Effectiveness of Educational Program Based on Interactive Conversation Maps on Knowledge, Self-care and Self-efficacy of Diabetic Children

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Abstract:

Background: Diabetes mellitus is one of the most common chronic illnesses in childhood that can negatively impact on children's life. Diabetes conversation map is a novel interactive and pictorial health education method that could be effective for improvement of diabetic children's knowledge, self-care behaviors and diabetes management self-efficacy. **Aim of the study** was to evaluate the effectiveness of educational program based on interactive conversation maps on knowledge, self-care and self-efficacy of diabetic children. **Research design:** A quasi-experimental research design was used. **Setting:** This study was carried out at the Pediatric Diabetic Clinic in the Comprehensive Health Insurance Hospital (Hassan Awad Clinic) at Benha City, which is affiliated to the General Insurance Authority. **Subjects:** A purposive sample of 60 children with type 1 diabetes mellitus. **Tools of data collection:** Three tools were used; **Tool (I)**: A structured interviewing questionnaire involving three parts; Part (1) Characteristics of the studied the diabetic children, Part (2) Medical history of the studied children, Part (3) Children's knowledge about diabetes mellitus, **Tool (II):** The revised diabetes self-care inventory for children and adolescents and **Tool (III):** Diabetes management self-efficacy scale. **Results**: Most of children had high total knowledge level at immediate post-program and follow-up after one month. Most of children had high total self-care level at immediate post-program and follow-up after one month. Moreover, most of children had high total level of diabetes management self-efficacy at immediate post-program and follow-up after one month. **Conclusion:** The educational program based on interactive conversation maps was effective in improving children's knowledge about diabetes and enhancing their self-care practices and self-efficacy in managing diabetes**. Recommendations:** Encouraging healthcare providers to use diabetes conversation map as new educational tools rather than routine counseling methods for educating diabetic children.

Keywords: Diabetic Children, Educational Program, Interactive Conversation Maps, Knowledge, Self-care, Self-efficacy.

Introduction:

Diabetes mellitus (DM) is a metabolic disorder which occurs as a result of deficiency in insulin action, production or both. Type 1 diabetes mellitus (T1DM) is a chronic metabolic disease commonly seen in childhood. It occurs as a result of the destruction of the pancreatic beta cells, accompanied by T-cells, for reasons relevant or irrelevant to autoimmunity **(Mayer-Davis et al., 2020).**

Diabetes mellitus is one of the greatest global health threats of the 21st century. Diabetes and its complications are the leading causes of death in many countries (**Çallı and Kartal, 2021**). 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. Egypt has the largest contribution among the Eastern Mediterranean & Middle East countries, accounting for a quarter of the region and total incidence is about 8/100000 per year in children < 15 years **(International Diabetes Federation (IDF), 2021)**.

Type 1 DM (T1DM) can profoundly disrupt lives of pediatric patients, particularly adolescents who grapple with maintaining proper adherence to the T1DM regimen, often resulting in unstable blood glucose levels. Insufficient control of T1DM can cause grave situations associated with either abnormally high blood glucose resulting in diabetic ketoacidosis (DKA) and hyperosmolar coma or abnormally low blood glucose level resulting in seizures and unconsciousness **(Moghadam et al., 2022).** Moreover, poorly controlled diabetes in the long run can hasten the progression of both microvascular and macrovascular complications, encompassing conditions like heart disease, neuropathy, nephropathy, retinopathy, and even premature mortality **(Zahran & Jadidi, 2023 & Qasim et al., 2019).**

Following identification of the newly developed T1DM in children, there are shifts in the child's daily schedule and the entire family dynamic. Consequently, the enthusiasm of children to embrace and carry out the essential self-care tasks holds immense significance in shaping both short- and long-term health outcomes **(Ispriantari et al., 2023)**.

Self-care of T1DM by the children requires frequent blood glucose monitoring, multiple insulin injections or use of an insulin pump, frequent alterations in insulin dose to match changing diet and activity patterns, and regular visits to health care providers **(American Diabetes Association, 2021).**

Self-care is an important issue for prevention and management of T1DM. Self-care of a diabetic child is a continuous process of knowledge and skills based on the children's awareness to be an active and knowledgeable participant in the treatment process. Self-care in diabetes assumes that the child can practice behaviors that include an appropriate diet, avoidance of high fat intake, increased physical activity, glycemic monitoring and regular foot evaluation. A high level of preparedness for self-care and decision-making by diabetic children will be beneficial in reducing the number of hospitalizations. Additionally, good self-care in diabetic children can improve their quality of life **(Uchmanowicz et al., 2020 & Eva et al., 2022).**

Inadequate diabetic self-care remains a significant problem in all settings that could have an impact on the children's morbidity and mortality as well as on increasing the costs of medication, laboratory tests and effort of the care providers. In contrast, children who have adequate self-care have better outcomes, live longer, enjoy a better quality of life and suffer fewer symptoms and minimal complications related to diabetes. The pediatric nurse helps the diabetic children to accept the disease and provide education regarding blood glucose monitoring, insulin injection, urine analysis, diet, exercise and hygiene **(Smudja et al., 2024)**.

Despite the advancements in diabetes treatment technology, evidence indicates that maintaining consistency in self-care routines remains a challenge for pediatric patients, with adolescents in particular facing difficulties. This challenge can have repercussions on metabolic control **(Khadilkar & Oza, 2022).** Knowledge and education about the disease, understanding the link between self-care practices and health outcomes, and adequate self-care management skills play a significant

role in successful disease control among children with diabetes. On the other hand, barriers such as depressive symptoms, diabetes-associated distress, difficulty in performing lifestyle modifications, lack of psychological support, fear of hypoglycemia, and poor communication with healthcare providers negatively impact self-care management **(Hamdan et al., 2024)**.

As diabetes mellitus affect all aspects of life, its care plan is interlinked with daily actions of the diseased child and hence the diabetic children also play an important role in the control and management of their disease. Diabetes management self-efficacy is considered as an important pre-requisite for the success of diabetic control and self-management **(Qasim et al., 2019).**

Self-efficacy (SE) is considered as an essential prerequisite for the initiation and adoption of healthy lifestyle habits. It is a social cognitive theory proposed by Albert Bandura in 1977, who described SE as individual's ability to influence or perform actions successfully that affects life and to maintain control over the ways these actions are experienced. Several studies have demonstrated the association between self-efficacy and diabetes management, blood glucose levels, quality of life and eating behaviors among people living with diabetes. Thus, self-efficacy is seen as a crucial factor which can play a vital role in the management of diabetes mellitus **(Qasim et al., 2020).**

Self-efficacy impacts compliance with treatment and, therefore, plays a role in the clinical outcome. Increase in the self-efficacy of the children increases the compliance with the recommended treatment. Moreover, it reflects child's ability to adopt behavioral changes for better self-care abilities. Therefore, evaluation of self-efficacy of the diabetic children assists in selection of suitable self-care interventions (**Çalli & Kartal, 2021)**.

Diabetes management requires continuous and high levels of education at diagnosis and afterward to support children and adolescents. Education is necessary for its successful management. Children not receiving sufficient levels of education or not continuing to have educational support exhibit more possibility of developing diabetes-related complications. Diabetes education needs to be an ongoing process and be repeated in order to be more effective **(Phelan et al., 2022 & Ayar et al., 2021**).

Poor knowledge is one of the primary factors contributing to inadequate self-care behaviors. Given that T1DM often develops in young individuals who may have limited knowledge for effectively managing their condition **(Sherifali et al., 2021).** Continuous diabetes education for pediatric patients with diabetes has been proven to enhance self-care practices, coping mechanisms, and lifestyle adjustments. Consequently, effective self-management significantly reduces the likelihood of experiencing microvascular and macrovascular complications, as well as mortality **(Owusu et al., 2023 & Carmienke et al., 2020).**

In this perspective, knowledge about DM and its management becomes a fundamental requirement for understanding and engaging children in their self-care, as well as for making daily decisions about the demands related to the disease and treatment (**Moraes et al., 2020)**.

Traditionally, children with diabetes used to receive education related to their disease process, metabolic control, exercise and diabetic diet through didactic lectures, brochures, pamphlets, and face to face counseling. But, there are various educational tools that have been developed to enhance the

delivery of knowledge and practices. Among novel methods, Diabetes Conversation Maps (DCM) are considered as useful tools for the educational empowerment of diabetic patients. These are interactive pictorial tools designed in such a way that it does not need formal education for common understanding **(Zakaria et al., 2023)**.

The diabetes conversation map is an educational strategy created by the International Diabetes Federation, developed on the basis of playful, interactive illustrations, containing descriptions on the chronic condition of diabetes and the daily situations experienced by health services users. It can serve as a medium for sharing personal experiences and encompasses feelings, support networks and healthy lifestyle practices **(Besen et al., 2022).**

Diabetes Conversation Map is a patient-centered conversation-based tool. It encourages interactive dialogue among the participants, and inspires the participants to make their own discoveries **(Li et al., 2020).** Furthermore, conversation maps combine various educational theories and have proven to be an internationally effective diabetes education for self-care management **(Carvalho, et al., 2021).**

Conversation Map program was developed as a new educational initiative tool that engages children with diabetes in group discussions which include diabetes-related topics involving; living with diabetes, how diabetes works (e.g., the role of insulin and glucose), healthy eating and being active, starting insulin treatment, foot care, and understanding the many factors involved in managing diabetes. These discussions are moderated mainly by certified nurses who provide the opportunity to formulate strategies for behavior change using map as a visual illustration of children with diabetes, activity cards, conversation questions, facilitator, group interaction, and action plans **(Srulovici, et al., 2020**).

Significance of the study:

Diabetes is a serious threat to global health and it is among the top 10 causes of death. Children living with diabetes are at risk of developing a number of serious and life threatening complications, leading to an increased need for medical care, a reduced quality of life and undue stress on families. Diabetes and its complications can lead to frequent hospital admissions and premature death. Also, there is a positive message with early diagnosis and access to appropriate care, diabetes can be managed and its complications prevented **(IDF, 2021)**.

Globally, Type 1 diabetes (T1D) is considered one of the most common chronic conditions typically diagnosed in pediatric patients. As reported by the International Diabetes Federation, the global count of children and adolescents (aged 0–19 years) living with T1DM was around 1.2 million in 2021 **(IDF, 2021).** The prevalence of T1D is rising, with the global in the incidence rate increasing by approximately 3% per annum. Approximately 184,100 new cases are identified each year [1]. **(Gregory et al., 2022 & Patterson et al., 2020)**.

Nowadays, due to the rising prevalence of diabetes, the importance of self-care has become more relevant to good diabetes management. Moreover, the main principle of self-care in diabetes is patient-centered care. Appropriate preparation for self-care behaviors, such as healthy eating, physical activity, blood glucose monitoring, adherence with medications, satisfactory problem-solving skills, healthy coping skills and reducing risky behaviors, can predict greater child involvement in the treatment process and better outcomes (**American Association of Diabetes Educators, 2020)**.

Higher self-efficacy is believed to have an impact on the children's life, self-management, and outcomes related to diabetes. This concept has also been revealed to be significantly associated with the likelihood of obtaining positive results and acquiring the means of self-management for diabetes. Higher levels of self-efficacy and better diabetes education have positive effects on metabolic control **(Ayar et al., 2021)**. There is a strong correlation between consistent engagement in diabetes self-care and better health outcomes, including proper blood glucose control, reduced complications, improved quality of life, and lower mortality rates **(Ji et al., 2020).**

Diabetes education increases the children's readiness to take pro-health actions and is connected with improved compliance with medical recommendations concerning regular drug intake, proper diet and physical activity, implementation of foot self-care, glycaemic measurement, blood pressure, body mass and blood laboratory parameters. Diabetes education is important, but it must be transferred into action, which means into self-care activities, to be fully beneficial for the child **(Uchmanowicz et al., 2020).** The 2022 International Society for Pediatric and Adolescent Diabetes (ISPAD) guidance states that education around principles of self-management of T1DM should be provided to all children. Information should be comprehensive, age-appropriate, and tailored to meet the needs of children **(Olinder et al., 2022).**

Interactive Conversation Maps are innovative tools that have been developed to help children better understand their condition and develop an action plan to improve their health outcomes. These maps are visual aids that provide children with a framework for discussing their condition with healthcare providers and identifying areas for improvement **(Faridi et al., 2021).** ICM is a valuable method to promote diabetic care and prevent diabetes-related complications and from the moment of diagnosis, it needs to be promoted and extensively used for all people with diabetes **(Zakaria, et al., 2023).** Hence, this study aimed to evaluate the effectiveness of educational program based on interactive conversation maps on knowledge, self-care and self-efficacy of diabetic children**.**

Aim of the study:

This study aimed to evaluate the effectiveness of educational program based on interactive conversation maps on knowledge, self-care and self-efficacy of diabetic children.

Research objectives:

- Assess children's knowledge about diabetes mellitus and diabetes self-care practices.
- Assess diabetic children's self-care practices and self-efficacy in managing diabetes.
- Design and implement educational program based on interactive conversation maps for diabetic children.
- Evaluate the effectiveness of educational program based on interactive conversation maps on knowledge, self-care and self-efficacy of diabetic children.

Research hypotheses:

H.1- Children's knowledge about diabetes will expected to be improved after implementation of the educational program based on the interactive conversation maps.

H.2- Children with diabetes will expected to have higher self-care scores after implementation of the educational program based on the interactive conversation maps.

H.3- Children with diabetes will expected to have higher self-efficacy scores after implementation of the educational

program based on the interactive conversation maps.

Subjects and Method

Research Design:

A Quasi-experimental research design was used to conduct this study (pre and post-test design one group).

Research Setting:

This study was carried out at the Pediatric Diabetic Clinic in the Comprehensive Health Insurance Hospital (Hassan Awad Clinic) in Benha City, which is affiliated to the General Insurance Authority. It is located on the 3rd floor of the hospital and offers medical services to children with diabetes for less than 18 years at Qalyubia Governorate.

Sample size equation:

The number of subjects was estimated according to the following equation:

$$n = \frac{Z^2 P (1-P)}{d^2}$$

where: n= sample size

Z = Z statistics for a level of confidence

P= Expected prevalence or proportion

d= Precision

for the expected prevalence of 4.0%, the required sample size is 60 for the margin of error or absolute precision of ± 5% in estimating the prevalence with 95% confidence and considering the potential loss / attrition of 5% with this sample size, the anticipated 95% CI is (-0.1%, 9.0%). This sample size is calculated using the scalex SP calculator (**Naing et al., 2022**).

Sample type:

A purposive sample of 60 children with type 1 diabetes mellitus (T1DM) (one group pre and post-test) who regularly visit the previously mentioned setting during the period of collecting data to receive their medical management and met the following inclusion and exclusion criteria.

Inclusion criteria:

- Children aged from 6 ≤ 18 years.
- Children with T1DM
- Free from other chronic diseases
- Both genders.
- Alert, cooperative and willing to participate in the study

Exclusion criteria:

- Children with another endocrinal disorder
- Children suffering from diabetes debilitating complications such as kidney failure or blindness

Tools of data collection:

Three tools were utilized to gather data pertained to the study as follows:

Tool (I): A structured interviewing questionnaire sheet:

It was designed by the researchers after reviewing the recent and relevant literatures **Kyle & Carman, (2021) & Pal, (2021)**. It included:

Part 1: Characteristics of the studied the diabetic children: It included data about the studied children as age, gender, birth order, educational level, place of residence.

Part 2: Medical history of the studied children: It included data pertained to the medical history of the children under study as duration of diabetes, type of diabetes treatment, history of diabetes in the family, metabolic control and ketoacidosis.

Part 3: Children's knowledge about diabetes mellitus. It consisted of 30 closed-ended questions regarding:

A- Children's knowledge regarding diabetes mellitus as definition, causes, risk factors, manifestations, types, diagnosis, management, complications and prevention of its complications.

B- Children's knowledge regarding self-care practices of diabetes and includes:

1- Insulin (types, indications, preparation and injection, storage, frequency and sites of injection).

2- Diabetic diet (healthy diet, food pyramid, amount of food and hypoglycemia).
3- Physical exercise (types, precautions and hypoglycemia).
4- Hygiene (eye care, teeth care, foot care, bathing and wound care).
5- Checkup (importance and schedule).

Scoring System of children's knowledge:

The scoring system was designed as follows: (1) score was granted for correct answer and (0) for the incorrect. The total level of children's knowledge was classified as follows:

- High knowledge: for ≥ 75%
- Moderate knowledge: for 50% to < 75%
- Low knowledge: for < 50%

Tool (II): The revised diabetes self-care inventory (R-DSCI) for children and adolescents

It is a self-reported scale that was adopted from **Nakamura et al., (2019)** to assess various self-care behaviors among diabetic children. It is composed of 41 items involving eight subscales as follows: (1) Support from family and attitude toward diabetes self-care (8 items), (2) Regularity of snacks and insulin injection (6 items), (3) Support at school and perception of life with diabetes (8 items), (4) Self-monitoring of blood glucose and daily life (5 items), (5) Independent self-care behavior (4 items), (6) Physical activity (3 items), (7) Nutrition and goal of blood glucose control (5 items), and (8) Discussions with medical staff/teachers (2 items).

Children rated their own self-care on a three-point Likert scale as follows; (3) always, (2) sometimes and (1) Never. The total score ranges from 41–123, with higher scores indicating better self-care. Total score of self-care is categorized as the following:

- High level (≥ 80%)
- Moderate level (60 < 80%)
- Low level (<60%)

Tool (III): Diabetes Management Self-Efficacy Scale (DMSES)

It was adopted from **Noroozi & Tahmasebi, (2014)** and it is a self-administered scale assessing the extent to which respondents are confident they can manage their blood sugar, diet, and level of exercise. Responses are rated on a 5-point scale ranging from (1) can't do at all to (5) certain can do. The scale contains 20 items involving 5 subscales; Specific nutrition (6 items), General nutrition (4 items), Blood glucose control (4 items), Physical activity and weight control (3 items) and Medical control (3 items). Higher scores indicate higher self-efficacy in performing DSM activities. Total score of self-efficacy is categorized as the following:

- High self-efficacy (≥ 80%)
- Moderate self-efficacy (60 < 80%)
- Low self-efficacy (<60%)

Tools validity and reliability:

Tools of collecting data were designed in Arabic language and submitted to a jury of three Professors in the field of Pediatric Nursing from the Faculty of Nursing/ Benha University, to test the content validity of the instruments and judge clarity, comprehensiveness, relevance, simplicity, and accuracy of tools.

The internal consistency of the developed and validated tools for knowledge, diabetes self-care inventory and diabetes management self-efficacy scale were tested using Cronbach's alpha coefficient. Test retest results reflected that all items were significantly differ and has a correlation above the threshold of significance (r=0.85, 0.93 & 0.91) respectively.

Administrative design:

An official letter was obtained from the Dean of the faculty of Nursing/ Benha University to the director of the Comprehensive Health Insurance Hospital and the head of the

Pediatric Diabetic Clinic to conduct the study. A clear explanation was given about the nature, importance and the expected outcomes of the study.

Ethical considerations:

Prior to conduction of the study, an ethical approval was obtained from the Scientific Research Ethics Committee at Faculty of Nursing Benha University with ethical approval code (REC-PN-P67). Written consent was taken from the participants after clarifying the aim and nature of the study. They were informed that the gathered data will be used only for the purpose research and they have the right to take part, refuse or withdraw at any time. Total confidentiality of the collected data was secured. The study doesn't cause any harmful effects on children.

Pilot Study:

A pilot study was conducted on 10% (6 children) of the sample size to evaluate the feasibility, applicability of the used tools and time required to collect data. After obtaining the results of the pilot study, the needed adjustments were made according to the study participants' responses, and the final form was created. Participants in the pilot study were excluded from the actual study.

Field work:

Data collection was conducted from beginning of March 2025 until the end of June 2025, covering 4 months. The following phases were fulfilled to achieve the aim of the study.

Assessment phase:

In this phase, the researchers interviewed the studied children individually in order to collect data by using pretest to determine the baseline knowledge level, self-care and self-efficacy level. The researcher attended to the outpatient clinic 3 times a week (Saturday, Monday, and Tuesday), from 9 A.M. to 2 P.M. The researcher introduced herself to the children and illustrated the aim of study and took their written consent to take part in the study before collecting data. Five children were interviewed every day. This period took about one month from the beginning of March to the end of March 2025. The total time needed for filling different data collection tools was 30-45 minutes for each child.

Planning phase:

Based on the outcomes of the assessment phase, the educational program based on diabetes conversation maps was designed after reviewing of the related literature. Also, the researcher prepared the training place for implementing conversation map sessions.

Implementation phase:

The total number of children was 60, who were divided into 6 equal subgroups, and 10 children were assigned to each group. Children received four sessions based on conversation map and each session took about 45-60 minutes. The sessions were repeated for the different subgroups and the basic content was the same for all subgroups.

Diabetes conversation Maps are a series of educational tools that can provide diabetic children with a visual platform in order to learn about behavior change and improve self-care regarding their condition. Conversation Maps are designed to represent surroundings that are familiar to the children, as a busy street or a park, making the discussion meaningful for the participants.

The researcher modified and translated the conversation maps in to Arabic to be more applicable to the studied children. The researcher took on the role as the facilitator of Diabetes Conversation Map. During each session, a Diabetes Conversation Map (laminated 3×5-foot with colourful drawings as metaphors of situations familiar to people with diabetes) was placed on a table with children gathered around it. Conversation questions and discussion cards were used to encourage group interaction.

Session 1 (Map 1): How diabetes works

This map is a colorful drawing which is used to teach diabetic children how diabetes occurs, and how to manage potential complications. The facilitator used these drawings to help the children sitting in group to understand the disease.

Session 2 (Map 2): Living with diabetes

Colorful drawings were used to teach children about daily self-care, hypo or hyperglycemia, and psychosocial adjustment

Session 3 (Map 3): Healthy eating and exercise

This map includes colorful drawings that provide information about dietary choices and portion sizes, along with different types of physical activity.

Session 4 (Map 4): Starting insulin or oral antidiabetic medication

This map focuses on teaching children about the use of insulin or other oral medications. It includes potential benefits of insulin, identifying sites and route of injection and demonstration of self-injection of insulin.

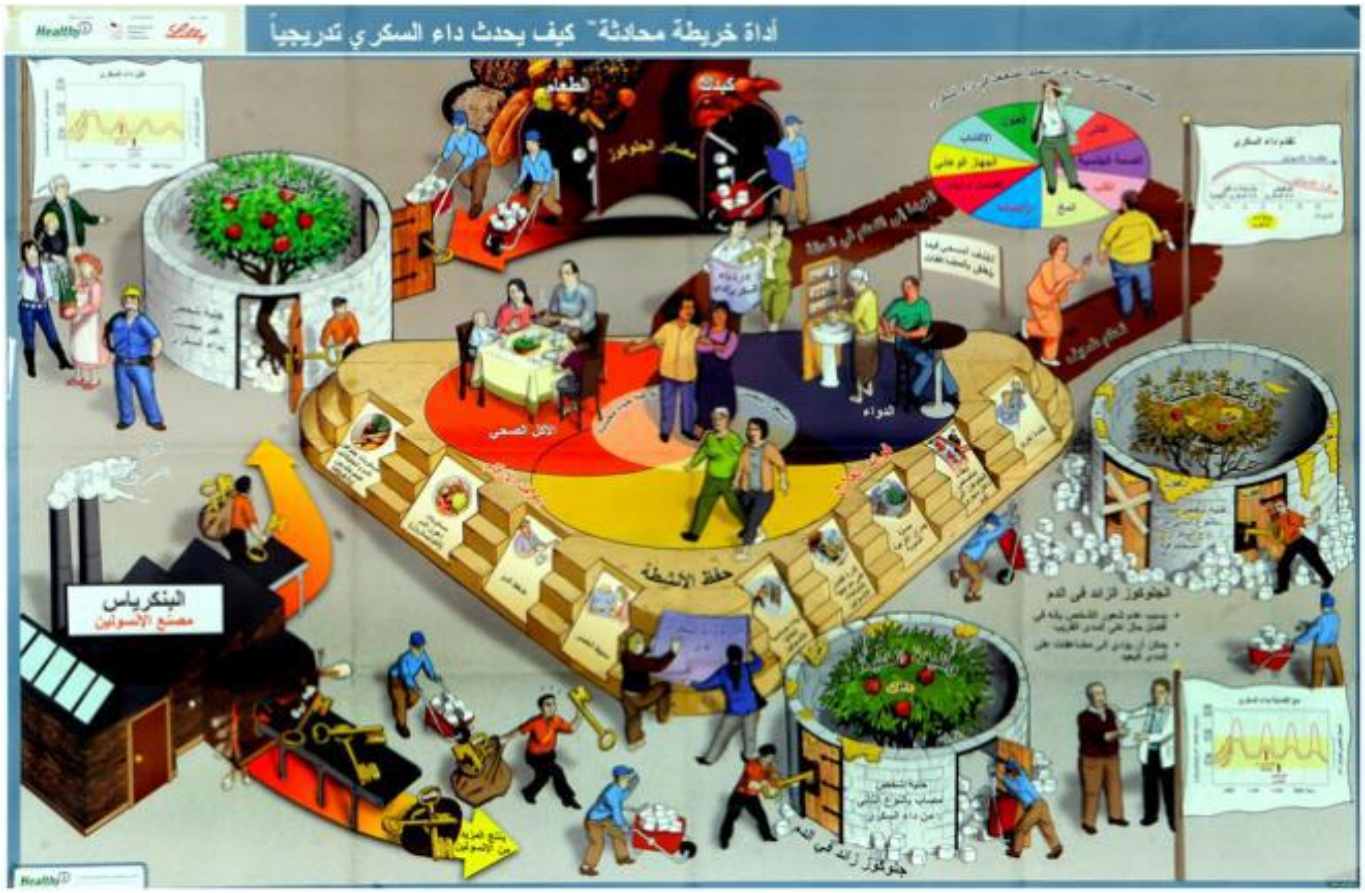
Session 5 (Map 5): Diabetic foot care.

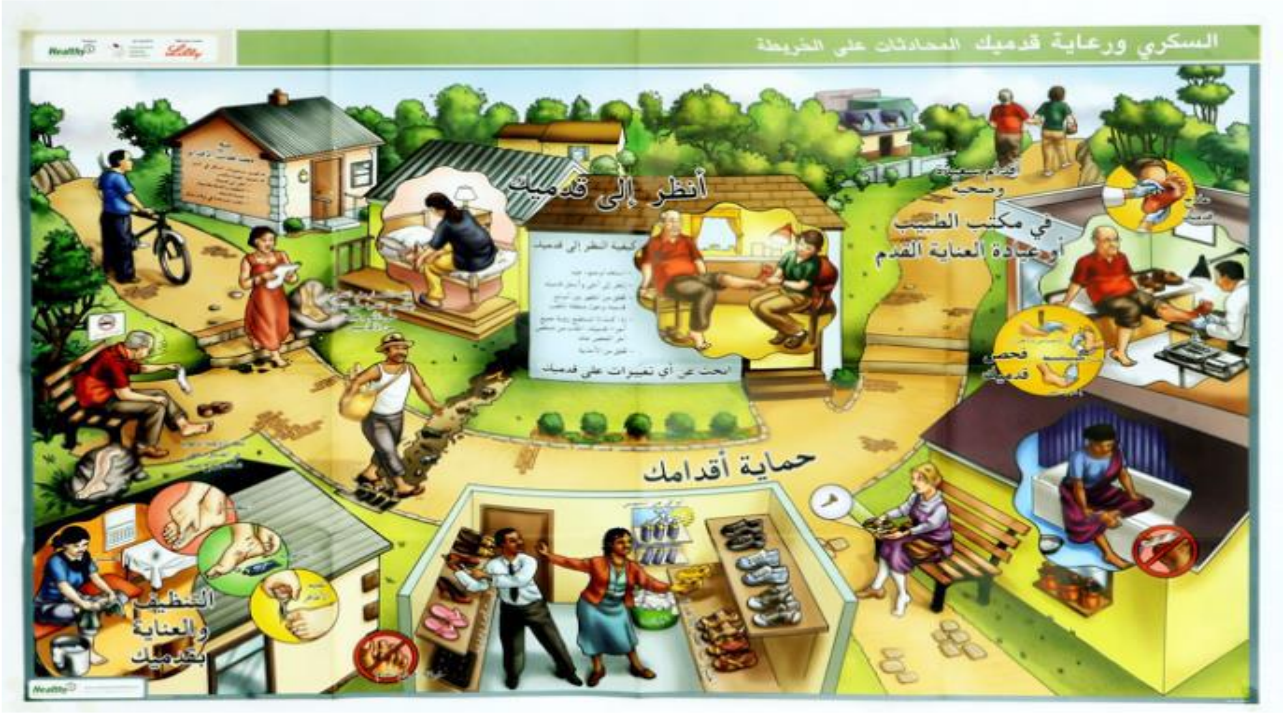
This map concerned with daily foot care involving; inspection, cleaning, nail care and selecting appropriate footwear.

Each map includes six components including; the visual, information-sharing, activity cards, group interaction, educator guide, and a goal-setting card. Each session lasts approximately 45-60 minutes depending on the needs of the children and the time availability.

During implementation of the educational program based on the conversation maps, the researchers asked mostly open-ended questions to generate discussion and encourage self- reflection and sharing of the experience of children with diabetes, as well as, enable myths to be dispelled. This helps children to come up with their own solutions.

The researcher demonstrated active listening and all children had equal chance to engage in the discussion. Also, children had an opportunity to set own goals. Practical demonstrations included blood sugar monitoring, insulin self-injection, and care of diabetic foot. This period took about six weeks (from the beginning of April 2025 to the middle of May 2025).





Essellouti R., Bassiri M.,Tanane O., & Saile R., (2024). Impact of the therapeutic education tools "Map kit diabetes conversation" on the improvement of the autonomous management and self-efficacy of diabetic patients. Hong Kong Journal of social sciences, Kong Journal of Social Sciences, volume, pp. 135-165.

Evaluation phase:

After the educational program based on conversation maps was implemented, the researcher administered post tests for evaluating knowledge, self-care and self-efficacy of the studied children, using the same pretest form. This assisted to evaluate the effectiveness of educational program based on interactive conversation maps on knowledge, self-care and self-efficacy of diabetic children. The first evaluation was performed immediately post the program and the second evaluation was done after one month. This period took about six weeks (from the middle of May 2025 to the end of June 2025).

Statistical analysis:

Statistical analysis was done by using Statistical Package for Social Sciences (SPSS) version 20. Data were collected, revised, organized, coded, tabulated, and analyzed using frequencies, number, percentage, mean scores, standard deviation and correlation coefficient. Data were presented in the form of tables and figures. Quantitative data was presented by mean (□) and standard deviation (SD). Qualitative data was presented in the form of frequency distribution tables, numbers and percentages. Qualitative variables were analyzed by Chi- Square test (x^2) & correlation coefficient (r) to detect the relation between the variables of the study (P-value). A highly statistical significant level value was considered when ($p<0.001$). A statistical significant level value was considered when ($p<0.05$) and no statistical significance difference was considered when ($p>0.05$).

Results:

Table (1) illustrates that, three quarters (75.0%) of the studied children aged 6- > 12 years, with mean age of 10.600±2.650 years, less than two thirds (61.75) of them were males, more than half (53.3%) were ranked as the second child in the family, and more than three quarters (76.7% & 78.3%) were in the primary education and were from rural areas respectively.

Table (2) reveals that, more than half of the studied children (58.3%) had diabetes from 1- < 3 years, all (100%) of the studied children used injection therapy as diabetes management, more than half (58.3%) had family history of diabetes and had moderate metabolic control. also, most of children (81.7%) didn't have ketoacidosis .

Table (3) indicates that, there was a highly statistical significant difference between the results of immediate post-program and follow-up after one month phase compared to pre-program phase regarding all items of the studied children's knowledge, with $p<0.001$. Also, the total mean scores for children's knowledge were higher at immediate post-program and follow-up after one month phase than at pre-program phase, with statistical significant differences (25.366±4.345 & 24.183±4.788 versus 15.183±3.868), where $P<0.001$.

Figure (1) displays that, more than half (55%) of the studied children had low total knowledge level at pre-program implementation. While, most (88.3% & 81.7%) of children had high total knowledge level at immediate post-program and follow-up after one month implementation respectively.

Apparently **table (4)** reveals that, children had lower total mean scores for all domains of self-care pre-program implementation. While, the total mean scores for all domains of self-care were higher immediate post-program implementation and follow-up after one month (113.05±12.18 & 111.11±13.8 versus 67.88±16.12) respectively .

Figure (2) illustrates that, less than three quarters (71.7%) of the studied children had low total self-care level at pre-program

implementation. Meanwhile, the majority (91.7%) and most (83.3%) of children had high total self-care level at immediate post-program implementation and follow-up after one month respectively.

Table (5) shows that, there was a highly statistical significant difference between the results of immediate post-program phase and follow-up after one month compared to pre-program phase regarding all items of studied children's diabetes management self-efficacy, with $p<0.001$. Moreover, the total mean scores for children's self-efficacy were higher at immediate post-program and follow-up after one month phase than at pre-program phase, with statistical significant differences (93.150±9.493 & 91.683±9.441 versus 58.266±8.846) respectively, where $P<0.001$.

It is evident from figure (3) that, more than two thirds (66.7%) of the studied children had low total level of diabetes management self-efficacy pre-program implementation. While, most (93.3%) and the majority (88.3%) of children had high total level of diabetes management self-efficacy at immediate post-program and follow-up after one month phase respectively .

Table (6) reflects that, there was a highly statistical significant positive correlation among total knowledge of studied children, total self-care and total self- efficacy pre-intervention and immediate post -intervention ($P<0.001$ & 0.05). Additionally, there was highly statistical significant positive correlation between total knowledge of studied children and total self-care and total self-efficacy at follow-up after month. While, there was no statistical significant correlation between total self-care and total self- efficacy of studied children at follow-up after month ($P>0.05$).

Table (1): Distribution of the studied children according to their characteristics (n=60).

Characteristics of the studied children	No.	%
Age (years):		
6- > 12	45	**75.0**
12 – 18	15	25.0
Mean ± SD 10.600±2.650		
Gender:		
Male	37	**61.7**
Female	23	38.3
Birth order:		
The first	22	36.7
The second	32	**53.3**
The third or other	6	10.0
Level of education:		
Primary education	46	**76.7**
Preparatory education	7	11.7
Secondary education	7	11.7
Place of residence:		
Urban	47	**78.3**
Rural	13	21.7

Table (2): Distribution of the studied children according to their medical history (n=60).

Medical history of the studied children	No.	%
Duration of diabetes (years):		
< 1	4	6.7
1- < 3	15	25.0
3- < 6	35	**58.3**
6 or more	6	10.0
Mean ± SD 4.200±1.350		
Type of diabetes treatment:		
Injection therapy	60	**100.0**
Pump	0	0.0
History of diabetes in the family		
Yes	35	**58.3**
No	25	41.7
Metabolic control		
Good	14	23.3
Moderate	35	**58.3**
Poor	11	18.3
Ketoacidosis		
Yes	11	18.3
No	49	**81.7**

Table (3): Mean score of the studied children's knowledge at pre/ immediate post and follow-up after one month- program phases (n = 60).

Items	Maximum score	Pre-intervention	Immediate post-intervention	Follow-up after one month	Pre- post Test	Pre-follow - up Test
		Mean ± SD	Mean ± SD	Mean ± SD	t-test/ P-value	t-test/ P-value
Diabetes mellitus	9	6.000±1.540	7.350±.546	6.933±1.162	**8.046 0.000****	**5.862 0.000****
Insulin	7	2.633±1.460	6.416±1.618	5.883±1.747	**14.647 0.000****	**12.607 0.000****
Diabetic diet	4	2.066±.362	2.850±.917	2.833±1.044	**6.714 0.000****	**5.759 0.000****
Physical exercise	3	1.233±647	2.766±.647	2.633±.758	**13.923 0.000****	**11.973 0.000****
Hygiene	5	2.283±1.090	4.616±1.075	4.450±1.095	**13.277 0.000****	**12.743 0.000****
Check-up	2	1.866±.342	1.483±.503	1.450±.565	**4.638 0.000****	**4.637 0.000****
Total score	**30**	**15.183±3.86**	**25.366±4.34**	**24.183±4.78**	**17.368 0.000****	**15.804 0.000****

****A Highly Statistical significant p < 0.001**

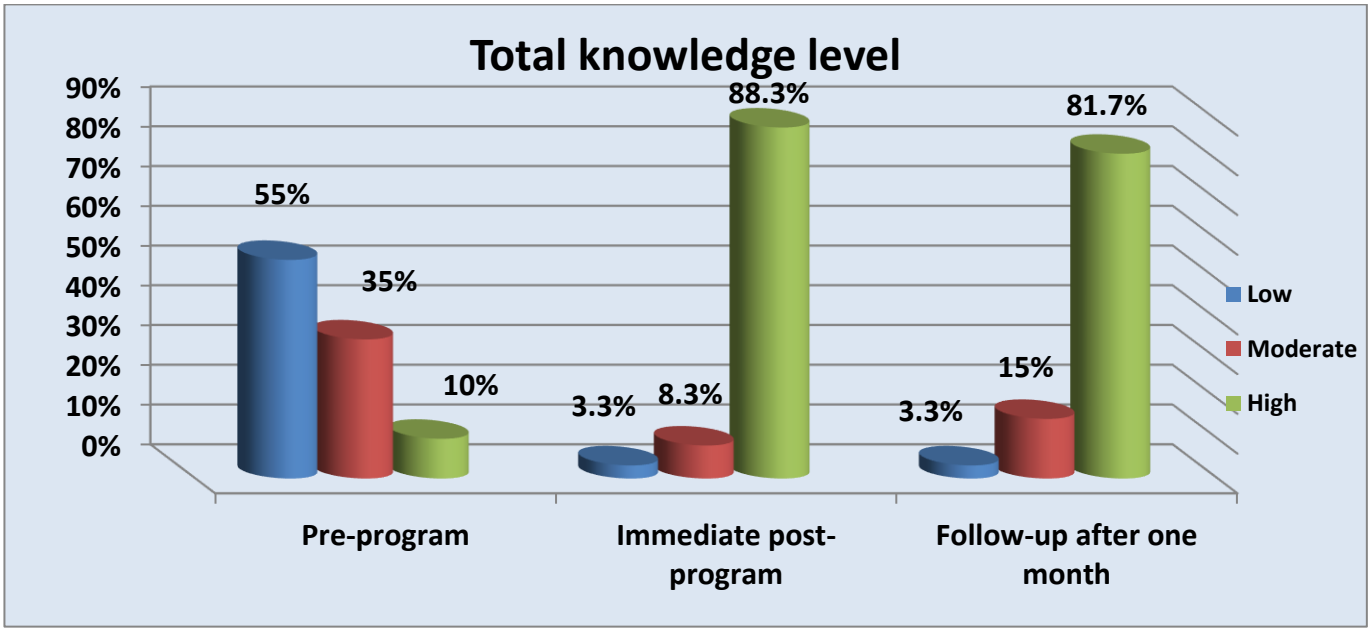


Figure (1): Percentage distribution of the studied children regarding their total knowledge level at pre/immediate post and follow-up after month-intervention phases (n = 60).

Table (4): Mean score of self-care of the studied children at pre/ immediate post and follow-up after one month- intervention phases (n = 60).

Domains	Maximum score	Pre-intervention	Immediate post-intervention	Follow-up after one month	Pre-post Test	Pre-follow - up Test
		Mean ± SD	Mean ± SD	Mean ± SD	t-test/ P-value	t-test/ P-value
Support from family and attitude toward diabetes self-care	24	1.083±3.724	22.816±2.127	22.433±2.506	**22.605 0.000****	**21.937 0.000****
Regularity of snacks and insulin injection	18	12.033±1.784	16.850±1.665	16.566±1.898	**14.531 0.000****	**13.437 0.000****
Support at school and perception of life with diabetes	24	14.66±2.885	21.900±1.937	21.550±2.353	**17.164 0.000****	**15.433 0.000****
Self-monitoring of blood glucose and daily life	15	10.166±1.342	13.616±1.940	13.433±2.086	**10.990 0.000****	**9.820 0.000****
Independent self-care behavior	12	5.683±2.029	11.383±1.530	11.133±1.798	**17.617 0.000****	**16.616 0.000****
Physical activity	9	4.300±1.924	7.733±1.273	7.616±1.341	**10.815 0.000****	**10.358 0.000****
Nutrition and goal of blood glucose control	15	7.166±3.103	13.316±2.521	13.100±2.508	**12.227 0.000****	**12.211 0.000****
Discussions with medical staff/teachers	6	2.783±1.194	5.433±.830	5.283±.922	**14.414 0.000****	**13.871 0.000****
Total score	**123**	**67.883±16.12**	**113.050±12.1**	**111.116±13.8**	**17.621 0.000****	**16.623 0.000****

****A Highly Statistical significant p < 0.001**

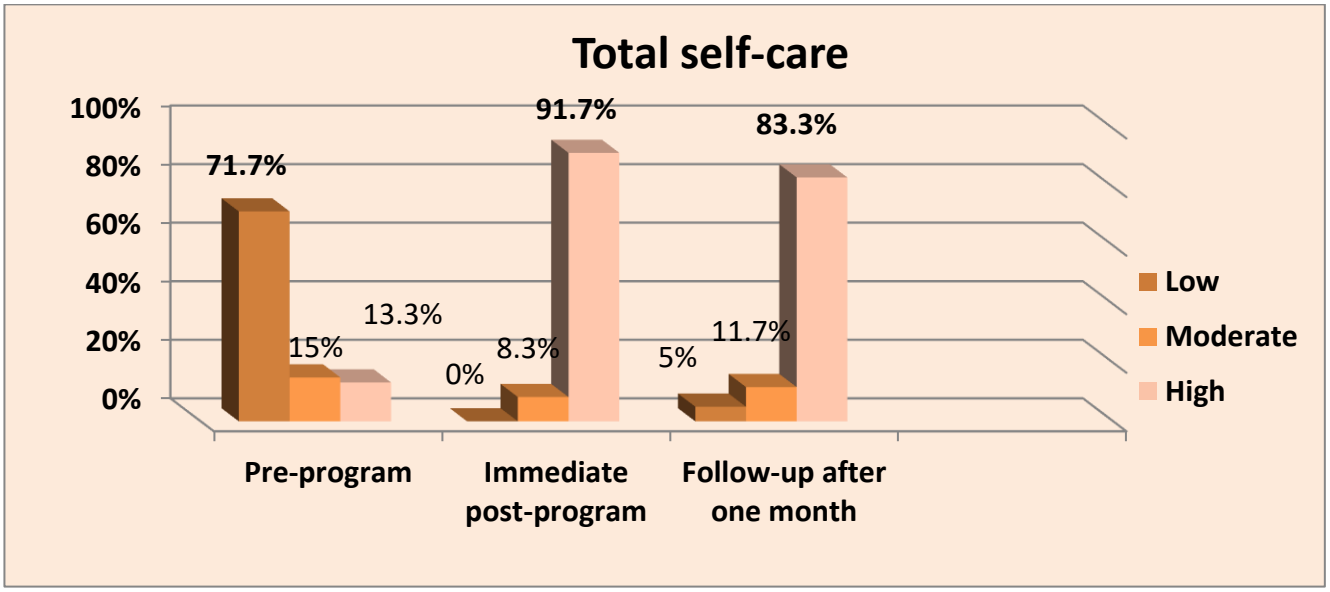


Figure (2): Percentage distribution of the studied children regarding their total self-care level at pre/immediate post and follow-up after month-intervention phases (n = 60).

Table (5): Mean score of diabetes management self-efficacy among the studied children at pre/ immediate post and follow-up after one month- intervention phases (n = 60).

Items	Maximum score	Pre-intervention	Immediate post-intervention	Follow-up after one month	Pre-post Test	Pre-follow - up Test
		Mean ± SD	Mean ± SD	Mean ± SD	t-test/ P-value	t-test/ P-value
Specific nutrition	30	14.850±4.635	28.283±2.358	27.750±2.460	**21.699 0.000****	**19.562 0.000****
General nutrition	20	12.300±1.279	18.516±2.466	18.316±2.527	**17.168 0.000****	**16.026 0.000****
Blood glucose control	20	12.316±1.321	18.516±2.236	18.316±2.310	**18.272 0.000****	**16.397 0.000****
Physical activity and weight control	15	9.333±1.174	13.950±1.741	13.583±1.816	**16.964 0.000****	**14.108 0.000****
Medical control	15	9.466±1.080	13.883±1.563	13.666±1.361	**19.342 0.000****	**18.544 0.000****
Total score	**100**	**58.266±8.84**	**93.150±9.49**	**91.683±9.44**	**21.594 0.000****	**19.425 0.000****

****A Highly Statistical significant p < 0.001**

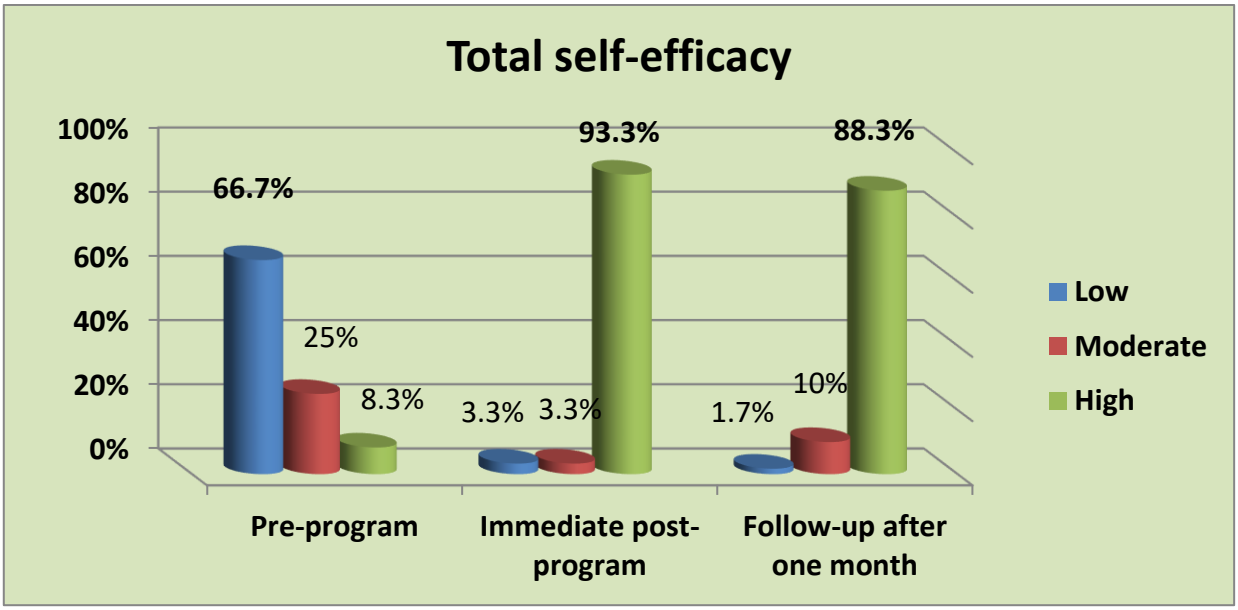


Figure (3): Percentage distribution of the studied children regarding total diabetes management self-efficacy at pre/immediate post and follow-up after month-intervention phases (n = 60).

Table (6): Correlation matrix among study variables through program phases

Variables			Total Knowledge	Total self-care	Total self-efficacy
Pre-Intervention	Total Knowledge	r	1	.794**	.834**
		P-value		.000	.000
	Total self-care	r	.794**	1	.762**
		P-value	.000		.000
	Total self-efficacy	r	.834**	.762**	1
		P-value	.000	.000	
Immediate post-intervention	Total Knowledge	r	1	.409**	.643**
		P-value		.001	.000
	Total self-care	r	.409**	1	.678
		P-value	.001		.055*
	Total self-efficacy	r	.643**	.678	1
		P-value	.000	.055*	
Follow-up after one month	Total Knowledge	r	1	.463**	.317*
		P-value		.000	.013
	Total self-care	r	.463**	1	.170
		P-value	.000		.194
	Total self-efficacy	r	.317*	.170	1
		P-value	.013	.194	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 r level (2-tailed).

Discussion:

Diabetes is not only a chronic disease but also a worldwide health concern. The prevalence of diabetes has been rapidly increasing and has become a major worldwide health problem of this century. Diabetes self-management education is an ongoing process of facilitating the knowledge, skill and ability necessary for diabetes self-care (**Farag, et al., 2021**). Diabetes conversation map is a useful approach to improve diabetic control and prevent diabetes-related morbidity and mortality and must be encouraged and used widely for all diabetic children from the time of diagnosis. A multidisciplinary team, active learning and follow-up of diabetic child are an integral part of the success of the Diabetes conversation map (**Srulovici et al., 2020).**

Regarding characteristics of the studied children **(table 1),** the findings of this study reflected that, three quarters of the studied children aged 6- > 12 years, with mean age of 10.60±2.65 years, less than two thirds were males and more than half were ranked as the second child in the family. Also, more than three quarters were in the primary education and were from rural areas.

The results of the current study are in the same context with **Mohammad et al., (2020)** who studied "Knowledge and Self-efficacy among Children with Type 1Diabetes and their Caregivers" and found that more than three

quarters of children were in age group from 6 to 12 years, with a mean age of 10.45± 3.24, more than half of children were males and were the middle child. Also, more than two thirds of children were in primary education.

Also, these findings are in harmony with **Elhawy et al., (2021)** who evaluated "Effect of Caregiver's Health Education on Patterns of Self-Management and Glycemic Control in Pediatric Type 1 Diabetes" and found that, more than half of diabetic children were males and most of them were primary stage students.

Similarly, these findings agree with **Hussien et al., (2022)** who conducted a study entitled "The effect of an educational program on the Self-Efficacy among children with juvenile diabetes" and mentioned that, the highest percentage of participants were ranked as the second child, less than two-thirds of them were males and less than three quarters of the studied adolescents were living in rural areas.

Concerning the medical history of the studied children **(table 2),** the results of the current study demonstrated that, more than half of the studied children had diabetes from 1- < 3 years, all of the studied children used injection therapy as diabetes management, more than half had family history of diabetes and had moderate metabolic control. Also, most of children didn't have ketoacidosis**.**

These results are corresponding with **Soliman et al., (2022),** who evaluated "Effect of Educational Intervention on Pediatric Diabetes self-care Practices" and pointed that, half of children had diabetes from 1- < 3 years. Also, these findings are supported by **Mohammad et al., (2020)** who revealed that, all children had injection therapy, more than one third had moderate metabolic control and the majority of them didn't have ketoacidosis. **Elhawy et al., (2021)** reported that, all of diabetic children had multiple daily insulin injection regimens.

Regarding knowledge of the studied children about diabetes mellitus **(table 3)**, the current study clarified that, there was a highly statistical significant difference between the results of immediate post-program and follow-up after one month phase compared to pre-program phase regarding all items of the studied children's knowledge, with $p<0.001$. Also, the total mean scores for children's knowledge were higher at immediate post-program and follow-up after one month phase than at pre-program phase, with statistical significant differences, where $P<0.001$.

This finding could be attributed with implementation of ICM provide children with comprehensive information concerning type 1 DM. This knowledge significantly improves children's understanding of their health conditions, which in turn progresses their ability to manage these conditions effectively.

These results go in accordance with **Hamza et al., (2024)** who carried out a study entitled "Effect of Interactive Conversation Map on Self-management, Self-efficacy and Distress for Patients with Type 2 Diabetes" and stated that, there were substantial statistical variations in the mean knowledge scores before, after, and after the follow-up with ($p< 0.001$). Also, there was a highly statistically significant improvement in all aspects of knowledge regarding diabetes milieus disease after implementation of ICM.

On the same scope, **Mohamed & Ramadan, (2022)** conducted a study entitled " Instructional Guidelines Using Conversation Maps to Improve Self- Management for Diabetic Patients" and showed that there were high statistically significant differences of mean knowledge scores pre to post implementation of diabetes conversation map within the conversation map group with ($p= < 0.001$).

Likewise, this result is compatible with **Adam et al., (2018),** who studied "Evaluating

the Impact of Diabetes Self-Management Education Methods on Knowledge, Attitudes and Behaviors of Adult Patients with Type 2 Diabetes Mellitus" and found that, the difference in mean scores of knowledge was high statistically significant after DCM implementation.

Figure (1) displays that, more than half of the studied children had low total knowledge level at pre-program implementation. While, most of children had high total knowledge level at immediate post-program and follow-up after one month implementation.

This finding is in the same context with **Hamza et al., (2024)** who mentioned that, the majority of study subjects had a satisfactory total level of knowledge in post intervention, and most of them had a satisfactory level in post 6 months intervention in follow-up compared to one third pre-intervention

Additionally, these results agree with **Mohamed & Ramadan, (2022)** who demonstrated that there was a high statistically significant improvement of diabetes conversation map group's total satisfactory knowledge scores post-implementation of diabetes conversation map with high statistically significant differences between pre and post where (p = 0.001). While, there were no statistically significant differences in total satisfactory knowledge scores of control group between pre and post where (p= 0. 127).

Apparently **table (4)** reveals that, children had lower total mean scores for all domains of self-care pre-program implementation. While, the total mean scores for all domains of self-care were higher immediate post-program implementation and follow-up after one month. Also, the result of the current study **(Fig. 2)** illustrates that, less than three quarters (71.7%) of the studied children had low total self-care level at pre-program implementation. Meanwhile, the majority (91.7%) and most (83.3%) of children had high total self-care level at immediate post-program implementation and follow-up after one month respectively.

This could be attributed to the effectiveness of DCM implementation on improving the motivation of diabetic children to learn self-management of their disease, enhancing understanding, raising awareness, and motivating them to manage their disease.

These results agree with **Essellouti et al., (2024)** who evaluated "Impact of the therapeutic education tools "Map kit diabetes conversation" on the improvement of the autonomous management and self-efficacy of diabetic patients" and found that there was a significant increase in diabetes empowerment score six months after study enrollment among patients who received DCM kit-based education compared to the control group. Also, the use of the CM to teach diabetic children was helpful in improving knowledge, attitude and practices.

On the same scope, **Ghafoor, et al., (2015)** pointed that, ICM applications provide detailed knowledge of diabetic diet planning and selecting foods that regulate blood sugar levels. In addition, ICMs sessions cover the major aspect of diabetes management including diet, exercise, blood sugar monitoring, and medication. The diabetic children learn about the effect of their life style choice on their health, which empower them to apply what they learned. The structure nature of the ICM sessions encourages children to set realistic goal and develop applicable action plan of care and motivate them to manage their condition

The findings of the present study (**Table 5)** represents that, there was a highly statistical significant difference between the results of immediate post-program phase and follow-up after one month compared to pre- program

phase regarding all items of studied children's diabetes management self-efficacy, with p<0.001. Moreover, the total mean scores for children's self-efficacy were higher at immediate post-program and follow-up after one month phase than at pre-program phase, with statistical significant differences.

The possible explanation of this result could be attributed with the effectiveness of conversation map program which utilize colorful graphics and a highly interactive approach help children to access to the health information easily and support them in creating treatment plans that are appropriate for their condition. ICM is a suitable, simple, and attractive way of learning.

These findings are supported by **Hamza et al., (2024)** who clarified that there was a highly statistically significant difference in DMSE score between pre intervention, and post intervention (p < 0.001). Moreover, there was a highly statistically significant improvement in all elements of diabetes self-efficacy scale pre and post implementation of ICM.

Also, these findings are consistent with **Li et al., (2020)** who studied "Impact of Conversation Maps on diabetes distress and self-efficacy of Chinese adult patients with type 2 diabetes" and illustrated that, the baseline total score of self-efficacy did not reach statistically significant difference between the two groups. However, total score of self-efficacy in the intervention group was higher than that in the control group after 6 months.

On the same context, these results are in concurrence with **Qasim et al., (2020)** in a study entitled "Diabetes conversation map - a novel tool for diabetes management self-efficacy among type 2 diabetes patients in Pakistan" and displayed that, at baseline, there was no statistically significant difference in diabetes management self-efficacy (DMSE) score. While, at 3 months follow-up, the average difference in DMSE score increased between the DCM and control group. Besides, there was no significant difference in average scores of the DMSE sub-scales between the two groups at the baseline. However, after 3 months there was a significant improvement in the DMSE sub scales (Exercise and weight control, health seeking and diabetes treatment, blood sugar monitoring, and diet control) in the DCM group as compared to the control group.

The result of the current study (**fig. 3)** reveals that, more than two thirds of the studied children had low total level of diabetes management self-efficacy pre-program implementation. While, most and the majority of children had high total level of diabetes management self-efficacy at immediate post-program and follow-up after one month phase respectively.

This result is in agreement with **Hamza et al., (2024)** who reflected that, majority of studied patients were in the low self-efficacy stage in the pre-program implementation. While less than half of them distributed in moderate & high self-efficacy post program implementation.

The findings of the current study **(Table 6)** showed that, there was a highly statistical significant positive correlation among total knowledge of studied children, total self-care and total self- efficacy pre-intervention and immediate post -intervention (P<0.001 & 0.05). Additionally, there was highly statistical significant positive correlation between total knowledge of studied children and total self-care and total self- efficacy at follow-up after month. While, there was no statistical significant correlation between total self-care and total self- efficacy of studied children at follow-up after month (P>0.05).

These findings are compatible with **Hussien et al., (2022)** who illustrated that,

there were statically significant positive correlation between the studied adolescents' total knowledge, practice and total self-efficacy score at pre, post and follow up of the educational program.

Conclusion:

The educational program based on interactive conversation maps was effective in improving children's knowledge about diabetes and enhancing their self-care practices and self-efficacy in managing diabetes.

Recommendations:

- Encouraging healthcare providers to use DCM as new educational tools rather than routine counseling methods for educating diabetic children.
- Providing workshops and training sessions for endocrinology nurses about impact of applying diabetes conversation maps on diabetic children.
- Conducting the study in different settings to generalize the results of the study.

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فاعلية برنامج تعليمى مبنى على خرائط المحادثة التفاعلية على المعلومات والرعاية الذاتية والكفاءة الذاتية للأطفال المصابين بالسكرى

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يُعد داء السكري من أكثر الأمراض المزمنة شيوعًا في مرحلة الطفولة، والذى يمكن أن يؤثر سلبًا على حياة الأطفال. تُعد خريطة محادثة داء السكري أسلوبًا تفاعليًا وتصويريًا جديدًا للتثقيف الصحي، ويمكن أن تكون فعالة في تحسين معلومات الأطفال المصابين بداء السكري، وسلوكيات الرعاية الذاتية، والكفاءة الذاتية في إدارة داء السكري. **هدفت الدراسة** إلى تقييم فاعلية برنامج تعليمى مبنى على خرائط المحادثة التفاعلية على المعلومات والرعاية الذاتية والكفاءة الذاتية للأطفال المصابين بالسكرى. **تصميم البحث**: تم استخدام تصميم بحث شبه تجريبي. **مكان البحث:** أجريت هذه الدراسة في عيادة الأطفال لمرضى السكري في مستشفى التأمين الصحي الشامل (عيادة حسن عوض) بمدينة بنها، التابعة للهيئة العامة للتأمين. **العينة:** عينة غرضية من ٦٠ طفلًا مصابًا بداء السكري من النوع الأول. **أدوات جمع البيانات:** تم استخدام ثلاث أدوات؛ الأداة الأولى: استبيان مقابلة منظم يتضمن ثلاثة أجزاء؛ الجزء (١) خصائص الأطفال المصابين بالسكري المدروسين، الجزء (٢) التاريخ الطبي للأطفال المدروسين، الجزء (٣) معلومات الأطفال بمرض السكري، الأداة الثانية: قائمة الرعاية الذاتية المراجعة لمرض السكري للأطفال والمراهقين والأداة الثالثة: مقياس الكفاءة الذاتية في إدارة مرض السكري. **النتائج:** كان لدى معظم الأطفال مستوى عالٍ من المعلومات الكلية بعد تنفيذ البرنامج مباشرة والمتابعة بعد شهر واحد. وكان لدى معظم الأطفال مستوى عالٍ من الرعاية الذاتية الكلية بعد تنفيذ البرنامج مباشرة والمتابعة بعد شهر واحد على. علاوة على ذلك، كان لدى معظم الأطفال مستوى عالٍ من الكفاءة الذاتية في إدارة مرض السكري الكلية بعد تنفيذ البرنامج مباشرة والمتابعة بعد شهر واحد. **الاستنتاج:** كان البرنامج التعليمي المبنى على خرائط المحادثة التفاعلية فعالاً في تحسين معلومات الأطفال بمرض السكري، وتعزيز ممارسات الرعاية الذاتية لديهم، وكفاءتهم الذاتية في إدارة مرض السكري. **التوصيات:** تشجيع مقدمي الرعاية الصحية على استخدام خرائط المحادثة الخاصة بمرض السكري كأدوات تعليمية جديدة، بدلاً من أساليب الإرشاد التقليدية، لتثقيف الأطفال المصابين بالسكري.