

EFFECT OF MOTHERS' ENGAGEMENT IN VIRTUAL EDUCATIONAL PROGRAM ON THEIR PERFORMANCE REGARDING PEDIATRIC DIABETIC CARE

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This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Faculty of Nursing Ethical Committee: Approval Code No. [NUR 20] 4/12/2022, and a Permission to collect data from Mansoura University Pediatric Hospital (MUPH) was also obtained. Written informed consent was obtained from all the study participants.

Competing interests:

The authors declare that they have no competing interests.

Abstract:

Background: Diabetic virtual education (DVE) emphasizes accessible structured guidance for mothers as the first line caregiver for their children with type 1 diabetes mellitus (CTID). CTID have a distinct emerging multi-treatment requirement. **Aim:** this study aimed to evaluate the effect of a diabetic virtual educational program (DVE) on mothers' performance regarding care of their children with type I diabetes. **Materials and Methods:** A quasi-experimental design was employed using a consecutive convenient sample of 54 mothers included. The study was conducted over a period of three and half months from mid- January to end of April 2025 at Mansoura University Paediatric Hospital (MUPH), Endocrinology department and juvenile diabetic clinic through virtual sessions. Data collected pre and post the DVE using two tools regarding mother's care of their CT1DM. tool I: include personal data sheet and an assessment questionnaire for mothers'

knowledge regarding care of their children with type 1 diabetes. Tool II: mothers' reported practice questionnaire. Results: revealed that all studied mothers (100%) pre the DVE had poor knowledge and inadequate level of reported practice regarding care of their type I diabetic children. Post the FVE, an overall good knowledge and adequate reported practice were noticed for all studied mothers with highly statistically significant differences at p value < 0.001 . Conclusion: Marked enhancement observed for overall performance i.e. mothers' knowledge and reported practice regarding care of their children with type 1 diabetes after implementing the DVE.

Keywords: Virtual Education, Mothers' performance, Type I Diabetic Children Care.

Introduction:

Type 1 diabetes mellitus (T1DM) is the third most common chronic ailment affecting children and adolescents worldwide. According to the International Diabetes Federation (IDF). The prevalence of diabetes in children aged less than 15 yrs. T1DM continued to increase annually at the past decades. T1DM set a considerable burdens and overloads on both caregivers and professionals. Which significantly challenges healthcare systems and families. Managing children with type paediatric diabetes (CT1D) requires aligned strict and consistent daily care practices including insulin administration, blood glucose monitoring, carbohydrate counting, healthy nutrition, and maintenance of regimented physical activity. Regarding the developmental stage of given age, children with diabetes are often unable to manage the complex care regimen without caregiver guidance and supervision. This makes the involvement of primary caregivers-particularly mothers- a basic demand for effective diabetic control. [1,2]

Mothers as the primary caregiver, required to be involved in all care details related the child's diabetes management. Dependently, mothers are in a need for complete and accurate awareness regarding care of their CT1D. By role, the improved awareness of mothers can improve their performance regarding care domains that can help children with T1DM demonstrate better glycaemic control, reduced episodes of hypo- and hyperglycaemia, and improved adherence to treatment regimens. [3,4] However, the role of caregiving for chronic health ailments can be associated with multi-sources psychological stressors. Mothers of chronically ill children frequently report a high level of stress, anxiety, guilt feeling, blaming, and exhaustions as they assume responsibility of both the emotional and clinical care complexities easing for supporting the chronically ill child. [4,5]

These stressors can interfere with effective caregiving and reduce the mother's confidence and competency in conducting diabetes- home care practices. Thus, maternal wellbeing and empowering can affect not only the CT1D care but also the overall family dynamics. In addition, the virtual educational intervention which can be based on enhancing family relations and caregiver empowerment can substitute negative family dynamics to safe supportive one. [6]

The virtual health education is the most accessible educative methods, which had emerged during the COVID-19 pandemic. Virtual delivery of educative programs has become an innovative and

scalable strategy. Virtual sessions provide structured, interactive education that empowers mothers with disease-specific knowledge, stress management skills, and relational strategies to support their children's health behaviours. [7] These programs are cost-effective, less disruptive to family routines, and can reach caregivers in geographically diverse or underserved areas.

Despite the increasing adoption of virtual formats for caregiver education, there remains a limited body of evidence specifically assessing how engagement in such programs influences maternal performance in diabetes care. Performance in this context refers not only to technical knowledge but also to behavioural consistency and effective communication with the child about diabetes management. There is also a gap in understanding the mechanisms by which virtual models enhance caregiving outcomes in chronic disease settings.

Mothers, as primary caregivers, play the crucial role in supporting their children's daily care activities and maintaining glycaemic control through acquiring adequate levels of knowledge and practices for addressing competent care behaviours [8,9]. Virtual education has promised an intervention for children with chronic illnesses, including diabetes. [10] Integrating mothers into virtual educative programs can enhance their ability to support children's care practices while saving time and effort to deliver more family care, particularly for chronic ill children. [11,12]

Previous evidence suggests that virtual educative sessions can significantly improve parental skills in managing their child's chronic condition. [13,14] However, there is still a need to conduct such educative programs for enhancing mothers' performance regarding the care abilities of their children with diabetes, particularly in Egypt and other low- and middle-income countries. [12,14]. Therefore, the present study aimed to evaluate effect of a diabetic virtual educational program (DVE) on mothers' performance regarding care of their children with type I diabetes.

Subjects and Methods:

The study started at the beginning of 2025 and lasted 3 and half months, targeted mothers of type I diabetic children at pediatric MUPH who were accompanying their children during hospitalization or follow up. Diabetic Virtual Education (DVE) was conducted through quasi-experimental study through telegram synchronous video in a live broadcast weekly. Ethical approval was obtained from the Faculty of Nursing Ethical Committee via Letter Code No. NUR (20) dated 4/12/2022. At first, the tools were developed by the researcher, tool I: represented an assessment of mothers' knowledge regarding care of their T1DMC and consisted of general and detailed care domains. The reported practice assessment questionnaire consisted of 11 domains to cover care areas such as insulin medication and nutritional and activity regimen. The validity of the tools investigated using Cronbach alpha factor for knowledge assessment questionnaire and reported practice questionnaire scored 0.85 for both. Then, a pilot study conducted on~10% of participant with 54 mothers enrolled. An oral consent taken from all participants with declaration of their right to withdraw at any time without any rationalization. The program aim, content, and

timeline were explained to all participants, as well as supervisors of the selected hospital departments to gain their cooperation. The tools were filled in by mothers pre and post the DVE through google drive format.

Results:

The personal data of the studied mothers revealed that the mean age of the studied mothers was 40.5 ± 5.506 years, and related to marital status, 88.8% of studied mothers are married. It is noted that 76% of studied mothers are highly educated and 61% are housewives. Whereas low economic status level represents 74 % of the studied mothers. Regarding children no., 46.4% have four children. On the other hand, 90.8% reported that they didn't receive any training regarding Caring of their T1DM children, and for those who received training previously, 5.5 % received training more than two years ago, reveals also that 61% of the studies mothers not working, whereas, 15% works, and 24% are in work vacation as showed in table (1) and figure (1).

The total knowledge and reported practice level of the studied mothers represented in table (2,3) which registered highly statistically significant difference pre and post the program with p-value < 0.001 with overall domains. This reflected by all participants scored good knowledge level post the FVE compared to all scored at poor level pre-program, revealing a clear improvement post the program, the same result recorded for reported practice level pre and post the program.

Table (4), presents Comparing means pre and post program regarding the mean scores of total mothers' knowledge and reported practice, and paired sample t test, the findings value of means and SD presents noticeable growth at knowledge level indicated by a highly statistically significant differences at P value < 0.001

Table (5) illustrates total responses' percentages of studied mothers' allover knowledge domains, outcomes explicit significant improvement as the total correct answers at MCQ domains experienced a rise from 13.6% pre-program to 91.4% post the program. In the same line, self-reported responses "no"& "not sure" at total domains registered a decline from 69% and 18.5% pre-program to 93.5% for both post program, which reflects an improvement towards the good level of mothers' knowledge post the program.

Discussion:

The findings from the current study provide compelling evidence that involving virtual diabetic education program significantly improves the knowledge and reported practice levels among mothers of children with Type 1 Diabetes Mellitus (T1DM). The statistically significant pre-post changes across overall measured domains highlight the effectiveness of the DVE program in empowering caregivers with essential diabetes-related knowledge and emergency response skills. [16]

The observed improvement in mothers' knowledge post-intervention, with correct responses increasing from 13.6% to 91.4%, and the corresponding decline in incorrect and unsure responses, confirms that tailored education directly influences caregivers' preparedness. These results are aligned with previous findings that emphasize the role of caregiver education in achieving optimal diabetes management [17]. Furthermore, this finding suggests that investing in educational content for caregivers not only builds awareness but directly translates to improved home-based care for children with T1DM. [18]

The demographic profile of the participants also provides valuable insight. Despite the majority being non-working and of lower economic status, their receptivity to the training and post-program improvement was significant, suggesting that such interventions are universally beneficial, irrespective of socioeconomic background. While a significant number had to take leaves with non-paid vacation from work, after their CT1DM diagnosed.

In context, this highlights the need for easily accessible education, which can have achieved through FVE. Additionally, this was given the urgent need for seeking to acquire knowledge and practices required as a main care challenge for detailed daily care to CT1DM. This aligns with WHO suggestions that mothers often prioritize caregiving over employment during medical crises [19]. Such patterns suggest that the severity and shock of the diagnosis experience can significantly influence mothers' decisions and stress responses and may initially hinder caregivers be acquiring of emergent care knowledge and practices. [20] This supports integrating caregiver education into standard pediatric diabetes care, especially in resource-limited settings. [18,21]

In conclusion, the results validate the necessity of structured, context-specific caregiver education programs. While future research could explore long-term retention of knowledge and sustained behavioral change, the current outcomes advocate strongly for broader implementation of similar interventions in diabetic pediatric care protocols. [17] Furthermore, the consistent statistically significant improvements observed across all measured domains post-intervention strongly support the effectiveness of structured family-centered educational programs. These findings align with prior research indicating that targeted interventions can significantly enhance caregiver knowledge and practices. [16,17] It is worth noting that mothers' improved emergency response behavior and adherence to proper glucagon administration are particularly vital, as they directly influence acute outcomes in hypoglycemic episodes. [18,19] Hence, reinforcing these aspects within future programs remains crucial. [22]

Conclusion

Diabetic virtual educative programs can improve the overall mother's performance and enhance mothers' knowledge and reported practices regarding care of their children with type one diabetes mellitus.

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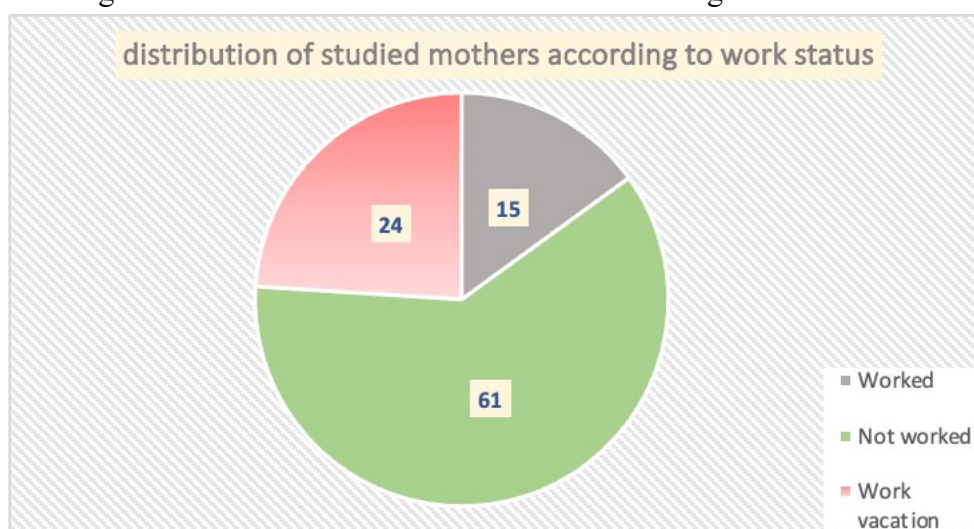
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Table 1. The Personal Data of the studied mothers.

Characteristics	No	%
Age (year)		
20-29	0	0
30-39	21	39
40-49	31	58
≥50	2	3.7
Mean± SD	40.5 ± 5.506	
Marital status		
Married	48	89
Widow	2	3.7
Divorced	4	7.5
Level of education		
Diploma	13	24
High Graduate	41	76
Postgraduate	0	0
Occupation		
Currently Working	8	15
On Work vacation	13	24
Not worked (Housewife)	33	61
Economic status		

Low	40	74
Moderate	14	26
High	0	0
Children Number (no.)		
Two	8	15
Three	13	24
four	25	46
five	8	15
Previous Mother Training		
Yes	5	9.2
No	49	91
Date of Previous Mother Training		
No training received	49	91
> one year	2	3.7
> two years	3	5.5

Figure 1. distribution of studied mothers according to work status.

**Table 2. Total Scoring Level of Studied Mothers' Knowledge Pre and Post the program**

Item	Total pre- program Mothers' knowledge		Total Post-program Mothers' knowledge		Z-Score	P value
	NO	%	NO	%		
Good $\geq$ 75%	0.00	0.00	54	100	6.51	< 0.001**

Fair $\leq 74 - \geq 50$	0.00	0.00	0.00	0.00		
Poor $< 50\%$	54	100	0.00	0.00		

****Highly statistically significant at p-value < 0.001 .**

Table 3. Total Level of Studied Mothers' reported practice Pre and Post the program

Item	Total pre- program Mothers' reported practice		Total Post-program Mothers' reported practice		Z-Score	P value
	NO	%	NO	%		
Adequate $\geq 85\%$	0.00	0.00	54	100	5.63	$<0.001^{**}$
Inadequate $< 85\%$	54	100	0.00	0.00		

**** highly statistically significant at $p < 0.001$.**

Table 4. Paired Sample T-Test regarding total Mothers' performance

Item	Compare Means		Paired t- test	P value
	Pre-program	Post-program	score	
Total Mothers' knowledge	Mean $\pm$ SD	Mean $\pm$ SD	89.3	$< 0.001^{**}$
	25.02 $\pm$ 7.9	133.3 $\pm$ 4.4		
Total Mothers' reported practice	38.15 $\pm$ 9.1	102.3 $\pm$ 5.2	44.2	$< 0.001^{**}$

****Highly statistically significant at p-value < 0.001 .**

Table 5. Total responses of studied mothers' all-over knowledge domains

MCQ responses at domains 1, 2 & 3		
Responses	Pre	post
Correct	13.6%	91.4%
Incorrect	86.4%	8.6%
Self-reported responses at domains:		
Yes	12%	93.5%
Not sure	18.5%	5.2%
No	69.4%	1.2%