Effect of Educational Program on Mothers' Knowledge, Stress and Fear of Hypoglycemia and their children Glycemic Control

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Abstract

Background: Type I diabetes (T1D) is a chronic condition that impacts all part of a patient's life. As a result, stress and fear of hypoglycemia (FOH) can have a severe impact on a patient's mental, physical, and psychological health. **Aim:** was to evaluate effect of educational program on mothers' knowledge, stress and fear of hypoglycemia and their children glycemic control **Research design:** A quasi- experimental research design was used in this study**. Sample and Setting:** was conducted on one hundred mothers who have been selected for the program (pre and post) in pediatric department at General and Health Insurance Hospitals. **Tools of data collection:** four tools for data collection were used tool (1) An interviewing questionnaire sheet, (2) Pediatric Inventory for Parents (PIP), (3) The Hypoglycemia Fear Survey–Parent (HFS-P) (4) Glycemic control. **Results** of this study showed that the mean age of mothers was 33.5 ± 20.1, and noticeable improvement in the mothers' knowledge about T1D in post-test than in pre-test, the total mean scores of Pediatric Inventory for Parents (PIP) and The Hypoglycemia Fear Survey–Parent (HFS-P) were alleviated in post-test than in pre-test. while Glycemic control of school age children were better controlled in post-test at 3 and 6 months than in pre-test. So, **this study concluded that** improving mother's knowledge about T1D, alleviating mothers stress, fear of hypoglycemia, after education program and the children's glycemic control improved after health education program. **This research recommended that** Future studies are needed to create and improve interventions through educational programs in alleviating stress, fear of hypoglycemia for mothers taking care of children with T1D.

Keywords: Fear of Hypoglycemia, Glycemic Control, knowledge, Mothers, Stress

Introduction

Among the high incidence chronic problems in children, type 1 diabetes mellitus (T1DM), causes the loss of insulin secretion by gradually destroying the pancreatic islets in people who are genetically vulnerable to it(**Larsson, et al., 2016**). The T1D is a chronic illness that can has a detrimental effect on a child's mental and health wellbeing because it impacts all element of the affected life of the child**(Jaser, et al., 2017).** Different researches have revealed an increase in the prevalence of T1D in youngsters worldwide **(Mahmoodi, et al., 2017).** According to a study performed in the Menoufia Governorate, the occurrence incidence of juvenile diabetes between children's that are in school was 3.75/1000.7 **(Hassan, et al., 2019)**

Hypoglycemia is a significant glycemic control limiting factor that can result in symptoms that are frightening to both the parents and their children. Researches suggests that FoH may be a major hindrance to managing diabetes and improving long-term health results (six to eight). Although research suggests that novel insulin regimens as well as insulin substitutes may reduce the causes also the continuous of hypoglycemic incidents, hypoglycemia still poses a challenge for T1D in the children (**Vivien et al., 2022**).

Mothers have been the subject of extensive research in child psychology. However, one research evidence that moms had greater incidence of post-traumatic stress than dads. Moms' responses to their children's diabetes have been subject to a variety of findings. Additionally, standard insulin regimens for children with poorly controlled diabetes cause extra stress for their parents. The weeks immediately following a child's diagnosis have been associated with the highest levels of parental stress, which eventually reduce but may not totally disappear during the next year **(Burckhardt, et al., 2019).**

The management of T1D necessitates numerous daily subcutaneous insulin injections

or lifetime substitution of insulin with an insulin pump. Vision issues, kidney problems, heart issues as well as foot damage are examples of long-term consequences that might develop if they are not properly controlled (Brinkman, 2017). Therefore, the entire family must adjust their conduct, and the mother has the most of the duty (**Makara-Studzińska, et al., 2019).**

It can be difficult to achieve and maintain a healthy glycemic control in a child with T1D. The physical, psychological, and lifestyle changes that a child with diabetes experiences as he gets older are numerous. The introduction of diabetes management was the single most significant strategy to enhance glycemic control in youngsters **(Seth, 2020).**

The management of children's diabetes can be difficult, and several emotional and behavioral issues may have an impact on the course of daily treatment. Particularly in youngsters who are unable to recognize and express signs of hypoglycemia or hyperglycemia, inconsistent eating patterns and levels of physical activity make managing diabetes more challenging. **(Delamater, 2019).** Conflicts within the family may worsen already inadequate glycemic control **(Fox, et al., 2020).** The FoH among mothers—even without evidence of low glucose levels like to be a key factor in raising the emotional cost for T1D's children. **(Johnson, et al., 2013).** Additionally, avoiding hypoglycemia owing to parental dread of it can harm children's ability to control their blood sugar levels**(Barnard, et al., 2010)**. The FoH is frequently cited by parents as a serious issue. **(Van, et al., 2018).** Therefore, measures like improved education about diabetes and education about technology of diabetes may be useful to break this potentially vicious cycle and reduce mothers' stress and deducible behavior(**(Barnard, et al., 2010)**).

Significance of the study:

Once T1D is diagnosed, intense monitoring of glucose levels and compensatory insulin therapy is indicated. Many factors affect blood levels of glucose, as food consumption, physical activity, drugs, illness, stress, and pain; but maintaining near normal blood glucose levels plays an important role in preventing diabetes-related problems **(American Diabetes Association, 2018).** The estimated annual incidence of diagnosed T1D was 17,900 among youth's ages 0–19 year, **(Mayer-Davis, et al., 2017).**

According to a study done in the Egyptian governorates of Fayoum, North Sinai, and Suez, T1DM affects children with a prevalence rate of 0.7/1000 and an occurrence rate of 4.01/100,000.6 Another research conducted in the Menoufia Governorate revealed an incidence rate of 3.75/1000 juvenile DM cases among children in school-age **(Hassan, et al., 2019). (Pierce, et al., 2017).**

Aim of the Study:

Was to evaluate effect of educational program on mothers' knowledge, stress and fear of hypoglycemia and their children glycemic control

Research Hypothesis:

H1: Mothers may have enough knowledge regarding T1D after perform the education program.

H2: Mothers may maintain low level of stress, fear of hypoglycemia after perform the education program.

H3: Children may maintain glycemic control after perform the education program.

Subjects as well as Methods

Research design: (pre-test/post-test) quasi-experimental research approach was utilized to accomplish the research's aim.

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Setting: This study was conduct in pediatric department at General and Health Insurance Hospitals at Minia City.

Sampling and population: used in this study the a purposeful sampling technique; one hundred mothers and their school age children were involved in the present study. They chose based on the following criteria: **inclusion criteria**, mothers who volunteered to participate in the research had school-age children with T1D. **Exclusion criteria:** mothers of children with T1D and other chronic illnesses, such heart disease. **To determine sample size**, 0.05 was chosen as the level of significance, 0.95 was chosen as the power, and an effect

size of 0.25 was used in the power analysis. 100 moms of school-aged T1D children, which was the minimal sample size necessary, were collected.

Data Collection Tools:

Four tools were employed in this research as follows:

Tool I: After evaluating the pertinent literature, the investigators designed a pre-questionnaire for the mothers as pre/post to gauge their awareness of T1D **(Jaser, et al., 2017). It had the following two components:**

Part I: Personal data: as age of the mothers, education level of the mothers, number of children, current residence, children age, sex, Hemoglobin A1c (%) tests.

1. **Part II: Interview mothers' knowledge questionnaire:** All mothers took this part as a pre- and post-educational test. It includes: mothers knowledge regarding T1D. It consists on 40 questions include the following: three questions about the meaning of T1D, three questions about T1D diet, four questions about treatment, five questions about diabetic complications, and five questions about general knowledge of insulin use. Moreover three questions general knowledge of physical exercise**,** three questions about the meaning of hypoglycemia, four questions about causes of hypoglycemia, five questions about signs and symptoms of hypoglycemia, and five questions about management of hypoglycemia.

Mothers' knowledge scoring system was graded in relation to the questions of the interviewing questionnaire sheet; mother responses were assessed using a sample answer sheet that the researchers had created. Correct answers take a score of one, while wrong answers take a score of zero. The scores of the questions were added up for each part, and the total was classified by the number of things. The average of these scores were calculated, along with a % score. Less than fifty-percent of the total mothers' knowledge was deemed to be unsatisfactory, whereas fifty-percent and above was deemed to be satisfactory.

Tool II: Pediatric Inventory for Parents (PIP) attempts to gauge the stress levels endured by parents of chronically unwell children. Parental stress in children: The PIP, which evaluate experiences in relation to parenting children with a medical status, was used to quantify parenting distress and stress **(Streisand, et al., 2001).** In the PIP, children's parents with chronic illnesses are asked to score the continuity and difficulty of forty- two occurrences that are frequently reported by those parents. Communications (with child as well as partner, and team of healthcare in nine statement), emotional distress (effect on mood as well as sleeping quality in fifteen statement), medical services (following prescribed treatment in eight statement), as well as function role (effect on capacity to work as well as other children's care in ten statement).

Scoring system of Pediatric Inventory for Parents (PIP): Responses are graded on Likert scales" five-point" that range from one equal ("never/not at all") to five equal ("very often/extremely") depending on the frequency of the item over the previous week and its level of difficulty. Higher scores indicate higher levels of stress. Continuity as well as difficulty scores are added independently for each of the 4 domain scales before being combined to provide an overall total frequency score (PIP-F) as well as total difficulty score (PIP-D). the higher scores reflect more frequent issues, greater difficulty, and more stress associated with parenting children **(Streisand, et al., 2005)**

Tool III: The Hypoglycemia Fear Survey–Parent (HFS-P), to evaluate the concerns and actions of parents around hypoglycemia. The HFS-P is a twenty-five statements survey that consists of a Worry subscale (HFS-W) with 15 items and a Behavior subscale (HFS B) with ten statements. The statements in the Behavior subscale evaluate certain behaviors intended to prevent hypoglycemia, whereas the statements in the Worry subscale reflect anxiety-inducing features of hypoglycemia. We questioned the parents regarding the regularity of problematic hypoglycemic incidents during the previous three months in keeping with the unique HFS-P statements (refer to the hypoglycemia in the children with

consciousness but needing parental assistance)**(Clarke, et al., 1998)**.

Scoring system of this tool with a five Likert reaction from one equal (never) to five equal (always). By adding the items for, one may determine the subscale HFS-P scores and the overall score. The HFS-W ranged from 15 to 75, the HFS -B ranged from10 to50 and the HFS-P total ranged from 25 to 125. Greater scores correspond to greater FoH**(Gonder-Frederick, et al., 2013).**

Tool V: Glycemic control: At the diabetic clinic laboratory, hemoglobin A1c (HbA1c) was tested at baseline in pre-test and post-test at 3 and 6 months. At ages six to twelve, hemoglobin A1c levels under 6.4% were regarded as indicative of adequate glycemic management. **(Bergenstal, et al., 2017)** HbA1c reflects the mean blood glucose level over the past two to three months and is a well-validated and widely-accepted outcome measure in diabetes-related studies **(Agiostratidou et al., 2017; Canadian Agency for Drugs and Technologies in Health, 2014; U.S. Department of Health and Human Services Food and Drug Administration, 2008).** When feasible, the most recent HbA1c lab results were retrieved from the child's medical record. This was possible for the participants who were followed within the Nemours healthcare system. Higher HbA1c indicates poorer glycemic control **(Lacher et al., 2013).**

Validity and Reliability: A team of three nursing in pediatric experts measure the content validity of the tools, and any necessary adjustments were made. The consistency and reliability of the instruments were evaluated using the Cronbach's alpha for moms knowledge, PIP, and HFS-P (0.870, 0.860, and 0.820, respectively) coefficient method.

Pilot study: A pilot research was conducted on ten percent (10) of the moms in order to evaluate the completeness and clarity of the study instruments as well as the time needed to complete each one. Depend on the pilot's results, the appropriate modifications, exclusions, and/or additions were implemented. The final forms were given the thumbs-up by a jury before the study could start.

Ethical consideration: taken written consent from all mothers who share in the research post being informed of its objective and nature. The researchers originally offered all optional participants to them and told them that the information they were gathering would be kept completely confidential. They were made aware that taking part in the study was fully voluntary and that they could stop at any time without incurring any fees. Information about the mother's private life was kept secret. Confidentiality and anonymity were guaranteed.

Educational program: For mothers of school-aged children with T1D, the researchers developed an booklet in the form of a distributed book after completing a knowledge evaluation (booklet in Arabic). Depend on a review of pertinent books and online sources, information regarding T1D.

Field work:

The initiative was implemented during a 12-month period, from January 2022 to January 2023, during which time the field work was conducted. Pre- and post-testing engross for one month, and the program was implemented over a period of five months. Post-testing includes knowledge, stress, and fear of hypoglycemia assessments as well as measurements of the children's HbA1c at three and six months. Twenty smaller groups made up of five moms and their children each were formed from mothers and their children with T1D. A total of seven sessions, each lasting 30 minutes, were held for each group. Each participant receives a program description pamphlet that lists all of the educational resources. Every session typically starts with a review of the material covered in earlier ones and the objectives for the upcoming one. The interested mothers and their kids received praise and/or appreciation as a reward. For the care of T1D in children, a health education message was created in accordance with the American Diabetes Association's (ADA) "Standards of Medical Care in Diabetes." (**Chiang, et al., 2018**). Researchers first spoke with moms at the Minia General and Health Insurance Hospitals in Minia City before beginning their main study. The researchers gave

the moms and their children a thorough discussion of the research's history and goals before distributing the pre-test designed to get the necessary data. Also the researchers were accessible when more details were required. The program's curriculum was created depend on an evaluation of the moms' and their kids' genuine educational needs.

The information provided by the participants has therefore been divided up into conceptual sessions. **Content of the 1st session** comprised face-to-face interactions between the researcher and the women and children whose lives were under investigation, personal interviews with the mothers and their children, a lecture to the moms, a chat, and the findings of the pre-test. **Content of the 2nd session** there were descriptions, causes, and symptoms of T1D. **Content of the 3rd session**: Blood/urinary ketone monitoring (methods and importance), blood glucose control (methods and importance). **The 4th session** covered were the term, its causes, symptoms, and treatment for hypoglycemia**. The 5th session cover** nutritional instruction (healthy eating, regulating carbohydrate intake, including whether to count carbohydrates). **The 6th session cover** the use of insulin, strategies for exercise and physical activity (appropriate forms of exercise, the value of exercise, and how to control the hypoglycemia while exercising), behavior of the child as well as mental health, development as well as diabetes requirements and priorities throughout childhood, complication's management. The topic of **the 7th session** was rewriting. There were many different instructional methods used, including as lectures as well as discussions in small-group. These involved the use of films and images as examples. A post-test format that measures the children's HbA1c in post-test at three and six months was eventually delivered in order to get the necessary data.

Data analysis

To enter the data, a appropriate personal computer was utilized. The statistical software suite SPSS-20 was used to conduct the statistical analysis. The information in each tool was analyzed, categorized, and coded. Descriptive statistics based on number as well as percentages were employed variable's qualitative, while means as well as standard deviations were utilized for data were quantitative. Chi-square analysis was used to evaluate qualitative research variables when comparing the mean of the 2 studied groups, and the Friedman test with a P value of 0.05 was employed to detect statistically significant differences.

Results:

Table (1) indicates that more than fifty percent of mother's ages were under 30 years old with mean was 33.5 ± 0.9, 50% of them were read & write, while just 10% of them have high degree of educational. Also there were 60% of them lived in the rural area.

Table (2): discuss the demographic as well as clinical traits of the 100 children. Related to children age 58% of children aged 6-9 years with mean 7.5 ± 0. 2, 66% of them were females. Only 70.0% of children had controlled diabetes by recommended standards (HbA1c< 8%). 44.0% of children monitor blood glucose frequency ≤3 times/day. Also, 78% of school age children had hypoglycemia in (past 3 months) in this study.

Table (3): The above table illustrates that 85.0% in post-test of mother have correct answer about type 1 diabetes knowledge. Regarding correct answer of knowledge about diet of type 1 diabetes it was 20.0% in pre-test but reached to 100.0% in post-test. Related to mothers correct answer about complication of insulin injections knowledge is 10 % in pre-test as well as 90 % in post-test.However, this increase reached statistically significant difference between the mothers knowledge about type 1 diabetes, diet, and complication of insulin injections (P. 0.02, 0.01, and 0.03); respectively. Total mothers knowledge score in pre-test 8.0% knowledge's satisfactory while in post-test were 95% satisfactory knowledge (P.0.05).

Table (4): The above table clears that 90.0% in post-test of mother have correct answer about definition of hypoglycemia. Regarding correct answer of knowledge about causes of hypoglycemia it was 14.0% in pre-test but reached to 92.0% in post-test.

In relation to mother's correct answer about management of hypoglycemia is 20.0 % in pre-test and 100.0% in post-test. However, the difference between the mothers' knowledge and this rise was statistically significant about definition, causes, and management of hypoglycemia (P. 0.05, 0.05, and 0.01); respectively. Total mothers knowledge score in pre-test was 20.0% satisfactory in comparing to post-test were 90% satisfactory (P.0.04).

Table (5) shows that, Glycemic control of school age children in this study had significantly improved throughout the study. Percentage within the normal level increased from 70.0% pre-test to 73.0% and 77.0% post-test at 3 and 6 months respectively.

Table (6): reveals the mean (SD) scores for the PIP, HFS-P and HbA1c levels. The total mean scores of mother's stress and fear of hypoglycemia were alleviated in post-test than pre-test. While Glycemic control (the child's HbA1c) was better control in post-test than in pre-test. Glycemic control Mean±SD of school age children were 10.45±1.34 in pre-test in comparing to 8.66 ± 1.16 in post-test.

Table (7): Clears that the mean score of the mothers' PIP, and HFS-P. The mean score of the PIP- Emotional distress was 48.2±8.6 in pretest in comparing to 23.2±6.4 at Post-test.

Total mean score of the HFS-P scale were 51.7±15.2 in pre-test while in post-test were decreased to 20.5±0.5.

Table (8): There was a significant correlation between education level and HbA1C levels. There is evidence that women with greater levels of education have better control over their children with T1D who are in school(r=-0.1634, p<0.05).

Table (9): there were significant correlation between occupation of mothers and HbA1C levels). Mothers who working have better glycemic control of their school age children have T1D than not working mothers (r=-0.1523, p<0.05).

Table (10): suggests that there is a positive significant association between mothers, the PIP scores are included in both the HFS-P subscale and HFS-P total scores. HFS-P total and subscale have a negative correlation with PIP-medical care (frequency) (r=0.602, p=0.001), (r=0.885, p=0.001); respectively.

Table (11): demonstrated that the total mean score of the PIP, (HFS-P), and HbA1c had statistically significant negative association with mothers' knowledge both before and after the test (r=.458**-P=<0.001, (r= 0.186** P=<.0001, and 0.534** &P=<.0001); respectively. The pre-test and post-test results of the moms of children with T1D showed the most strong positive statistically significant association between the total scores of mothers' knowledge(r=.0.952) P=0.001.

Table (1): Distribution of mothers based on their demographic traits (n= 100)

Items	No	%
Age of mothers:		
< 30 years	60	60.0
30<40 years	20	20.0
40 and more	20	20.0
Mean ± SD of mothers age	33.5 ± 0.9	
Formal education of mothers		
Illiterate	10	10.0
Can read and write	50	50.0
Secondary School	30	30.0
Higher Education	10	10.0
Occupation of mothers		
Working	70	70.0
Not working	30	30.0
Residence		
Rural	60	60.0
Urban	40	40.0

NS= Not statistically significant differences

Table (2): Distribution of Children's demographic and clinical characteristics

Items	No	%
Age of child		
6-9 years	58	58.0
10- 12 years	42	42.0
Mean ± SD of child age	7.5 ± 0.2	
Sex		
Male	34	34.0
Female	66	66.0
HbA1c		
Glycemic control within normal level <6.4 %	70	70.0
Glycemic control not within the normal level >6.4 %	30	30.0
Number of Insulin's Injections		
≤3/day	78	78.0
≥4/day	22	22.0
Daily BG Monitoring Frequency		
Less or equal 3 times/day	44	44.0
More or equal 4 times/day	56	56.0
Hypoglycemia (past 3 months)*	78	78.0

Note: * Mention that children have hypoglycemia but still require their parents' assistance

Table (3): Comparison of mothers knowledge in pre-and post-test about type 1 diabetes (n= 100).

Questions	Pre-test		Post-test		P. value
	No	%	No	%	
knowledge about type 1 diabetes					
Correct	18	18.0	85	85.0	X2=0.62 0.02*
Incorrect	38	38.0	7	7.0	
don't know	44	44.0	8	8.0	
knowledge about Diet of type 1 diabetes					
Correct	20	20.0	100.0	100	X2=0.65 0.01*
Incorrect	40	40.0	0.0	0.00	
don't know	40	40.0	0.0	0.00	
knowledge about Physical Exercise					
Correct	8	8.0	90	90.0	X2=0.60 0.01*
Incorrect	62	62.0	3	3.0	
don't know	30	30.0	7	7.0	
knowledge of Insulin use					
Correct	30	30.0	100	100.0	X2=0.68 0.01*
Incorrect	60	60.0	0	0.0.0	
don't know	10	10.0	0	0.00	
Complications of insulin injections					
Correct	10	10.0	90	90.0	X2=0.65 0.03*
Incorrect	60	60.0	6	6.0	
don't know	30	30.0	4	4.0	
Total mothers knowledge score					X2=0.60 0.05*
Satisfactory	8	8.0	95	95.0	
Unsatisfactory	92	92.0	5	5.0	

Table (4): Comparison of mother's knowledge in pre-and post-test about hypoglycemia (n= 100).

Questions	Pre-test		Post-test		P. value
	No	%	No	%	
Definition of hypoglycemia					
Correct	18	18.0	90	90.0	X2=0.55 0.05*
Incorrect	36	36.0	6	6.0	
don't know	46	46.0	4	4.0	
Causes of hypoglycemia					
Correct	14	14.0	92.0	92.0	X2=0.52 0.05*
Incorrect	60	60.0	5	5.0	
don't know	26	26.0	3	3.0	
Signs and symptoms of hypoglycemia					
Correct	8	8.0	90	90.0	X2=0.58 0.04*
Incorrect	62	62.0	3	3.0	
don't know	30	30.0	7	7.0	
Management of hypoglycemia					
Correct	20	20.0	100	100.0	X2=0.50 0.01*
Incorrect	60	60.0	00	0.00	
don't know	20	20.0	00	0.00	
Total mother's knowledge scores about hypoglycemia					X2=0.53 0.04*
Satisfactory	20	20.0	90	90.0	
Unsatisfactory	80	80.0	10	10.0	

Table (5): Glycemic Control of The school age children in pre and post-test at 3 and 6 months (n=100).

	Pre-test		Post-test				P. value
			At 3months		At 6 months		
HbA1c	N	%	N	%	N	%	
Glycemic control within normal level <6.4 %	70	70.0	73	73.0	77	77.0	F. 44.5 0.005**
Glycemic control not within the normal level >6.4 %	30	30.0	27	23.0	23	23.0	

F: Friedman test *** High statistical significance***

Table (6): The total mean scores of Pediatric Inventory for Parents, The Hypoglycemia Fear Survey–Parent and Glycemic control in pre and post-test (n=100)

	Pre-test	Post-test
Variable	Mean± SD	
Pediatric Inventory for Parents (PIP)	4.85 ± 4.70	1.33 ± 2.04
The Hypoglycemia Fear Survey–Parent (HFS-P)	80.72 ± 18.70	20.23 ± 12.42
Glycemic control (the child's HbA1c)	10.45 ± 1.34	8.66 ± 1.16

Table (7): The mean score of mothers' Pediatric Inventory for Parents, and The Hypoglycemia Fear Survey–Parent subscales (no = 100).

Items	Mean± SD		X^2	P. value
	Pre-test	Post-test		
Pediatric Inventory for Parents (PIP)				
PIP-Communication	24.4±4.1	18.5±3.2	5.22	0.001**
PIP- Emotional distress	48.2±8.6	23.2±6.4		
PIP- Medical care	30.9±3.2	16.5±4.2		
PIP- Role function	20.14±0.5	15.7±0.3		
The Hypoglycemia Fear Survey–Parent (HFS-P)				
Worry subscale (HFS-W)	24.8±12.1	17.5±8.6	5.36	0.001**
Behavior subscale (HFS B)	26.9±6.9	16.4±4.5		
HFS-P total scale	51.7±15.2	20.5±0.5		

Table (8): Mothers' literacy levels and their impact on HbA1c levels

Level of education	N	%	HbA1c level	P. value
Illiterate	10	10.0	6.66±1.27	r=-0.1634 0.05
Can read and write	50	50.0	6.25±1.10	
Secondary School	30	30.0	6.05 ±2.06	
Higher Education	10	10.0	6.04 ±1.03	

Table (9): Mothers' occupations and their impact on HbA1c levels

Occupation of mothers	N	%	HbA1c level	P. value
Working	70	70.0	6.22 (±4.03)	r= 0.1523 0.05
not working	30	30.0	6.56 (±3.05)	

Table (10): Correlations between mothers Hypoglycemia Fear Survey–Parent version (HFS-P) scale and Pediatric Inventory for Parents (PIP) scores (n=100)

PIP Score	Mothers	
Stress frequency	HFS-P subscale	HFS-P total
	r(p-value)	r(p-value)
PIP-Communication	0.669* 0.03	0.612* 0.02
PIP- Emotional distress	0.825* 0.02	0.840* 0.05
PIP- Medical care	-0.602*** 0.001	-0.885*** 0.001
PIP- Role function	0.880*** 0.001	0.615* 0.01
PIP- Total	0.626* 0.01	0.638* 0.01

Note: * p<0.05, **p<0.001The connection between HFS-P and PIP scores was calculated using Pearson correlation analysis.

Table (11): Correlation between mean scores of mother's knowledge, PIP, (HFS-P), and HbA1c in pre and post-test (n= 100)

Items	Pre-test knowledge	Post-test knowledge	Pre-test PIP	Post-test PIP	pre-test (HFS-P)	Post-test (HFS-P)	Pre-test HbA1c	Post-test HbA1c
	r(p-value)	r(p-value)	r(p-value)	r(p-value)	r(p-value)	r(p-value)	r(p-value)	r(p-value)
Pre-test knowledge								
Post-test knowledge	**0.952** **							
	0.000							
Pre-test PIP	-.595-	0.055						
	.224	0.551						
Post -test PIP	-.520-	**.458**-**-	.046					
	.066	**0.000**	.6654					
Pre-test (HFS-P)	-.300-	-.234-	.532	0.134				
	.334	.323	.452	0.356				
Post -test (HFS-P)	-.350-**	**-.222-****	.235	**0.186****	0.322			
	0.000	**0.000**	.0.355	**0.000**	0.543			
Pre-test HbA1c	-.650-	-0.652-	.522	0.025	0.074	0.086		
	0.354	0.444	.243	0.675	0.765	0.534		
post-test HbA1c	-.620-**	**-.954-****	-.645-	**-0.234-****	-0.423-	**-0.456-****	**0.534****	
	.000	**.000**	.275	**0.000**	0.942	**0.000**	**.000**	
	*. The 0.05 level of significance for correlation **At the 0.01 level, correlation is highly significant.							

Discussion

One of the most prevalent chronic juvenile disorders T1DM, causes genetically predisposed people to eventually lose their pancreatic islets **(Elhawy et al., 2021).** Although T1DM can affect people of any age, it is more prevalent in children and young people, with reports indicating the incidence has risen by 2-5 percent globally **(Vojislav et al., 2020).** The T1DM is a chronic condition that can have a detrimental impact on a child's mental and health wellbeing as well as their health-related quality of life (HRQOL) **(Makara-Studzińska et al., 2019)**

The T1D treatment poses a number of difficulties, particularly for young children and their parents. The results of children with T1D are positively impacted by parental care **(Schiaffini et al., 2020).** T1DM management needs numerous daily subcutaneous insulin injections or lifetime substitution of insulin with an insulin pump. Long-term problems can include vision issues, renal issues, heart disease, as well as foot damage if they are not treated properly. Therefore, the entire family must adjust their behavior, with the mother bearing the bulk of the responsibility (HRQOL) **(Makara-Studzińska et al., 2019)**

Mothers are the child's primary caregivers, thus they should help with caregiving and maintaining the child's healthy metabolic regulation **(Tawfique, et al., 2021).** In the relation to the hypothesis of the current research, the mothers of school age children with T1D will maintain good glycemic control after application of the education program on post-test than on pre-test.

The 100 mothers who are caring of school age children with T1D were included in the current research with mean was 33.5 ± 20, more than half of mothers age were less than 30 years, This finding is similar to those obtained by **Adam, et al., (2010)** they stated that moms should be of an appropriate age to be able to rely on responsibility responsibly toward their children due to new mothers are frequently emotionally unfit for parenthood. Also **Jennifer Scheurich, (2021)** mentioned that Parents ranged in age from 20–68 years who caring for their diabetic children (*M* = 33.83, *SD* = 5.74).

Additionally, the research's results were observed that fifty-percent of mothers could read and write, in addition justly 10% hold high degree of education and more than half of them lived in rural area. This finding is similar to those obtained by **Saunders, et al., (2014)** who claimed that as a mother's education declines, her family's health risks increase for herself, her children, and her own family. This result is not incongruent to those performed by **Abdulrahman, et al., (2013)** who state that the majority of mothers had attained college educational level and had completed secondary educational level while, (7.2%) were illiterates.

As regards traits of school age children with T1D in the current research, the age's mean was 7.5 ± 0. 2, more than half of school age children had diabetes type 1 in this study were females. As well as, this finding was not consistent with the finding of **Jennifer Scheurich, (2021)** who found that children ranged in age from 1–6 years with T1D (3.6±0. 6). There were more than fifty- percent of children had T1D were males.

As regard monitor blood glucose frequency, only 28.0% of children had controlled diabetes by recommended standards (HbA1c< 8%) and 44.0% of children monitor blood glucose frequency ≤3 times/day. Indeed, 78% of school age children had hypoglycemia in (past 3 months) in this study. As well as, this not parallel with **Fatemehsadat et al., (2018)** Who summarizes the demographic and clinical traits of the 61 child, the mean and standard deviation for HbA1c was 9.4 and 1.76, respectively, and just 8.3% of the had diabetics children under control by the guidelines (HbA1c: 7.5% (22)).

After the educational program was implemented, the overall knowledge of mothers as a whole was satisfactory, according to the current study, with statistically significant variations (P 0.05). This in line with **Seham et al. (2022),** who found that thirty-three percent of the moms had grater knowledge's level about T1D on the post-test compared to the pre-test following program implementation. As a result, there were substantial statistical differences between of mothers knowledge's level on before and after test at (P 0.001).

The current research's findings regarding mothers' diabetes awareness revealed that mothers' knowledge of diabetes mellitus was higher on after-test than it was on the pretest. This finding was line with **Seth, (2020)** research on the difficulties of achieving optimal glycemic maintain in children with T1D in India, which found that glycemic control knowledge can be improved through effective health education, which also encourages the child and their mother to take charge of their diabetes. According to the researcher, this can be attributed to the educational program's positive effects, the mothers' thorough pre-program preparation (they were eager to learn everything about diabetes), oral discussion, group discussions, feedbacks, explained booklets and videos, and the researcher's facilitation of efficient online speaking with the mothers. Additionally, this outcome was at odds with a study by **Hussien et al. (2019),** who discovered that about two thirds of the mothers of diabetic children had an unsatisfactory overall knowledge score regarding how to care for their offspring.

Regarding the mothers' PIP, The Hypoglycemia Fear Survey–Parent (HFS-P), Glycemic control (the child's HbA1c). The total mean scores of mothers stress and FoH were alleviated in post-test than pre-test while Glycemic control (the child's HbA1c) was better control in post-test than in pre-test. Glycemic control Mean±SD of school age children were 10.45±1.34 in pre-test and 8.66 ± 1.16 in post-test. There was no significant connection among HbA1c and other elements involving HFS-P and PIP. Also , this is consistent with the finding **Fatemehsadat et al., (2018)** that reports that children ten and older had higher HbA1c readings (9.91.8) than children nine as well as younger (9.01.7), F (1, 58)= 3.79, p=0.05. HbA1c did not significantly correlate with any other factors, such as HFS-P or PIP.

The actually research also found that the mothers with more knowledge in post-test than pre-test about T1D, diet, physical exercise, insulin use, complication of insulin injections and with high education were able to control a high glycemic of their school age children, with statistically significant differences (P. 0,02, 0.01, 0.01,0.01, 0.01, 0.03, 0.05); respectively. This result agreed with the result of **Seham, et al., (2022)** they claimed that mothers who knew more about diabetes were able to keep their Childs' blood sugar levels under better control. By enhancing the grandmas' understanding of diabetes, the coping scales for accepting responsibility and positive reappraisal were the highest elevated.

In the present research, there were negative significant connection among the total mothers knowledge scores in post-test about T1D and HbA1c level (r=**-954****, p<0.05) indicating grater knowledge ultimately leads to higher control of HbA1C levels. This result was accordance with the result of **Ouzouni et al., (2019)** they discovered a connection between the mothers of the investigated children and their ability to control their HbA1c levels. Additionally, this outcome supported the notion that the key to treating diabetes was education and information. Also **Seham, et al., (2022)** claimed that there were signs that educational interventions in diabetic children had a positive impact on glucose management as well as the psychology of themselves and those around them. **Seham, et al., (2022)** According to the study, this could be due to bettering the mother's understanding of diabetes and their children's care in order to obtain the best results.

In the current research there were a positive significant correlation among mothers, in both the HFS-P and HFS-P total scores with PIPscores. HFS-P and HFS-P total negatively with PIP-medical care (frequency). (r=0.602, p=0.001), (r=0.885, p=0.001); respectively. Also this result was consistent with **Fatemehsadat et al., (2018)** who discovered that moms' HFS-W subscale and HFS-P total scores strongly linked with a number of PIP scores. PIP-medical care (frequency) and the HFS-W subscale and HFS-P total had a negative correlation.

Conclusion:

After application of education program alleviating mother's stress, fear of hypoglycemia, and Consider psychological adjustment while contemplating crucial consequences for education, recognizing diabetic fear as well as stress for mothers have children with T1D. The school age children's

glycemic control improved after health education at 3 and 6 months in post-test. Additionally, mothers' knowledge about T1D and hypoglycemia has improved since the training program was implemented; there is a positive significant correlation between mothers, in both the subscale of HFS-P as well as total HFS-P with PIP scores, the subscale of HFS-P and total of HFS-P negatively with PIP-medical care (frequency). There is a significant connection existed between level of knowledge, education and occupation of mothers and HbA1C levels) so mothers who have grater knowledge in post-test ultimately lead to higher control of HbA1C level. Mothers who have a high education's level had better glycemic maintain in post-test ($r=-0.1634$, $p<0.05$). Mothers who working have better glycemic control than not working mothers ($r=-0.1523$, $p<0.05$).

Recommendation:

This research recommended that future studies are needed to create and improve treatment programs to reduce the mothers stress, fear of hypoglycemia through educational program for mothers in caring for their children with T1D. Finally, this study confirms previous research associating a person's age, education's level, and knowledge to their HbA1c profile, giving some insight into who is more at risk for having glycemic mantain that is less than ideal. A topic was discovered throughout the course of this investigation that will be the subject of future research.

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