

Assessment of the Knowledge and Practices about Diabetic Care on Preventing Diabetic Complications Among Children Suffering from Diabetes Mellitus

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Abstract

Background: Diabetes in children and adolescents is becoming an increasingly important public health concern throughout the world. It is associated with many serious complications and self-management is essential to prevent or delay such complication. **This study aimed to:** assess the knowledge and practices about diabetic care on preventing diabetic complications among children suffering from diabetes mellitus. **Research design:** A quasi-experimental design was utilized in the current study. **Setting:** This study was conducted at the pediatric in patient and out-patient unit in Beni-Suef University Hospital. **Subjects:** A convenience sample composed of 60 children and their accompanying mothers **Tools of data collection:** Three tools were used: *tool (1)* Structured questionnaire sheet and child assessment sheet, *tool (2)* Diabetes self-management questionnaire sheet, **Results:** More than three quarters of the studied children had poor diabetic self-management and all of the children were poor of diabetic self-care practices; there was highly statistical significant positive correlation between studied children total knowledge level and total reported practices level. **Conclusion:** The studied children had deficit knowledge and poor level of practices about diabetic care. **Recommendation:** A periodical educational program for children suffering from diabetes to improve knowledge and practices about diabetic care.

Keywords: Assessment, Diabetic Care, Diabetic Complications, knowledge, Practices

INTRODUCTION

Diabetes mellitus (DM) is a chronic disorder of metabolism characterized by hyperglycemia and insulin resistance. It is the most common metabolic disorder, resulting in metabolic adjustment or physiologic change in almost all areas of the body. DM in children can occur at any age, but 40% of children are diagnosed are between 10 to 14 years old and 60% are between 15 to 19 years old. Girls are 1.3 to 1.7 times more likely to develop type 2 diabetes than boys [1].

Diabetes is one of the most challenging health problems in the 21st Century. It is one of the most common chronic diseases of childhood after asthma and mental retardation. Type 1 diabetes is classically a disease of the young but can occur at any age; onset is generally rapid and presentation acute. The causes in the majority of cases is an autoimmune process, which destroys the insulin-producing pancreatic beta cells [2].

Both genetic and environmental factors have been implicated as important factors in the initiation of the autoimmune process, with viruses often acting as a trigger [4]. Type 1 diabetes (T1D) may occur at any age, it tends to develop in childhood; hence, it has long been called juvenile diabetes [3]. According to the [3], more than half of a million children are estimated to have type 1 diabetes, and around 86 000 developed the disease worldwide in 2019. The rate is increasing by around 3% every year.

The largest contribution to the total number of childhood type 1 diabetes comes from Egypt, accounting for about a quarter of the region's total. In Eastern Mediterranean and Middle Eastern countries, the incidence varies between 1/100 000 per year (Pakistan) and 8/100 000 per year (Egypt) in children under the age of 15 years. The diabetes children must follow certain self-care practices to achieve optimal glycemic control and prevent complications [2].

Long-term complications of diabetes involve both the microvasculature and the macrovasculature. The principal microvascular complications are nephropathy, retinopathy, and neuropathy. Microvascular disease develops during the first 30 years of disease, beginning in the first 10 to 15 years after puberty, with renal involvement evidenced by proteinuria and clinically apparent retinopathy. Macrovascular disease develops after 25 years of diabetes and creates the predominant problems in patients with type 2 DM. [5]. The process appears to be one of glycosylation, where in proteins from the blood become deposited in the walls of small vessels (e.g., glomeruli), where they become trapped by "sticky" glucose compounds (glycosyl radicals). The build up of these substances over time causes narrowing of the vessels, with subsequent interference with microcirculation to the affected areas [5].

Vascular changes can appear as early as 3 years after diagnosis with poor diabetic control, however with good to excellent control, changes can be postponed for 20 years or more. Intensive insulin therapy appears to delay the onset and slow the progression of retinopathy, nephropathy, and neuropathy. Hypertension and atherosclerotic cardiovascular disease are also major causes of morbidity and mortality in children with DM [6].

The complications have been observed in children with DM. Hyperglycemia appears to influence thyroid function, and altered function is frequently observed at the time of diagnosis and in poorly controlled diabetes. Limited mobility of small joints of the hand occurs in 30% of 7 to 18 years old children with type 1 DM and appears to be related to changes in the skin and soft tissues surrounding the joint as a result of glycosylation [7]. Children with diabetes need to learn to self-manage their disease early and gradually after diagnosis, and this should be integrated in their personal routines [8].

There might be some differences in self-care between pediatric and adult patients related to cognitive ability of children and emotional maturity in adolescents [9]. However, research demonstrated better glycemic control among children who practice self-monitoring of blood glucose. Moreover, they showed good tolerance of the testing process [10]. This would also help a smooth transition from pediatric to adult care for diabetes [11].

The role of the pediatric nurse in educating diabetes children in self-care is essential [12]. Patient education of self-care and the enhancement of the role of nurses in diabetes care leads to improvement in patient outcomes and the process of care. Nurses' responsibilities are numerous, educating the children understand their condition in such a way that they know enough about their management and self-care in order to change their lifestyle [13]. Hence, this study is an attempt to fill a gap regarding self-care in the management of children with diabetes in Egypt [14].

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The nurse as a member of the health care team must be involved in self-management of diabetic children. Diabetes is largely a self-managed disease and the patients' role is complex and demanding. Education is the key to the successful management of diabetes and is central to clinical management [15].

Significance of the study

Diabetes mellitus, is significant among the chronic diseases, in accordance with the International Diabetes Federation [16]. Diabetes mellitus is one of the most common chronic conditions that can develop in childhood. **Globally**, DM affects about 500 000 children (0-14 years old), with additional cases among late childhood and young adults [2].. The number of children worldwide living with DM is expected to double in the next 15 to 20 years [17]. In Eastern Mediterranean and Middle Eastern countries, the largest contribution to the total number of childhood with diabetes mellitus comes from **Egypt**, accounting for about a quarter of the region's total.

The incidence varies between 1/100 000 per year (Pakistan) and 8/100 000 per year (**Egypt**) in children under the age of 15 years [2].. Therefore this study will conduct to provide stepwise program for children suffering from diabetes to prevent diabetic complications .

AIM OF THE STUDY:

This study aimed to assess the knowledge and practices about diabetic care on preventing diabetic complications among children suffering from diabetes mellitus.

Subjects and Methods

Research Design:

Quasi experimental research design was utilized to achieved the aim of the study.

Research Setting:

This study was conducted at the pediatric in-patient and out-patient units affiliated to Beni-Suef University Hospital.

Research Subject:

A convenience sample composed of 60 children and their accompanying mothers were included in the study under the following inclusion criteria :

All children diagnosed with diabetes mellitus .

Both sex.

Age from 6 to 18 years.

Children free from any other chronic physical or mental disorders.

Tools for data collection:

Three tools were used in this study and were developed by the researcher after reviewing the related literature.

Tools of this study included:

First Tool:-

Part 1: Structured questionnaire sheet: to elicited data about the children and their accompanying mothers such as :- age, sex, diabetes duration years, weight, height , educational level of mothers, occupation .

Part 2: Child assessment sheet: include child's diagnosis, number of previous hospitalization, diabetic type, family history of DM, presence of diabetic complications .

Second Tool :-

Diabetes Self-Management Questionnaire (DSMQ) :The DSMQ was developed at the Research Institute of the Diabetes Academy designed by **Schmitt, et..al, [18]**. This scale was used to assess diabetes self-care management activities.

Third Tool: -

Observational checklists for self-care practices: were adopted from **Wilson and Hockenberry, [19]**. These checklists were for insulin injection by syringe, insulin injection by pen, blood glucose (glucometer) test, and foot care .

Ethical considerations:

An official permission to conduct the study was obtained from the Scientific Research Ethical Committee of Faculty of Nursing Helwan University. The studied children and their accompanying mothers were informed that participation in the study is voluntary and subjects were be given complete full information about the study and their role before signing the informed consent.

The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it would not be accessed by any other part without taking permission of the participants.

Field work:

The actual field works for this study for the beginning of Jun 2021 until end of Jun 2022.The researcher collected the data by herself. Consisted of four phases: assessment phase, plan phase, implementation phase and evaluation phase

Results:

Table 1: Distribution of the Characteristics of the Studied Children. (N=60)

Studied Children Characteristics	No.	Percentage %
Age:		
6<12	32	53.3
12≤18	28	46.7
Mean±SD	11.50±4.58	
Gender:		
Male	28	46.7
Female	32	53.3
Education:		
Educated	33	55.0
Not educated	27	45.0
Previous hospitalization:		
No	15	25.0
Yes	45	75.0
Diabetes onset / years:		
> 6 years	13	21.7
6 > 12 years	30	50.0
12 < 18 years	17	28.3
Mean±SD	9.43±4.61	
Duration of illness:		
> one year	27	45.0
< one year	33	55.0
Mean Height (cm):	137.33±21.30	
Mean Weight (kg):	41.42±18.27	

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Table (1) illustrated that more than half (53.3%) of the studied children's age ranged between 6<12 with Mean±SD (11.50±4.58) , slightly more than half of there were females (53.3 %) , and more than half (55.0 %) of studied children were educated, as regarded the previous hospitalization, it was clear that three quarter (75.0 %) of the studied children had yes previous hospitalization, half (50.0 %) of studied children diabetes onset at age 6-12 years , more than half (55.0 %) of studied children duration of illness were more than one year , mean height (137.33±21.30) and mean weight (41.42±18.27).

Table 2: Distribution of the Studied Parents according to their demographic Characteristics of Studied Children. (N=60)

Parents Characteristics	No.	Percentage%
Mothers' age		
35-45	6	10.0
46-55	34	56.7
≥ 56	20	33.3
Mean±SD	43.00±6.18	
Mothers' Education		
Educated	42	70.0
Uneducated	18	30.0
Fathers' Education		
Educated	52	86.7
Uneducated	8	13.3
Residence		
Rural	44	73.3
Urban	16	26.7
Income		
Enough	13	21.7
Not enough	47	78.3

Table (2) revealed that more than half (56.7%) of the mothers' age was between 36 - 45 years, the majority of fathers and mothers' (86.7% and 70.0%) were educated respectively , more than two third of the studied children (73.3%) were living in rural areas, and (78.3%) had not enough monthly income.

Table 3: Distribution of the Studied Children according to their assessment(N=60).

Child assessment	No.	Percentage%
Causes of previous hospitalizations		
No previous hospitalizations	15	25.0
Diabetic complications(Diabetic coma, DKA ,hypo and hyperglycemia)	30	50.0
Recurrent respiratory infection and Pneumonia	9	15.0
Surgical operation	6	10.0
Diabetes type		
Diabetes type 1	46	76.7
Diabetes type 2	14	23.3
Family history		
Positive	51	85.0
Negative	9	15.0
Treatment		
Insulin only	19	31.7
Insulin with other medicines	41	68.3
Insulin injections per day		

One	13	21.7
Two	34	56.7
Three	13	21.7
Glucometer at home		
No	32	53.3
Yes	28	46.7

Table (3) illustrated that half (50.0 %) of the studied children causes of previous hospitalization were diabetic coma, DKA ,hypo and hyperglycemia, Also more than three quarters (76.7%) of the studied children had type 1 diabetes , a majority (85.0%) of them had positive family history to diabetes , and more than half (68.3%) of them were an insulin with other medicines , more than half (56.7%) of the studied children were injected twice daily by insulin , more than half of the studied children were (53. %3) no have glucometer at home.

Table 4: assessment of the Studied Children regarding to Diabetic Complications(N=60).

Diabetic Complications	No.	%
1- No Complications	20	33.3
2- Short Term Complications:-		
- Recurrent infection	10	16.7
- Hypoglycemia	7	11.7
- hyperglycemia	5	8.3
- Diabetic Keto Acidosis	5	8.3
3- Long Term Complications :-	4	6.7
- Nephropathy	4	6.7
- Neuropathy	3	5.0
- Retinopathy	3	5.0
- Hypertension	2	3.3

As regarding diabetic complications Table (4) illustrated that more than one third of the studied children (33.3%) had no diabetic complications, near half of the suited children (45.0%) had short term complications, and less than one quarter of the studied children (21.7%) had long term complications.

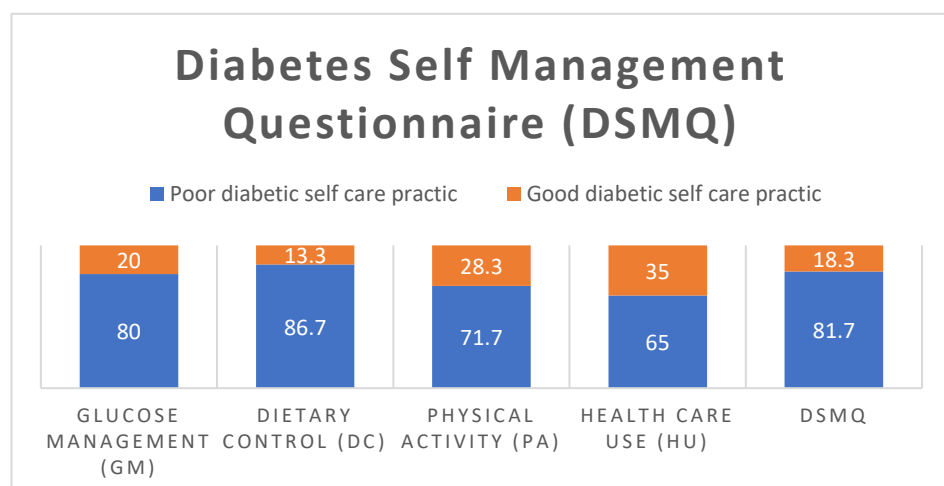


Figure 1: Total Score of Diabetes Self-Management Questionnaire (DSMQ) of the Studied Children.

Figure (1) Showed that the majority of the studied children (81.7%) had poor diabetic self-care management in all domains of diabetes self-management questionnaire post- program (dietary control, medication adherence, physical activity, health care use) .

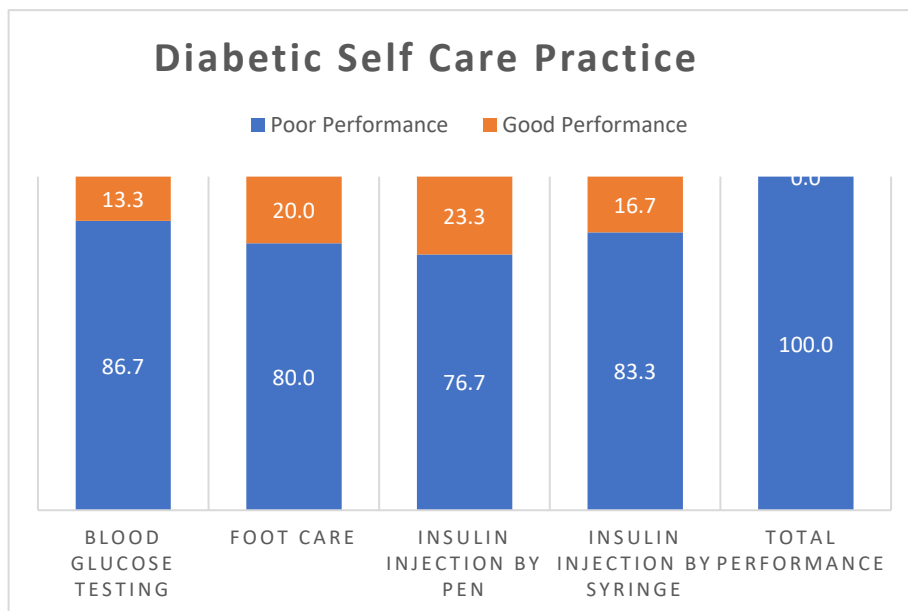


Figure 2: Total Score of diabetic self-care reported practice of the Studied Children (N=60).

Figure (2) revealed that all of the studied children (100.0 %) had poor performance of diabetic self-care practice (blood glucose testing, foot care, insulin injection by pen and by syringe).

Table 5 . Relation between demographic Characteristics and total practice of the studied children . (n=60)

	Practice total				X ²	P value
	Pre		Post			
	No.	%	No.	%		
Age						
≤6	2	20.0	11	22.0	FE	0.035*
7-12	5	50.0	14	28.0		
≥13	3	30.0	25	50.0		
Gender						
Male	8	80.0	20	40.0	2.003 ^{FE}	0.367
Female	2	20.0	30	60.0		
Education						
Primary	4	40.0	16	32.0	1.221 ^{FE}	0.872

Preparatory	3	30.0	11	22.0		
Secondary	2	20.0	11	22.0		
Uneducated	1	10.0	12	24.0		
Duration of illness						
Less than one year	3	30.0	24	48.0	1.125 ^{FE}	0.488
More than one year	7	70.0	26	52.0		
Number of previous hospitalizations						
One	2	20.0	25	50.0	2.321 ^{FE}	0.734
Two	3	30.0	12	24.0		
Three	5	50.0	13	26.0		

X² Chi Square test (Significance)

* Statistically significant at $p \leq 0.05$

^{FE} Expected cell count less than 5, Fisher's Exact test was used.

Table (5) shows that there is no statistical significant relation between total self-care practice and demographic characteristics of the children, but found statistically significant relation between children age and total self-care practice in pre and post program at $p \leq 0.05$

DISCUSSION

Diabetes is contributing to the global burden of complications [20]. These complications mostly associated with sedentary lifestyle, unhealthy dietary habits, skipping doctor's appointment, noncompliance with prescribed medication [21]. Thus, it is necessary to provide an optimal care for diabetes pediatric patients through self-management interventions that include set of self-management skills and practice [22]. Effective self-management skills and practice in pediatric diabetic patients involves the collection of advanced techniques and is best achieved by engaging in high-quality structured education [23].

The current study reported that near half of the children's age ranged between 7-12 with Mean±SD (11.50±4.58), This findings was agreement with [1]., in study in titled «Epidemiology, presentation, and diagnosis of type 2 diabetes mellitus in children and adolescents», who reported DM in children can occur at any age, but 40% of children diagnosed are between 10 to 14 years old and 60% are between 15 to 19 years old.

As regards gender, more than half of studied children were female, this findings in line with an epidemiological study of diabetes made in Egypt which found that the gender distribution is 1:1 male to female ratio [24]. Also this findings consistent with [25]., in study in titled «Effect of instructions on selected self-care practices among type-1 diabetic children» who found that more than half of the children were female. Also this findings inconsistent with [26]., in study in titled «Factors Affecting Self-Care Practices of Diabetic school Students», who found that more than half of the students were males.

As regards **children** educational level more than half of the studied children in the current study were educated this findings agreed with [25]., in study in titled «Effect of instructions on selected self-care practices among type-1 diabetic children», who reported the majority of the diabetic children were educated.

This study reported that majority of parents income were not enough. The present finding consistent with a German study done by [27], study «The association between socio-economic status and diabetes care and outcome in children with diabetes type 1 in Germany» showed a significant association between socioeconomic status and diabetes

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self-management patterns and glycemic control given that, low socio-economic status is linked to poor diabetes management and glycemic control with higher complications and bad outcomes.

The current study reported that the three fourth of studied children had diabetes type 1 and near one fourth of them had diabetes type 2, this findings agreement with [28] , study «Does breast feeding influence the risk of developing diabetes mellitus in children» , mentioned that type 1 diabetes remains the most prevalent form of diabetes in children. However, type 2 diabetes mellitus is estimated to occur in one to three (20% to 33%) of new diagnoses of diabetes in children today. The rate of type 2 diabetes mellitus in children continues to rise even as the obesity rates have plateaued in these age groups.

Concerning diabetes related complications; the present study showed that half of studied children had previous hospitalization caused by diabetes related complications. This finding was in agreement with [29], , in study in titled « A community based study on perceived knowledge of diabetes on cause, control, prevention and complications among diabetic patients in Bengaluru city» , who reported that diabetes related complications were prevalent in about forty two percent .

In relation to duration of illness the findings present study revealed that more than half of the children **duration** of illness were more than one year this findings was in agreement with study done in Egypt by [30], study «Effect of Caregiver's Health Education on Patterns of Self-Management and Glycemic Control in Pediatric Type 1 Diabetes» , reported that more than half of the sample duration of illness more than one year.

The current study revealed that half of the children diabetes onset at age 6-12 years, this findings was in line with study done by [27], , in study in titled «Education effectiveness in diabetes mellitus type 1 management made by children's caregivers» , reported that the most of sample were on the school stage. The disease has appeared abruptly in early childhood, with solid symptoms indicating the presence of the disease [31].

As regards family history of diabetes, the findings of the present study revealed that the majority of children had reported positive family history of diabetes. This finding in agreement with [27], , in study in titled «A community based study on perceived knowledge of diabetes on cause, control, prevention and complications among diabetic patients in Bengaluru city» , revealed that the positive family history of diabetes was reported by forty percent of the diabetic patients in Bengaluru City. Similarly, [32] in Port Said City- Egypt , , in study in titled « The effect of educational intervention on knowledge, attitude and glycemic control in patients with diabetes mellitus» found that seventy five percent of patients with diabetes had positive family history of diabetes.

Regarding diabetes related complications; the present study showed that one third of studied children had no diabetic complications and near half of them had short term complications. This finding was in agreement with [29] (Wong's Essential care of Pediatric Nursing) , reported in diabetes related literature, short term complications of diabetes such as DKA , hypoglycemia and hyperglycemia most common occur in the first year of diagnosis. Regarding long-term complications of diabetes involve both the microvasculature and the macrovasculature. The principal microvascular complications are nephropathy, retinopathy, and neuropathy. Microvascular disease develops during the first 30 years of diabetes, beginning in the first 10 to 15 years after puberty. Macrovascular disease develops after 25 years of diabetes related to poor diabetic control

Diabetes self-management and education is a dynamic mean for maintaining health. It is a behavior to promote health, prevent illness, treat and cope with health problems. Moreover, it comprises those activities performed independently by the individual to promote and maintain personal well-being throughout life. The effective management of chronic illnesses as diabetes mellitus, is a complex task that touches nearly every important aspect of daily life. It requires significant participation by patients and their families. " [32], [33] "

The findings of the study revealed that total scores of all domains of diabetic self-care management (dietary control, medication adherence, physical activity, health care use) was significantly improved throughout the study, the findings showed that majority of the studied children had poor diabetic self-care management in the preprogram , while in the post-program the majority of the children had good diabetic self-care management .

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Moreover, a significant improvement in the mean total scores of diabetic self-care management in post- program (38.73±5.85) compared to (17.80±8.86) in pre- program . It is consistent with the findings of the current study a previous Egyptian study done by [34], , in study in titled «Effect of an Intervention Program on Improving Knowledge and Self-Care Practices for Diabetic School-age Children » , reported a significant improvement in diabetes self-management and practices associated with educational program.

Also it comes in concordance with the findings of a study conducted in United States stated by [35], study «New-onset diabetes educator to educate children and their caregivers about diabetes at the time of diagnosis» , mentioned an association between the implementation of educational program to the newly diagnosed T1DM children and their caregivers and the great improvement in diabetes self-management patterns as well as the long term clinical outcome among this target group . From the researcher point of view it may be due to the studied children at school age and this age more liable to understand and gain information and remain knowledge after program who received

Diabetes self-management and education (DSME) is an important component in providing quality care to all diabetics. DSME helps patients develop the knowledge, skills, and abilities necessary for effective self-care. Diabetes programs as a behavioral and psychosocial strategy to facilitate self-care so as to provide better results. Several DSME interventions are capable of providing effective change in promoting behavior change [36],

DSME as an effective education, cost protection, can prevent complications. Diabetes self-management is a form of diabetes health education to improve health knowledge and behavior [37], Diet modification, physical activity, stress management, and pharmacological therapy all play a role in achieving the desired outcome for diabetes [38], Diabetes self-management support refers to the support needed to apply and maintain skills and behaviors in a sustainable manner [39],

Conclusion:

The studied children had deficit knowledge and poor level of practices about diabetic care.

Recommendation:

A periodical educational program for children suffering from diabetes to improve knowledge and practices about diabetic care.

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