



Original Article

Effects of a Home-Based Nursing Intervention Program on Caregivers Care Adherence of Children Affected with Type I Diabetes Mellitus

Shevan Y. Othman^{1*} , Shukir S. Hasan^{2,3} , Nadir A. Garjees⁴

¹Department of Nursing, Akre Technical Institute, Duhok Polytechnic University, Duhok, Kurdistan Region, Iraq

²Nursing Department, Nursing College, Hawler Medical University, Erbil, Kurdistan Region, Iraq

³Nursing Department, Faculty of Nursing, Tishk International University, Erbil, Kurdistan Region, Iraq

⁴Department of Pediatric, Medicine College, University of Duhok, Duhok, Kurdistan Region, Iraq

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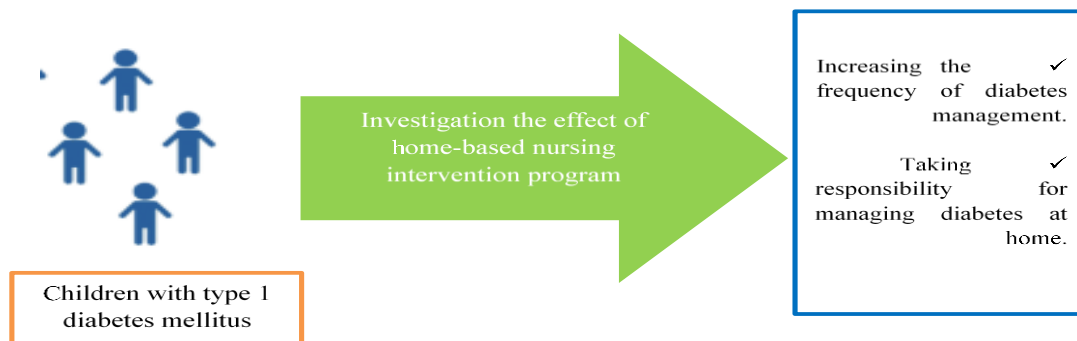
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ABSTRACT

Type 1 diabetes mellitus (T1DM) is a chronic disease that affects many children worldwide. Caregivers of children with T1DM play a crucial role in managing the child's health, but often face challenges in adhering to the recommended care guidelines. This study aimed to find out the effects of home-based nursing intervention programs on caregivers regarding the home care of children affected by T1DM. A quasi-experimental design with pre-and post-test control and intervention groups was used. This study was conducted in Akre, Duhok, Iraq, with 60 caregivers (30 in an intervention group and 30 in a control group) of children diagnosed with type 1 diabetes mellitus who were registered at the Gulan General Hospital in Akre city and were selected using the systematic sampling method between 3rd of January to 5th of September, 2022. A home-based nursing intervention program (5 months) was provided to the intervention group, while standard care was provided to the control group. A t-test, chi-squared analysis, and a structural equation model were used for data analysis of the iterative measurements. The end result shows the home-based nursing intervention program changed the behaviour of caregivers toward diet and insulin, modification of the diabetes care plan, intervention behaviour, and additional diabetes care practices were significant differences between groups. The home-based nursing intervention program was effective in increasing the frequency of diabetes management and taking responsibility for managing diabetes at home.

GRAPHICAL ABSTRACT



* Corresponding author: Shevan Y. Othman

✉ E-mail: shevan.osman@dpu.edu.krd

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Introduction

Type 1 diabetes mellitus (T1DM) is a metabolic and autoimmune disorder characterized by raised blood glucose levels (hyperglycemia), because of the insulin deficiency that occurs as a result of the loss of pancreatic islet β -cells [1]. Diabetes mellitus (DM) requires continuous management. Today is considered a worldwide epidemic, resulting in a challenge to health systems worldwide [2]. Recent epidemiological studies indicate that the incidence of type 1 diabetes is increasing worldwide, with the greatest increase in children aged 5 years while type 1 diabetes mellitus (T1DM) affects approximately 500,000 children (<15 years) worldwide [3, 4]. In Iraq, the estimated prevalence of T1DM increased from 7.8 in 1995 to 14.2 in 2000 and to 24.7 in 2014 per 100 000 under 15 years old children [5]. However, it affects more than 90% of children and adolescents, and it is the second most common chronic childhood disease, with a life expectancy mean of 15 years old [6].

Home-based nursing intervention programs have been found to be effective in improving the care adherence of children affected with Type I Diabetes Mellitus (T1DM). These programs often involve a team of healthcare professionals, including nurses, who provide comprehensive care to patients and their families in their homes [7, 8]. Parents and nurses play a crucial part in managing diabetes in the family. Nurses should arm families with the knowledge, skills, and capacities using evidence-based understanding. The nurses as a first-line healthcare providers have a pivotal role in Diabetes care. Nurses play a crucial role in tailoring diabetes education to each person's requirements and ensuring that it is guided in the right direction to modify behaviours [9].

The proper management of the disease in children and adolescents has been a challenge, because of the presence of behaviours, skills, and inadequate knowledge that contribute to non-adherence to treatment and the significant increase in long-term complications [10]. Diabetes can result in serious coping problems during the childhood years, as it is a chronic

disease that necessitates continuous monitoring [11]. The challenges of nutrition education for children and adolescents with diabetes are often age-related and reflect the nutritional and developmental needs of different age groups. Family functioning and interactions at meal-times have been demonstrated to impact eating behaviour and glycemic control in younger children [12]. Monitoring sugars at home with the help of a glucometer allows the patient and family to adjust insulin doses for hypoglycemia, high blood glucose, unplanned exercise, and ketosis on sick days [13]. Ongoing patient with T1DM self-management education and support are critical to preventing acute complications and reducing the risk of long-term complications. Significant evidence exists that supports a range of interventions to improve diabetes outcomes [14].

The results of Feldman *et al.*'s (2018) studies show that family-based interventions for youth with T1D are effective in improving diabetes and family-centered outcomes [15]. Likewise, very few studies have investigated the home-based nursing intervention program on caregivers regarding the home care of children with T1 diabetes, especially in Iraq. Therefore, it was necessary to conduct this study with the purpose of investigating the effects of a home-based nursing intervention program on caregivers regarding the home care of children with T1 diabetes in Iraq.

Materials and Methods

A quasi-experimental design was established for the effectiveness of a home-based nursing intervention program for caregivers of children affected with type I diabetes mellitus. The study was carried out in Gulan General Hospital in Akre city Dohuk Governorate, Kurdistan Region /Iraq, and home-based intervention was performed for each patient's home until the list of 60 caregivers was completed, so they were divided into two groups, one group of (30) caregivers who were exposed to the nursing intervention program as the "study group" and another group of (30) caregivers who were not exposed to the program and were considered the "control group". The

whole period of the study lasted for eight months, starting on January 3 and ending on September 5, 2022. Data collection was done by the researcher, who maintained the confidentiality and anonymity of the data. The form for data collection was applied without mentioning the name of the participant, the sensitive culture of the local ethics was considered, and approval was obtained from the Ethical Committee of Duhok University at the College of Nursing to conduct the study. A non-probability (purposive) sample of 60 caregivers was recruited for the study. patients and their caregivers for treatment and routine follow-up in outpatient settings at Gulan General Hospital in Akre City, the researcher took all the phone numbers of the caregivers after receiving their agreement to have a home visit for each of the study samples. The study sample consisted of 60 caregivers who take care of their T1DM child; Random sampling was used for the intervention group and the control group, with the first draw for the intervention group and the second draw for the control group. A home nursing intervention program was developed by a team of experts in diabetes care and nursing. The program was based on evidence-based practices and the Health Promotion Model (HPM). The program focused on increasing adherence to diabetes care and caregiver self-efficacy in managing their child's diabetes. The program included weekly phone calls and monthly home visits to provide education, support, and guidance to the caregiver. To create a nursing intervention program at home using HPM, assessment of patient's personal factors, environmental factors affecting health, and well-being, identification of patient's health-promoting behaviours were obtained using interviews, questionnaires and observations. Finally, the effectiveness of the nursing intervention program was evaluated through changes in caregivers' adherence to diabetes care, perceived self-efficacy, and the child's health status. The researcher prepared the tools depending on the DBRS available at: <https://scholarscompass.vcu.edu/etd/185>). After data collection, they were analyzed using SPSS version 26 statistical software. After importing the obtained data into the software, paired and

independent t-tests were used, and the chi-square test was used to analyze the qualitative data. A P value of ≤ 0.05 is considered as significant.

Results and Discussion

The study found non-significant differences between the domains (diet and insulin, modification of the diabetes care plan, intervention behavior, and additional diabetes care practices) before conducting the program (pre-test) at a P-value of > 0.05 , respectively (Table 1). Concerning the comparison between the diet and insulin domains, the current result shows that there is a highly significant difference between pre-test and post-test 1 at P-values (0.000, 0.007) respectively, after intervention programs, while in control groups there are non-significant differences between pre-test and post-test 1 and 2 in diet and insulin domains (Table 2). Regarding the comparison between the modification domains, the result reveals that there were highly significant differences between pre-test and post-test 1 and 2 at (P-values= 0.000 and 0.015), respectively, after intervention programs, while in control groups there were non-significant differences between pre-test and post-test 1 and 2 in the modifications of the diabetes care plan (Table 3). To compare the interventional behavior domain, the result indicates that there were highly significant differences between pretest and post-tests 1 and 2 at (P-value=0.000 and 0.007) respectively intervention programs. Furthermore the study shows there were non-significant differences between pre-test and post -test 1 and 2 in the interventional behavior of control groups (Table 4). Based on the comparison between additional diabetic care practice domains, the result shows that there is a highly significant difference between pre and post-test 1 and 2 in the intervention group, with a P-value of (0.000 and 0.011), respectively. Concerning the control groups, there is a non-significant difference between pre- and post-test 1 and 2 in additional diabetic care practice (Table 5). At the beginning of the study, the researcher found that there were no significant differences between all domains (diet and insulin,

modifications of the diabetes care plan, intervention behaviors, and additional diabetes care practices) in the intervention and control groups before exposure to nursing intervention programs (Table 1). The present results are in agreement with a study done by Gürkan *et al.* [16], who stated that there were no significant

differences between the diabetes behaviour rating scale domain in control and intervention groups before being exposed to nursing intervention programs. The researcher suggested that caregivers need health intervention programs regarding T1DM.

Table 1: Comparative domains between the intervention and control groups before conducting the program (pre-test)

Domains	N	Mean	N	Mean	Std. Deviation	P-value*
Pre test	Diet and insulin	Control	30	1.563	0.357	0.481(NS)
		intervention	30	1.498	0.284	
	Modifications of diabetes care plan	Control	30	1.450	0.418	0.070(NS)
		intervention	30	1.503	0.429	
	Intervention behaviors	Control	30	1.456	0.595	0.305(NS)
		intervention	30	1.489	0.406	
	Additional diabetes care practices	Control	30	1.240	0.468	0.610(NS)
		intervention	30	1.467	0.434	

*Mann-Whitney U

Table 2: Comparison between diet and insulin domain pre- and post-test (1 and 2)

Diet and insulin Domains	Interventional groups									
	Pre-test and post-test 1					Pre-test and post-test2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.498	0.284	-31.36	29	0.000	1.498	0.284	-0.671	29	0.007
3.237	0.186	1.561				0.348				
Diet and insulin Domains	Control groups									
	Pre-test and post-test 1					Pre-test and post-test 2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.294	0.201	1.361	29	0.184	1.294	0.201	1.361	29	0.180
1.288	0.202	1.288				0.202				

*Independent T-test

Table 3: Comparison between modification domain pre- and post-test (1 and 2)

Modifications of diabetes care plan	Interventional groups									
	Pre-test and post-test 1					Pre-test and post-test 2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.533	0.409	-27.506	29	0.000	1.533	0.409	2.582	29	0.015
3.183	0.337	1.200				0.458				
Modifications of diabetes care plan	Control groups									
	Pre-test and post-test 1					Pre-test and post-test2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.094	0.143	1.000	29	0.326	1.094	0.143	-1.000	29	0.326
1.089	0.143	1.089				0.143				

*Independent T-test

Table 4: Comparison between interventional behaviour domain pre- and post-test (1 and 2)

Interventional behaviour	Interventional groups									
	Pre-test and post-test 1					Pre-test and post-test2				
	Mean	Std. Deviation	t-test	d.f.	P-value *	Mean	Std. Deviation	t-test	d.f.	P-value *
	1.489	0.406	-21.954	29	0.000	1.489	0.406	-0.267	29	0.017
3.100	0.410	1.456				0.595				
interventional behaviour	Control groups									
	Pre-test and post-test 1					Pre-test and post-test 2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.2167a	0.294	0.920	29	0.899	1.2167a	0.294	-0.267	29	0.997
1.2167a	0.294	1.2167a				0.294				

*Independent T-test.

Table 5: Comparison between additional diabetic care practice domain pre- and post-test (1 and 2)

Additional diabetic care practice	Interventional groups									
	Pre-test and post-test 1					Pre-test and post-test2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value *
	1.467	0.434	-22.239	29	0.000	1.467	0.468	-2.134	29	0.011
3.007	0.290	1.240				0.468				
Additional diabetic care practice	Control groups									
	Pre-test and post-test 1					Pre-test and post-test 2				
	Mean	Std. Deviation	t-test	d.f.	P-value*	Mean	Std. Deviation	t-test	d.f.	P-value*
	1.1267a	0.193	0.721	29	0.883	1.1267a	0.193	-0.000	29	0.991
1.1833a	0.249	1.1267a				0.193				

*Independent T-test

Regarding changes in their behaviour toward home care management of patient complaints with T1DM, this study found that there were changes in the diet and insulin domains, and highly significant differences between pre-test and post-test (1 and 2) after intervention programs in intervention groups (Table 2). This finding strongly agreed with Mayen *et al.* [13], who illustrated that in total caregivers regarding diet balance assessment there was an obvious improvement in post-program implementation, supported by Hilliard *et al.* [14] effects of intervention programs toward insulin independence after being exposed to programs, while in control groups there is a non-significant

between pre-test and post-test 1 and 2 in diet and insulin domains (Table 2). The cause of care of parents is due to they do not apply for intervention programs.

Concerning participant behaviour upon modifications of the diabetes care plan, the study reveals that there were highly significant differences between pre-test and post-test 1 and 2 after intervention programs in intervention groups (Table 3). The same result was found by Qadir *et al.* [17], who found that most diabetic adolescents had good practices regarding the benefits of regular physical activity and exercise after being exposed to intervention programs. While in the control groups, there is a non-

significant difference between pre-test and post-test 1 and 2 in the modifications of the diabetes care plan (Table 3). Similarly it is strongly agreed with Pongmesa *et al.* [18], whose results showed that patients with diabetes have low awareness of exercise and drug management. The researcher believes that when parents are not offered educational programs related to general health, especially diabetes, they have little information about their patients.

Likewise, there are highly significant differences between pretest and post-tests 1 after intervention programs in intervention groups (Table 4). This result is in agreement with done by Popovic-Pejicic *et al.* [19] in the hospital clinical center of Banjaluka about the structure of an education program of 5 days for 38 patients with T1D. They reported that the results of the test of knowledge about T1D showed that patients improved their knowledge by 36.78% after the education program. In control groups, there is a non-significant difference between pre-test and post-tests 1 and 2 in the interventional behaviour (Table 4). This was meant for the control group, which was not exposed to the educational program and did not get information from anyone on the benefits of interventional behaviour during this period, so their behaviour and practices were not changed.

In general, it can be concluded that the perceived social support of patients in the intervention group is better than the control group after the educational intervention. This is consistent with the findings of the study by Mazloomi *et al.* [21], but it is not consistent with the study of Heidari *et al.* [22]. In their study, Heidari *et al.* investigated the effect of relationship between family support and blood glucose control among elderly with type 2 diabetes and reported a significant negative correlation between family support and HbA1C level. These results may be due to the sample size and differences in the target group of the study.

It is recognized that education is a factor that should be considered in the proposition of care through contact, in the same way as educational activities in groups. In this direction, the low educational level of most participants constituted a risk factor.

Conclusion

After the intervention of health education programs for caregivers, the study found that there is a highly significant difference in the change of their behaviour toward home care management of T1DM considering all domains (diet and insulin, modifications of the diabetes care plan, intervention behaviours, and additional diabetes care practices) in the intervention group compared to the control group.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

ORCID

Shevan Y. Othman

<https://orcid.org/0000-0002-2740-5783>

Shukir S. Hasan

<https://orcid.org/0000-0002-2728-1071>

Nadir A. Garjees

<https://orcid.org/0009-0002-2586-3585>

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