	88 (44%)	5 (2.5%)	0.003
	Yes	27 (84.4%)	4 (12.5%)	1 (3.1%)	
HbA1C control	**Unknown**	22 (91.7%)	2 (8.3%)	0 (0%)	0.001
	Excellent	4 (33.3%)	6 (50%)	2 (16.7%)	
	Good	37 (56.1%)	27 (40.9%)	2 (3%)	
	Poor	71 (54.6%)	57 (43.8%)	2 (1.5%)	

DISCUSSION:

To maintain their own health, those with chronic diseases must be able to self-manage. Patients with health problems who require help should be supported by healthcare practitioners. This study aimed to assessing knowledge of children and adolescents regard to diabetes and assess the relationship between knowledge and glycemic control in type 1 diabetic children and adolescents in Taif diabetic center, KSA. There were 232 children and adolescents in the study, with 54.7% of them being female. T1DM was diagnosed in 86.9% of the participants. Over half of the participants (53.9%) had a positive family history of diabetes and used insulin one to three times a day (52.2%). Over half of the participants (57.8%) had inadequate knowledge levels, whereas 39.7% and 2.6%, respectively, had good and excellent knowledge levels. Sex was shown to be a significant factor in diabetes awareness (P=0.026), with more females (47.2%) having good knowledge than men (30.5%). Participants' knowledge level was substantially linked with maternal education (P=0.018) and family income (P=0.001).

Not only associated with knowledge levels, sociodemographic factors are often reported associated with glycemic and metabolic control among children. The study of Alasaaf et al. conducted a study of the impact of socioeconomic characters on glycemic and metabolic control in children with T1DM in a developing country. The study reported that children whose mothers had a bachelor's degree or higher were less likely to have poor metabolic control compared to children whose mothers had only elementary education. Low socioeconomic status is also associated with poor metabolic control. [8]

Age was not significantly associated with knowledge level in our study. This is inconsistent to the findings of the study of Martin et al. who assessed diabetes knowledge among adolescents with T1DM and reported a significant proportional association between diabetes knowledge and age. [11] Martin et al. further reported that there was a significant inverse association between HbA1C and diabetes knowledge scores.

Being diagnosed within the last year was linked to a lower level of knowledge than prior diagnoses

(P=0.005). Similarly, higher percentages of excellent knowledge were linked to more frequent daily insulin usage.

Our overall level good and excellent knowledge was less than that reported in the study of Moawad et al., who assessed knowledge among Saudi diabetic children and adolescents and reported that 48.2% had great knowledge. Moawad et al. also reported a significant association between age and diabetic knowledge and self-care development. [15]

Diabetes metabolic control deteriorating during adolescence is a rather common occurrence. Insulin resistance rises in both boys and girls during adolescence. Adolescents may become increasingly resentful of parental oversight of their diabetes care, as well as the restrictive character of diabetic treatment regimens, as acceptance of medical advice and adherence to treatment regimens decline. Diabetes can make it difficult to fit in with a peer group and raise the chance of risky behaviour, while variable glycemia can increase the risk of a negative consequence. This suggests that proper diabetes education to this age group is critical towards better outcomes.

CONCLUSION:

The study found positive associations between diabetic knowledge and sociodemographic factors, time of diagnosis, as well as better glycemic control. We recommend further educational emphases for this age group as it is likely to be associated with better prognosis and less complications.

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