

Self-Care Management of Children with Type 1 Diabetes Mellitus: Effect of an Educational Training Program

Rehab Hassan Kaf1¹, Azza Ismail Ismail El Sayed²

Lecturer of Pediatric Nursing, Faculty of Nursing, Suez Canal University, Egypt.^{1,2}

Assistant professor, Department of Nursing, Collage of Applied Medical Science, Jouf University. KSA²

Abstract

Background: Diabetes is a chronic illness that, requires continuous medical care and child education to control its complications. Diabetes education is the keystone of diabetes care. children need education about diet, exercise, weight control, blood glucose monitoring, use and adherence to medications, foot, and eye care.

Objective: This study aimed to evaluate the effect of an educational training program on self-care management of children with type 1 diabetes mellitus. **Methods:** A quasi-experimental research design was used in this study with a purposeful sample of 100 child aged (6-18) years old, diagnosed with type 1 diabetes mellitus (T1DM) and were treated in the outpatients pediatric clinics affiliated to Suez-Canal University Hospitals. A structured interview questionnaire was used to collect the data (pre and post). Children received the educational training program after assessing the baseline data. The study instruments were the demographic, medical history, knowledge and reported practice questionnaire. **Results:** Revealed that, there was a significant upgrading in studied children' knowledge and reported practice regarding self-care management post implementation of the educational training program compared with the pre implementation. **Conclusion & recommendations:** The findings of this study concluded that, there was a positive significant correlation between the study variables. The study findings recommended the requisite for structured training programs at the hospitals to improve knowledge and practices of diabetic children and their parents as well as nurses to promote better compliance towards self-care management and prevent diabetes- related complications.

Key Words: Children, Educational training program, Self-care management, Type 1 diabetes mellitus

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I. Introduction

Diabetes mellitus is a metabolic disorder which occur as a result of deficiency in insulin action, production or both. Type 1 diabetes mellitus (T1DM) considered one of the major types of diabetes mellitus that arise from autoimmune destruction of pancreas that makes it unable to secrete insulin (Albikawi et al., 2015).

The burden of T1DM is markedly increasing in the Middle East and North Africa as it is the cause of morbidity and mortality, the prevalence of T1DM was 35.4 million in 2015 and it is estimated to rise to 72.1 million by the year 2040. The prevalence of T1DM in Egypt is among the highest in the Middle East and North Africa countries with 7.8 million people known to have diabetes mellitus (IDF, 2018).

Living with T1DM remains a challenge for a child and the whole family, even in countries with access to multiple daily insulin injections, glucose monitoring, structured diabetes education and expert medical care. This is due to that, acute complications of hypoglycemia (abnormally low blood glucose), DKA and metabolic disturbances may lead to poor growth and the early onset of circulatory (or 'vascular') complications (IDF, 2019).

Children with T1DM need daily insulin injections to maintain a glucose level in the appropriate range, without insulin, they would not survive. However, with appropriate daily insulin treatment, regular blood glucose monitoring, education and support, they can live healthy lives and delay or prevent many of the complications associated with diabetes(American Diabetes Association, 2017).

Preventing and managing complications of T1DM mainly rely on children readiness to self- manage their care on regular basis. Yet, a global survey found that, only 16.2% of children with T1DM adhere to recommendations had been given to them regarding self-care management. One reason for the poor outcomes in children with T1DM is the lack of participation in the treatment of the disease. This participation is a key success factor in the management of T1DM that demands motivation, knowledge, and compliance to a difficult and complex lifetime regimen (Hosseini et al., 2017).

Based on statistics and tendencies of increasing prevalence rates of T1DM worldwide especially in developing countries and in Egypt in particular, there is a need for sustained active child education, support, and

evaluation to increase children involvement and self- reliance in the management of their condition and prevention of its complications(Grillo et al., 2013) . Therefore, the current study will be carried out to evaluate the effect of educational training program on self-care management of children with Type 1 diabetes mellitus.

The significance of the study:

Type 1 diabetes mellitus leads to serious complications that, affect the different body systems and general health, which in turn increase the burden of the disease (American Diabetes Association, 2018) . The present study will help children to manage their health with minimum complications, reduce cost of disease management through decreasing hospitalization time. In addition, the current study will provide some benefits to the community as it will help maintain a high quality of life for children with T1DM and increase the awareness about the disease management.

Overall Objective:

The present study aimed to evaluate the effect of an educational training program on self-care management of T1DM children.

Research hypothesis:

Children who participated in an educational training program will have higher levels of self-care managements of T1DM following completion of the program at post implementation evaluation.

II. Subject and methods

Design: A quasi-experimental design (one group pre/post) was utilized in this study

Setting: This study was conducted at the pediatric outpatient clinics affiliated to Suez Canal University Hospitals, Egypt.

Subject: A purposive sample of 100 child diagnosed with T1DM and treated at the previously mentioned setting throughout the period of data collection. The inclusion criteria included children with T1DM aged between 6-18 years old, from both sexes and free from other chronic diseases.

Tools of data collection: One tool was used to collect the required data. The tool was designed and written in simple Arabic language and consisted of: **structured interviewed schedule** composed of four parts. **The First** part involved the demographic characteristics of the studied children as age, sex, residence, level of education and previous diabetic training. **The second** part concerned with medical history of studied children as, duration of illness, presence of complications, frequency of insulin injection and blood glucose monitoring per day. **The third** part concerned with studied children knowledge regarding self-care management as diet, blood glucose monitoring, physical exercise and foot care. **The fourth** part concerned with studied children reported practices regarding self-care management relating to administration of insulin injection, monitoring of blood glucose level, foot care, hygienic care and dietary control.

Scoring system: Items of assessing studied children' knowledge and reported practice regarding self-care management were consisted of 80 closed ended questions. The total score was (100), that distributed according to the importance of each item. According to children' responses, their knowledge scores were classified into sufficient ($\geq 70\%$) and insufficient ($<70\%$). Then their total reported practice scores were classified as satisfactory ($\geq 70\%$) and unsatisfactory ($<70\%$).

III. Methods

Preparatory phase:

- An official permission to conduct the study was obtained from the director of Suez Canal University Hospitals and director of outpatients clinics as well after explaining the purpose and methods of data collection by the researchers.

- A pilot study was carried out on ten children who represented 10% of the studied children at the previously mentioned settings in order to test the applicability of the constructed tools and the clarity of the included questions related to self-care management of children with T1DM. The pilot study had also served to estimate the time needed for the illustrative session that conducted by the researchers and for each child to fill in the questionnaire sheet and answer the study related questions. According to the results of the pilot, no modifications were required. The studied children of pilot study were included in the study total sample.

Ethical consideration was followed through:

An oral approval was gotten from each child before the study beginning, after explanation of the purpose of the study. Oral consents were gotten from the children's caregivers to gain their approval about their children's participation. The researcher assured maintaining anonymity and confidentiality of the collected data throughout the study phases. The right to withdraw from the study at any time without any responsibility was informed to studied children.

Fieldwork

The period of data collection was extended over a period of 9 months, started from December, 2016 to the end of August, 2017. The researchers were available in the study setting during working hours one day/week (Tuesday), the day specified for endocrine disorders. To assess studied children knowledge and reported practices regarding self-care management through the following phases:

Assessment phase (pre-implementation of the educational training program): It was started by meeting children. At the start of the interview, the researcher introduced themselves to the studied children and presented a brief explanation about the aim and nature of the study plus the content of the educational training program, clarifying that, it was designed to improve their self-care management. Each child interviewed individually, his/her knowledge and reported practice regarding self-care management of children with T1DM were assessed using the previously mentioned tool. The child's assessment sheet included their demographic characteristics and their medical data was filled by the researcher either through parents'/caregiver's interview or through revising the child's medical file.

Implementation phase: At this stage, the researchers organized group training sessions for the studied children that, was held immediately after assessment. At which the studied children were instructed about the disease, its management, complications and how to avoid it. In addition to, coping with psychosocial issues associated with the disease, how to be physically active and being prepared for any emergency. Based on studied children's needs, small group training sessions were organized for them. During these sessions, the researchers taught the required training to the studied children, and discuss successful experiences of similar children regarding self-care management in a purposeful manner. Furthermore, at this stage, the researchers helped studied children to identify barriers of self-care management as well as strategies to overcome them. The duration of group sessions ranged from 45 to 60 minutes for each session using different teaching methods as case scenarios, demonstration & re demonstration and lectures. The training sessions were directed by the material of the training booklet regarding self-care management of children with T1DM, that was prepared by the researchers based on needs' assessment of the studied children in the light of different national and international references and was written in simple Arabic language. Suitable teaching media were prepared and used during the implementation of the study such as data show, real equipment, posters and pictures.

Evaluation phase: Studied children were evaluated pre-training implementation to get a baseline assessment before the development of the educational training program and post-training implementation by using the same tool. A comparison between children's pre and post-test findings was done to determine the effect of the study intervention on their self-care management.

Statistical design: The study data were analyzed using SPSS version 21. Descriptive statistics including the frequency distribution and percentages were used for the analysis of nominal data as demographic data and medical history of the studied children. Differences between variables through times of evaluation were analyzed using T –test. The statistical significance and associations were assessed using chi square test (X^2), Pearson's and Spearman's tests. Significant level was identified at $p < 0.05$.

IV. Results

Table (1): illustrates demographic characteristics of the studied children in which, 67% of them are aged between 6 to less than 12 years, (mean age, 10.66), in addition, 57% , 60 % of the studied children were male and from rural areas respectively. Moreover, 67% and 85% of the studied children were enrolled in primary schools and didn't receive previous diabetic training respectively

Table (2) : shows the medical history of the studied children, in which, 62 % of them had a duration of illness less than 5 years, as well as, 56% of the studied children had no complications. In addition, 65%, 67% of the studied children took insulin injection once per day and monitored their blood glucose level once per day at fixed time respectively.

Table (3): reveals significant improvement in studied children total level of knowledge scores regarding self-care management after implementation of the educational training program with $P < 0.001$.

Tables (4) : illustrates significant improvement in studied children' total level of reported practices scores regarding self-care management after implementation of the educational training program with $P < 0.001$.

Table (5) shows that, there was a significant positive correlation between studied children' knowledge and reported practice regarding self-care management of T1DM pre- and post-implementation of the educational training program with highly statistical significant differences found at $p < 0.019$ and $p < 0.001$ respectively.

Tables (6): illustrates a significant correlation between total knowledge scores of the studied children and their demographic characteristics (age, sex, residence, educational level and previous diabetic training) pre and post implementation of the educational training program with highly statistical significant differences found at $P < 0.00*$, $P < 0.02$, $P < 0.05$ and $P < 0.01$ respectively.

Tables (7): reveals a significant correlation between total reported practice scores of the studied children and their demographic characteristics (age, sex, residence, educational level and previous diabetic training) pre and post implementation of the educational training program with highly statistical significant differences found at $P < 0.00*$, $P < 0.01$, $P < 0.02$ and $P < 0.05$ respectively.

Table (1): Frequencies distribution of the studied children according to their demographic characteristics (n = 100)

Items	No	%
Age in years		
6 < 12	67	67
12 ≤ 18	33	33
$\bar{X} \pm SD$	10.66 ± 3.21	
Sex		
Male	57	57
Female	43	43
Residence		
Rural	60	60
Urban	40	40
Educational level		
Primary school	67	67
Preparatory school	18	18
Secondary school	15	15
Previous diabetic training		
Yes	15	15
No	85	85

Table (2): Frequencies distribution of the studied children according to their medical history (n = 100)

Items	No	%
Duration of the illness (in years)		
1 < 5	62	62
5 < 10	27	27
10 < 15	11	11
Complications		
Retinopathy	16	16
Foot Complication	8	8
Neuropathy	20	20
No Complication	56	56
Frequency of insulin injection / day		
Once	65	65
Twice	35	35
Blood glucose monitoring /day		
Once at fixed time	67	67
Twice	33	33

Table (3): Frequencies distribution of the studied children according to their total knowledge scores regarding self-care management of T1DM (n = 100)

Knowledge total scores	Pre		Post		Significance test
	No	%	No	%	
Sufficient (≥ 70%)	20	20	84	84	t-test = 5.574 P < 0.001**
Insufficient (<70 %)	80	80	16	16	

Table (4): Frequencies distribution of the studied children according to their total reported practice scores regarding self-care management of T1DM (n = 100)

Reported practice total scores	Pre		Post		Significance test
	No	%	No	%	
Satisfactory ($\geq 70\%$)	24	24	79	79	t-test = 4.65
Unsatisfactory ($<70\%$)	76	76	21	21	P <0.001**

Table (5): Correlation between the studied children knowledge and reported practice regarding self-care management pre and post implementation of an educational training program (n = 100)

Items	Knowledge			
	pre		post	
	r	p	r	p
Reported practice pre	0.216	0.019*		
Reported practice post			0.357	0.001**

Table (6): Correlation between demographic characteristics of studied children and their total' knowledge (pre/post implementation) regarding self-care management (n = 100)

Items	Knowledge level								significance
	Pre				Post				
	sufficient		insufficient		sufficient		Insufficient		
	No	%	No	%	No	%	No	%	
Age in years:									
6 < 12	12	12	55	55	54	54	13	13	X ² = 0.75 P < 0.00*
12 ≤ 18	8	8	25	25	30	30	3	3	
Sex:									
Male	11	11	46	46	50	50	7	7	X ² = 0.70 P < 0.00*
Female	9	9	34	34	30	30	13	13	
Residence:									
Rural	10	10	50	50	45	45	15	15	X ² = 0.77 P < 0.02*
Urban	10	10	30	30	35	35	15	15	
Educational level:									
Primary	13	13	54	54	56	56	11	11	X ² = 0.56 P < 0.05*
Preparatory	4	4	14	14	11	11	7	7	
Secondary	3	3	12	12	13	13	2	2	
Previous diabetic training:									
Yes	5	5	10	10	5	5	10	10	X ² = 0.73 P < 0.01*
No	15	15	70	70	75	75	10	10	

Table (7): Correlation between demographic characteristics of studied children and their total' reported practice (pre/post implementation) regarding self-care management (n = 100)

Items	Reported practice level								Significance
	Pre				Post				
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		
	No	%	No	%	No	%	No	%	
Age in years:									
6 < 12	16	16	51	51	63	63	4	4	X ² = 0.73 P = 0.00*
12 ≤ 18	8	8	25	25	16	16	17	17	
Gender :									
Male	10	10	47	47	48	48	9	9	X ² = 0.76 P = 0.00*
Female	14	14	29	29	35	35	8	8	
Residence:									
Rural	16	16	44	44	55	55	5	5	X ² = 0.55 P = 0.01*
Urban	8	8	32	32	24	24	16	16	
Educational level:									
Primary	14	14	53	53	65	65	12	12	X ² = 0.70 P = 0.02*
Preparatory	5	5	13	13	9	9	9	9	
Secondary	5	5	10	10	6	6	9	9	
Previous diabetic training:									
Yes	9	9	6	6	10	10	5	5	X ² = 0.56 P = 0.05*
No	15	15	70	70	69	69	16	16	

V. Discussion

The uniqueness of diabetes mellitus among other chronic disorders is owed to the fact that, its treatment depends mainly on self-management. Therefore, diabetes related education is crucial to the treatment and management of diabetes (Ogle et al., 2016).

As regards demographic characteristics of the studied children the current study revealed that, their mean age was 10.66 years and two thirds of them were males, came from rural areas and enrolled in primary schools, while the majority didn't receive previous diabetic training. These findings are supported in some points and contradicted with others of a study conducted by **Abolwafa et al., (2017)** in which they evaluated the Effect of Educational Program on Improving Knowledge and Practice for Adolescence with Type 1 Diabetes Mellitus and found that, the mean age of the studied children was 16.7 years, two thirds of them were female while the majority came from rural areas and didn't attend previous training courses about type 1 diabetes mellitus.

Concerning medical history of studied children, it was clarified that, two thirds of them had been diagnosed with T1DM form a period less than 5 years and had no complications related to diabetes mellitus. Also, more than two thirds of the studied children took insulin once per day and monitored their blood glucose once per day at fixed time. These results were the same of **Al-Hussaini and Mustafa (2016)** in which they assessed the Adolescents' Knowledge and Awareness of Diabetes Mellitus in Kuwait and found that, nearly half of them had a confirmed diagnosis of DM since 5 years and didn't have complications related to diabetes mellitus. In addition, findings were different from that of **Santiprabhob et al., (2012)** whom studied Glycemic Control, Quality of Life and Self-Care Behaviors among Adolescents with T1DM who Attended a Diabetic Camp and found that, the majority of the studied children took insulin twice per day and monitored blood glucose level more than once per day. These result owed to the fact that, duration of illness is a major risk determinant in the occurrence of the complications associated with T1DM. As stated by **Dabelea et al., (2017)** whom studied Association of Type 1 Diabetes versus Type 2 Diabetes Diagnosed during Childhood and Adolescence with Complications during Teenage Years and Young Adulthood that, children had T1DM for more than 5 years are more liable to the occurrence of complications.

The current study showed significant improvement in studied children' total level of knowledge and reported practices scores post implementation of the educational training program with $P < 0.001$. These results were consistent with **Sachmechi et al., (2013)** whom studied the Impact of Diabetes Education and Peer Support group on the Metabolic Parameters of Patients with Diabetes Mellitus (Type 1 and Type 2), and found that, there is significant improvement in participant's levels of knowledge and practice post implementation of the educational program with $p < 0.0001$. These results could be owing to the fact that, diabetes education is a crucial part of diabetic patient comprehensive care.

Also, The current study reported that, there was a positive correlation between studied children' knowledge and reported practice pre and post implementation of the educational training program, these findings were supported with **Kazeminezhad et al., (2018)** whom carried out a study about Effect of Self-Care on Glycated Hemoglobin and Fasting Blood Sugar Levels on Adolescents with Diabetes and found a high statistically significance correlation between participants knowledge and practice pre and post implementation of the program. From the researchers' point of view, this result proven that, high level of knowledge scores is usually associated with increased level of satisfactory practice in diabetic patients.

In addition, there was a significant correlation between studied children' demographic characteristics (age, sex, residence, educational level and previous diabetic training) and their knowledge & reported practices scores pre and post implementation of the educational training program. These findings were concurrent with **Hosseini et al., (2017)** whom carried out a study about Effect of Educational Intervention on Self-Care Behaviors among Patients with Diabetes: An Application of PRECEDE Model and **Abolwafa et al., (2017)** whom revealed the presence of significant association between participants' demographic characteristics and their knowledge & practice.

Patient' education has been proven to be beneficial in reducing the high prevalence of complications in diabetic patients through enabling them in the day to day control of their conditions. Diabetic children need effective educational training programs regarding their self-care management. In addition, these programs should be implemented periodically to achieve a positive change in diabetic children' behavior. Nurses have a key role in children' education process if only they know when and how to educate them efficiently.

VI. Conclusion and Recommendations

The results of the current study showed that, the educational training programs are effective in improving self-care management of children with type 1 diabetes mellitus. At the light of these results, the present study recommends implementing of educational training programs to improve self-care management of children with T1DM on wide range since efficient diabetic education decreases diabetes' complications. Also, the health care personnel should have a continuous education to be able to teach patients.

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