

Knowledge and Self-efficacy among Children with Type 1 Diabetes and their Caregivers

Fawzia Nabeel Mohammad, Rasha Abdelateef Abdelaziz Ramadan & Nesreen Mosbah Elsayed Mohamed
Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University

Abstract

Diabetes is a chronic illness that have a major impact on the life of children and adolescents, as well as their families or caregivers. Self-efficacy regarding diabetes management is the capacity that influenced by knowledge and awareness. The lack of knowledge about diabetes can lead to inadequate diabetes management practices and can be lethal to the patient. **Aim of the study:** To assess knowledge and self-efficacy among children with type 1 diabetes and their caregivers. **Subjects and Methods:** A descriptive cross-sectional study was conducted which included 100 caregivers and 100 children with type 1 diabetes who attended the Diabetes Clinic for School Children affiliated to El-Mabara hospital for health insurance, El-Sharkia Governorate, Egypt, from December 2018 to May 2019. **Tools:** Diabetic Knowledge Questionnaire (DKQ), Parental Self-Efficacy Scale for Diabetes Management (PSESDM), and Self-Efficacy for Diabetes Scale (SED) for children. A Structured Questionnaire was developed by the researchers to assess more specific knowledge regarding diabetes. **Results:** The results showed that only 38.7% of the studied children and 45.4% of caregivers have sufficient general knowledge regarding diabetes. Concerning self-efficacy, the results demonstrated that 51.9% of children and 48.7 of caregivers had very poor self-efficacy regarding diabetes management while, those who had good self-efficacy constituted only 13.5% of caregivers and 12.3% of children. **Conclusion & recommendations:** The findings of this study concluded that, children and caregivers had insufficient general knowledge regarding diabetes and also both children and caregivers had very poor self-efficacy regarding diabetes management. The study findings recommended the requisite for structured training programs at the diabetes clinics for school age children to improve knowledge of diabetic children and their caregivers to promote better compliance towards self-care management and prevent diabetes-related complications.

Keywords: Knowledge, Self-efficacy, Type1 diabetes, Children, Caregivers.

Introduction

Diabetes mellitus is a metabolic disorder which occurs as a result of deficiency in insulin action, production or both. Type 1 diabetes mellitus (T1DM) is considered one of the major types of diabetes mellitus that arise from autoimmune destruction of pancreas that makes it unable to secrete insulin (Albikawi & Abuadas, 2015). The burden of T1DM is markedly increasing in the Middle East and North Africa as it is the cause of morbidity and mortality, the prevalence of T1DM was 35.4 million in 2015 and it is estimated to rise to 72.1 million by the year 2040. The prevalence of T1DM in Egypt is among the highest in the Middle East and North Africa countries with 7.8 million people known to have diabetes mellitus (IDF, 2019).

Type 1 diabetes mellitus leads to serious complications that affect the different body systems and general health, which in turn increase

the burden of the disease (American Diabetes Association, 2018). Management of diabetes mellitus is complex, so the reliance of some patients on their caregivers has increased especially for children and adolescents. A caregiver is a family member or a paid helper who is willing to provide long-term assistance to a child. Caregivers' behavior regarding diabetes management is influenced by knowledge and awareness (Lindquist et al., 2011).

Awareness of children and their caregivers is the key of success in the management of T1DM that motivate compliance to a difficult and complex lifetime regimen. Preventing and managing complications of T1DM mainly rely on children and their caregiver's knowledge and awareness to manage. Yet, a global survey found that, only 16.2% of children with T1DM adhere to recommendations had been given to them regarding self-care management. One reason for the poor outcomes in children with T1DM is the

lack of knowledge and awareness regarding importance of the treatment of the disease and the consequence complications (Hosseini et al., 2017).

Self-efficacy refers to an individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments. Factors that influence diabetes control include the association between self-efficacy and self-care behaviors (Datye et al., 2013). Children and adolescents with type 1 diabetes (T1D) experience a low-level of self-efficacy because of problems such as diet, limited activity, invasive monitoring of blood sugar, daily insulin injections, chronic physical complications, and hospitalization imposed on them by the disease (Lawrence et al., 2012).

Significance of the study:

Living with T1DM remains a challenge for a child and the whole family. Children with T1D must adhere to a complex and time-consuming lifelong daily medical regimen to delay or prevent the onset of acute and chronic T1D-related complications such as seizure, coma, diabetic ketoacidosis, cardiovascular disease, retinopathy, nephropathy, and neuropathy. Caregivers of children with T1D are responsible for the child's daily T1D management, including frequent blood glucose (BG) monitoring, insulin administration, and diet/physical activity regulation. The lack of knowledge and self-efficacy about diabetes management can lead to inadequate management and can be lethal to the patient. The knowledge about hypoglycemia, hyperglycemia, long term complications, the diet to be given, use of glucose test, storage and handling of insulin and plans for acute complications need to be assessed for proper management of diabetes. Not only knowledge need to be assessed but also self-efficacy to diabetes management.

Aim of the study:

The aim of this study is to assess knowledge and self-efficacy among children with type 1 diabetes and their caregivers, throughout the following:

1. Assessment of children's and caregivers' knowledge regarding diabetes.
2. Assessment of children's and caregivers' self-efficacy in diabetes management.

Research questions:

- What level of knowledge about type 1 diabetes do children and their caregivers have?
- What level of self-efficacy do children and their caregivers have to manage diabetes?

Subjects and Methods

Research design: A descriptive cross-sectional study was utilized in this study.

Cross-sectional studies are used both descriptively and analytically. Descriptive cross-sectional studies simply characterize the prevalence of a health outcome in a specified population.

Setting: This study was conducted at Diabetes Clinic for School Children affiliated to El-Mabara hospital for health insurance, El Sharkia Governorate, Egypt, from December 2018 to May 2019. The Diabetes Clinic for School Children is affiliated to the Health Insurance Sector at the level of El Sharkia Governorate. The clinic serves school children with diabetes from all rural and urban centers of El Sharkia Governorate. Children come from all El Sharkia centers for regular follow up and for obtaining fortified medications from the health insurance.

Subjects: A convenience sample of 100 children with T1DM and 100 caregivers constituted this study sample. The inclusion criteria included children with T1DM aged between 6-18 years old, from both sexes and free from other chronic diseases. Moreover, this study sample included caregivers who are willing to provide long-term assistance to the studied children.

Tools of data collection:

Different tools are used for data collection of the study including: I-Diabetic Knowledge Questionnaire (DKQ), II- Parental Self-Efficacy Scale for Diabetes Management (PSESDM), and The Self-Efficacy for Diabetes Scale (SED) for children. In addition, a structured questionnaire was developed by the researchers to assess knowledge regarding causes and symptoms of acute complications of diabetes, DKA, storage and handling insulin.

Tools were written in simple Arabic language and arranged as the following:

Tool I: An interview questionnaire to collect demographic data and knowledge of diabetes including three parts:

First part: Demographic characteristics of the studied diabetic children and their caregivers as age, gender, birth order, educational level etc.

Second part: Diabetic Knowledge Questionnaire (DKQ) adopted from **Eigenmann et al. (2011)** to assess general knowledge about diabetes. The DKQ 24-items designed to elicit information about children's and caregivers' understanding of the cause of diabetes, its associated complications, blood glucose levels, diet, and physical activity.

Scoring: The DKQ has three response options "Yes", "No", and "Don't know". One point is awarded for each correct answer, whereas, no point or negative scoring for the incorrect option. Its scoring involves summing-up the points obtained by each participant. A higher score represents better disease knowledge. Maximum score offered being 24 so, (≥ 12) was rated as sufficient level of knowledge and (< 12) was rated as insufficient.

Third part: A structured questionnaire was developed by the researchers concerned with more specific knowledge about diabetes included knowledge of children and caregivers about symptoms of diabetes, causes and symptoms of hypoglycemia and hyperglycemia, diabetic ketoacidosis, long-term complications of diabetes and insulin storage and handling

Scoring: The developed questionnaire has three response options "Yes", "No", and "Don't know". Only the correct answers were counted for 1 point, while, no point or negative scoring for the incorrect option. scoring is calculated through the sum of the number of participants who have correctly answered the questions divided by the number of questions.

Validity and Reliability:

Reliability of the study instruments was estimated by applying a test-retest method with Cronbach's alpha that was calculated between the two scores. It was 0.78 which indicates that the

instruments were reliable to meet the objectives of the study.

For validity assurance, the instrument was submitted to a jury of three experts involving two professors of pediatric nursing, and one professor of pediatrics to evaluate content validity and modify any mandatory items of the instruments. All required modifications were done.

Tool II: Self-efficacy for diabetes management including two parts:

First part: Self-Efficacy for Diabetes Scale (SED) concerned with measuring self-efficacy in the context of pediatric diabetes management. It was adopted from **Allen et al. (2018)**. The SED 35-item scale designed to measure perceived confidence and ability to manage diabetes. This measure included three subscales: self-efficacy specific to diabetes (SED-D; 24 items), self-efficacy specific to medical situations (SED-M; 5 items), and self-efficacy in general situations (SED-G; 6 items). For the SED-D, items 1–10, 12–16, 18, 20, 23, 24, 26, 31–33, and 35 were included. For the SED-M, items 11, 17, 19, 22, and 34 were included. For the SED-G, items 21, 25, and 27–30 were included.

Scoring:

The studied children responded to each item using a 4-point Likert scale. The total score ranged from 35-140 at the scale. The score from 0-35 indicated very poor self-efficacy, while, the score > 35 to 70 indicated poor self-efficacy. The score > 70 to 105 indicated good self-efficacy, while score > 105 to 140 indicated very good self-efficacy.

Validity and Reliability:

The SED demonstrated good convergent validity with high alpha coefficients ranging from .81 to .93. indicating a high internal consistency for the diabetes-specific subscale.

Second part: Parental Self-Efficacy Scale for Diabetes Management (PSESMDM). The PSESMDM is an 8-item measure that assesses level of self-efficacy regarding diabetes management. It was adapted by **Marchante et al. (2014)** from the Perceived Diabetes Self-Management Scale (PDSMS) to measure parental self-efficacy for diabetes management of young children. Each item was changed from "my diabetes" to "my

child's diabetes." The language of each statement was also simplified.

Scoring:

The PSESDM for parents of children with diabetes consists of eight items each rated on a 5-point Likert scale. Responses range from 1="Strongly disagree" to 5="Strongly agree." Items 1, 2, 6, and 7 are reverse scored. The total score on the measure could range from 8 to 40. A higher score on the PSESDM represents higher parental confidence in managing their child's diabetes.

Validity and Reliability:

The Cronbach's alpha coefficient for the PSESDM was within the acceptable range ($\alpha=0.84$), indicating adequate internal consistency. As hypothesized, higher PSESDM scores were associated with lower HbA1c ($r=-0.25$, $p=0.048$) and better diabetes-specific quality of life ($r=0.41$, $p=0.002$).

Under the supervision of the researchers, tools for data collection were administered by conducting face to face interview of participants (orally to illiterate caregivers) and asked to answer the questions orally. Literate participants were asked to complete the questionnaire themselves.

The study was conducted through:

Preparatory phase:

An official permission to conduct the study was obtained from the Director of Zagazig University Hospitals and Director of Diabetes Clinic for School Age after explaining the purpose and methods of data collection by the researchers.

Pilot study

A Pilot study was carried out on ten children who represented 10% of the studied children at the previously mentioned setting in order to test the applicability of the constructed tools and the clarity of the included questions related to awareness of children and their caregivers with T1DM. The pilot study had also served to estimate the time needed for interview that was conducted by the researchers for each child and caregivers to fill in the questionnaire and answer the study related questions. According to the results of the pilot, no modifications were

required. The studied children of the pilot study were included in the main study sample.

Ethical considerations

An oral approval was taken from each child before collecting data and, after explanation of the purpose and nature of the study as well, oral consents were taken from the children's caregivers to gain their approval for participation. The researchers assured maintaining anonymity and confidentiality of the collected data throughout the study phases. They were informed about their right to withdraw from the study at any time without giving any reason and without any responsibility for the studied children.

Field work:

Data collection extended over a period of 6 months, started from beginning of December, 2018 to the end of May, 2019. The researchers were available in the study setting during working hours all days of the week from 9.00 a.m. to 2.00 p.m. except Fridays to assess the studied children's knowledge regarding diabetes through the following:

Assessment phase

Firstly, the researchers introduced themselves to the studied children and caregivers and presented a brief explanation about the aim and nature of the study. Each child was interviewed individually, his/her knowledge and self-efficacy with T1DM and their caregivers were assessed using the previously mentioned tools. The child's demographic characteristics and his/her medical data were filled in by the researchers either through caregiver's interview or through revising the child's medical file. The questionnaire took approximately 25-35 minutes to be completed.

Statistical design:

The study data were analyzed using the statistical package for social science (SPSS), version 21. Descriptive statistics including the frequency distribution and percentages were used for the analysis of nominal data as demographic data and medical history of the studied children. Differences between variables through times of evaluation were analyzed using t-test.

Results

Table (1) shows frequency distribution of the studied children according to their demographic

characteristics and medical history. This table reveals that 69% of children were in age group from 6 to 12 years with a mean age of 10.45 ± 3.24 . Regarding the gender of studied children 56% of studied children were males.

Table (2) demonstrates frequency distribution of the studied diabetic children's caregivers according to their demographic characteristics. The table shows that 92% of caregivers were females (mothers of children) and 56% of caregivers were in the age group 30-40 years. Regarding the social status, 89% of them were married. Concerning their education, only 10% were illiterate. Regarding consanguinity between fathers and mothers of children, 88% of parents haven't any consanguinity. Concerning residence, 68% come from rural areas.

Table (3) displays general knowledge regarding diabetes mellitus among diabetic children and their caregivers, the table reveals that only 38.66% of children and 45.37% of caregivers had a sufficient level of general knowledge about diabetes. On the other hand, 32.3% of children and 27.5% of caregivers had insufficient general knowledge. Moreover, 29% of children and 27.12% of caregivers had no knowledge. The same table shows that 69.09% of children and

72.63% of caregivers had sufficient knowledge regarding symptoms of diabetes. Likewise, 43.83% of children and 56.3% of caregivers had sufficient knowledge regarding signs and symptoms of DKA. Also, 63.7% of caregivers had sufficient knowledge regarding storage and handling of insulin compared to 35.7% of children. Finally, the same table reveals that 77.8% of children and 55.2% of caregivers had no knowledge regarding long-term complications of diabetes.

Figure (1) illustrates the studied diabetic children's levels of self-efficacy. The figure indicates that 51.85% of children have a very poor level of self-efficacy regarding management of their diabetes, while 12.3% only have a good level and 14.34% had a very good level of self-efficacy.

Figure (2) shows with the studied caregivers' levels of self-efficacy to manage their children's diabetes. The figure reveals that 48.7% of caregivers had a very poor level of self-efficacy. Moreover, 15.5% had poor self-efficacy. Only 7.6% of caregivers had a very good level of self-efficacy and 13.5% had a good level of self-efficacy.

Table (1): Frequency Distribution of the Studied Children According to Their Demographic Characteristics and Medical History (N=100).

Items	No	Percent
Age in years:		
6 -12	69	69
>12-18	31	31
Mean±SD	10.45 ± 3.24	
Gender:		
Male	56	56
Female	44	44
Birth order		
First child	20	20
Middle child	53	53
Last child	27	27
Educational level:		
Primary	69	69
Preparatory	21	21
Secondary	10	10
Diabetes treatment		
Injection therapy	100	100
Pump therapy	0	0
Metabolic control		
Good (<7.5%)	19	19
Moderate (7.5%–8.5%)	35	35
Poor (8.6%–10.0%)	40	40
Very poor (>10.0%)	6	6
Ketoacidosis		
Yes	20	20
No	80	80

Table 2: Frequency Distribution of The Studied Diabetic Children's Caregivers According To Their Demographic Characteristics (N=100).

Items	No	Percent
Age in years		
<30	12	12
30-40	56	56
>40	32	32
Gender		
Male	8	8
Female	92	92
Marital status		
Married	89	89
Divorced	4	4
Widowed	7	7
Educational level		
Illiterate	10	10
Preparatory school	3	3
Secondary school	32	32
University	51	51
Post-graduate	4	4
Relation to child		
Mother	92	92
Father	5	5
Uncles	3	3
Residence:		
Rural	68	68
Urban	32	32
Consanguinity		
Yes	12	12
No	88	88
Previous diabetic training		
Yes	13	13
No	87	87

Table (3): Frequency Distribution of The Studied Diabetic Children and Caregivers According To Their Level of Knowledge (N=100).

Items	Total frequency and percent	Level of knowledge					
		Children			Caregivers		
		Sufficient knowledge	Insufficient knowledge	No knowledge	Sufficient knowledge	Insufficient knowledge	No knowledge
General knowledge	Frequency	928	776	696	1089	660	651
	(%)	38.66	32.33	29	45.37	27.5	27.12
Symptoms of diabetes	Frequency	760	193	147	799	111	190
	(%)	69.09	17.54	13.36	72.63	10.09	17.27
Causes of Hyperglycemia	Frequency	239	194	267	310	186	204
	(%)	34.14	27.71	38.14	44.28	26.57	29.14
Mild Symptoms	Frequency	674	158	168	803	111	86
	(%)	67.4	15.8	16.8	80.3	11.1	8.6
Moderate symptoms	Frequency	295	58	47	285	65	50
	(%)	73.75	14.5	11.75	71.25	16.25	12.5
Severe symptoms	Frequency	259	71	70	322	32	46
	(%)	64.75	17.75	17.5	80.5	8	11.5
Total symptoms of hyperglycemia	Frequency	1248	299	285	1413	202	342
	(%)	64.9	15.7	19.4	74.4	10.6	15
Causes of hypoglycemia	Frequency	232	73	95	274	70	56
	(%)	58	18.25	23.75	68.5	17.5	14
Mild symptoms	Frequency	552	331	217	746	217	137
	(%)	50.18	30.09	19.72	67.81	19.72	12.45
Moderate symptoms	Frequency	332	186	282	567	127	106
	(%)	41.5	23.25	35.25	70.87	15.87	13.25
Severe symptoms	Frequency	114	130	56	162	107	31
	(%)	38	43.3	18.66	54	35.6	10.3
Total symptoms of hypoglycemia	Frequency	998	647	555	1475	451	294
	(%)	43.4	30.4	26.2	64	19.5	16.5
signs and Symptoms of DKA	Frequency	263	94	243	338	73	189
	(%)	43.83	15.66	40.5	56.3	12.2	31.5
Long-Term Complications	Frequency	139	194	1167	415	257	828
	(%)	9.26	12.93	77.8	27.66	17.13	55.2
Storage and handling of insulin	Frequency	607	225	868	1074	212	404
	(%)	35.7	13.3	51	63.7	12.5	23.8

Figure (1): Frequency Distribution of Studied Diabetic Children Regarding Their Level of Self-Efficacy (N=100)

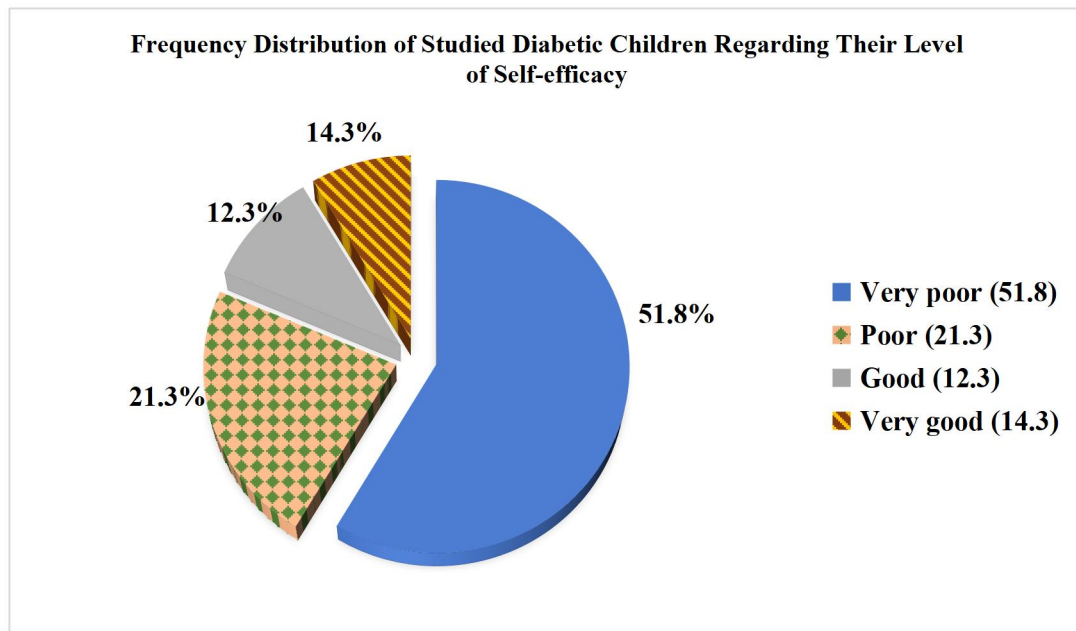
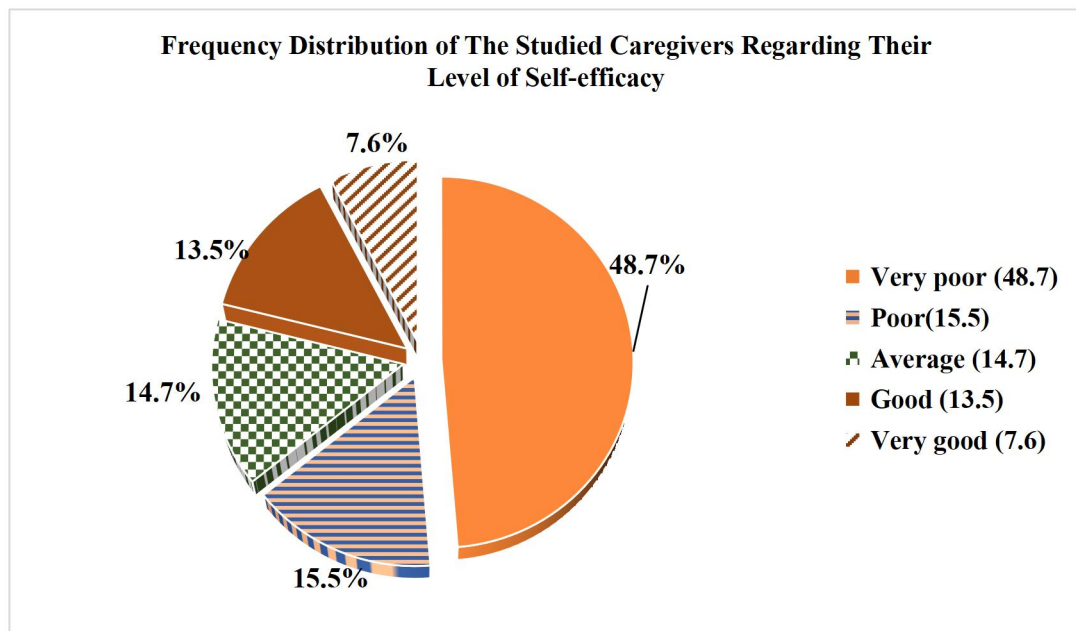


Figure (2): Frequency Distribution of the Studied Caregivers Regarding Their Level of Self-Efficacy (N=100)



Discussion

The aim of this work was to assess knowledge and self-efficacy among children with type 1 diabetes and their caregivers through answering the following questions:

- What levels of knowledge about type 1 diabetes do children and their caregivers have?
- What levels of self-efficacy do children and their caregivers have to manage diabetes?

Knowledge is a crucial factor in maintaining patient glycemic control and adherence to treatment. However, poor glycemic control, insufficient treatment adherence and severe psychological adjustment to disease could result from inaccurate or lack of knowledge about diabetes (Gomes et al., 2018).

The management of type 1 diabetes mellitus (T1DM) requires considerable knowledge and skill, and puts a significant strain on individuals and families (Allen et al., 2018). Numerous studies supporting the positive association between self-efficacy and diabetes self-care as consistent with Bandura's conceptualization theory which supposed that self-efficacy for diabetes intends to measure one's belief in their ability to engage in health-promoting behaviors consistent with T1DM management (Whittemore et al., 2012).

Mothers with more knowledge about diabetes and better education maintained better glycemic control of their children, irrespective of their socio-economic status, and to enhance glycemic control and minimize acute and chronic complications of diabetes in children, knowledge and education of mothers be important (Abdulaziz et al., 2016).

Regarding demographic data of children, the present study results revealed that slightly less than three quarters of the studied children were in age from 6 to 12 years with a mean age of 10.45 ± 3.24. Regarding gender, the results revealed that more than half of the studied children were males. These results of the present study were consistent with those of Noorani et al. (2016), who mentioned that males are the dominant gender for children with diabetes mellitus. Contradicting with the previous studies' results, in Egypt, El-Ziny et al. (2014) stated that the incidence and prevalence of T1DM were higher in females.

Concerning birth order of the studied children, the results revealed that more than half were within middle birth order. This result was in agreement with study of Moawad et al. (2014), who concluded in their results that the highest percentage was for middle child.

Regarding demographic data of caregivers, the present study results showed that more than half of caregivers were within age of 30-40 years. Concerning the marital status, the majority of caregivers were married while the minorities were either divorced or widowed. Concerning educational levels of caregivers, the highest percentage was university graduates.

In relation to residency, the current study showed that more than two thirds of caregivers come from rural areas. These results might be due to that, the diabetes clinic for school age children in Zagazig City serves all school age children at the level of Sharkia Governorate from all the rural and urban centers of the governorate. In agreement with the previous study results El-Ziny et al. (2014) stated that more cases of childhood type 1 diabetes were found to originate from rural areas.

Regarding general knowledge about diabetes mellitus among diabetic children and their caregivers, the present study result revealed that more than one third of the studied children and less than half of the studied caregivers gave the sufficient knowledge for Diabetic Knowledge Questionnaire (DKQ) that assesses general knowledge about diabetes. In contrast, approximately one third of the studied children and a less percentage of the studied caregivers gave wrong answers. As well, less than one third of the studied children and a near percent of the studied caregivers did not know the answers. According to these results nearly one third of both studied children and caregivers had no knowledge, in addition to one third had wrong answers. These results reflected insufficient general knowledge level among children and their caregivers.

These results might be due to children's and caregivers' misbeliefs about understanding of theoretical knowledge of diabetes. They misbelieve that even they understand what diabetes is and its treatment, still they do not know how to control their children's diabetes as diabetes is so difficult to be controlled in their

opinions. They expressed that, “even we become knowledgeable about our children’s diabetes, we can’t control it”.

These findings were in agreement with the results obtained by **Abdel Megeid and El-Sayed(2012),Jonsson (2014) and Noorani et al. (2016)**, who reported a significant deficit in knowledge about management of T1DM among mothers of diabetic children. However, these study results were in contrast with the study of **Al-Hussaini and Mustafa (2016)**, who reported that the majority of subjects have good level of general knowledge about diabetes.

Regarding general symptoms of diabetes, more than two thirds of children and nearly three quarters of caregivers gave the correct answer as they have sufficient knowledge. As well, concerning knowledge of children and caregivers regarding symptoms of hyperglycemia, results of this study indicated that slightly less than two thirds of children and slightly than three quarters of caregivers gave correct answers as they have sufficient level of knowledge. In the same line, results of this study showed that less than two thirds of caregivers and more than two thirds of children gave correct answers regarding symptoms of hypoglycemia as they have sufficient level of knowledge. This may be due to their long experience and suffering with these symptoms. In agreement with this study results of **Al-Hussaini and Mustafa (2016)** showed that the children had fairly reasonable knowledge of the familiar and known common symptoms of diabetes.

Regarding knowledge of children and caregivers with signs and symptoms of Diabetic Keto Acidosis (DKA), results of this study showed that more than two fifths of the studied children and more than half of caregivers gave correct answers as a sufficient level of knowledge. Although of this sufficient knowledge, the majority of children and caregivers reported that they can’t manage DKA.

In agreement with the previous results, **Othman et al. (2018)** highlighted that although mothers of pediatric type-1 diabetic children have the knowledge of DKA, however they need further education from the diabetes health educators and diabetes care team as most of them do not know about its management.

Regarding children’s and caregivers' answers to questions concerning causes of hyperglycemia, the current study revealed that nearly one third of the studied children compared to more than two fifths of caregivers gave correct answers as they have sufficient knowledge. However, more than one quarter of the studied children and a near percentage of caregivers showed insufficient knowledge. In addition, more than one third of the studied children and less than one third of the caregivers do not know the answers. These results might reflect insufficient or decreased knowledge regarding causes of hyperglycemia. This might be because children and their caregivers try to deny and reject some facts as the fact that, decreased activity is a cause of hyperglycemia. They rationalized their rejection as exercises and activities make them very tired and very exhausted. In addition, making exercises and activities need to adjust the dose of insulin and they can’t adjust it. Therefore, they preferred to watch TV, or play mobile games instead of making activities or exercises to escape the insulin calculating dilemma and the consequent fluctuations.

As well, the decreased level of knowledge and awareness regarding causes of hyperglycemia among children and their caregivers might be due to their fears of increased dose of insulin, as they rejected the fact that, too little insulin can cause hyperglycemia. They rationalized their answer as high doses of insulin may cause hypoglycemia, and symptoms of hypoglycemia scare them more than hyperglycemia. Therefore, they misbelieve that too little insulin is safe more and is not a cause for hyperglycemia.

In agreement with these study results, **Driscoll et al. (2016)** in their study entitled: "Fear of hypoglycemia in children and adolescents and their parents with type I diabetes" concluded that a substantial amount of research has demonstrated fears of hypoglycemia (FOH) as a serious clinical concern in children and adolescents with type 1 diabetes and their parents.

Incongruent with this study results which revealed that more than half of studied children and nearly two thirds of caregivers gave correct answers regarding causes of hypoglycemia as a sufficient level of knowledge. This may be due to their concerns and fears regarding hypoglycemia.

Therefore, they were concerned with causes and how to manage it.

Concerning long term complications of diabetes, the present study results showed that more than three quarters of the studied children and more than half of caregivers had no knowledge regarding long term complications. This might be due to the early age of the studied children as they have no complications yet and certainly it is due to their poor level of knowledge and awareness. In agreement, **Alruwaili et al. (2018)** who in a similar study reported that the highest percentage of caregivers did not know the serious complications of diabetes that might affect their children.

Regarding knowledge of storing and handling insulin, the present study results revealed that nearly one third of children and less than two thirds of caregivers gave correct answers as a sufficient level of knowledge. This might be due to the firm belief that insulin is the only treatment to manage diabetes, but this is a myth because management of diabetes should include balanced diet and regular exercises in addition to many other factors. In the same line, **Gerensea et al. (2015)**, stated that type 1 diabetic patient had average knowledge and favorable attitude towards self-administration of insulin injection. As well as, moderately adequate knowledge and fair practices on insulin storage and administration techniques.

Concerning parental self-efficacy, the present study revealed that more than two fifth had very low self-efficacy regarding diabetes management. In contrast, **Marchante et al. (2014)** stated that parents reported relatively high levels of self-efficacy in caring for their child's diabetes on the PSESDM.

Regarding self-efficacy of children, the present study results revealed that more than half had very low self-efficacy. In contrary, **An-Hsuan et al. (2010)** found that adolescents with type 1 DM had higher self-efficacy, especially males, have a higher probability of reaching target diabetes control.

Conclusion

Based upon the findings of the present study, it could be concluded that general knowledge of diabetes among children with type1 diabetes and their caregivers was insufficient and level of self-

efficacy in both children and caregivers was very poor.

Recommendations

- Knowledge enhancement programs to maximize knowledge and understanding of diabetes for children's and caregiver's powerful practice and management.
- Biopsychosocial model (BPS) should be applied to emphasize the interconnection between biological, psychological and socio-environmental factors.
- Illness conceptualizations and specific clinical recommendations for improving of self-efficacy in diabetic children and their caregivers.

References

- Abdel Megeid, F.Y. & El-Sayed, M.M.A. (2012): Health education intervention improves knowledge, attitude and practices of mothers of insulin dependent diabetes mellitus. *World Appl Sci J*, 17(11), 1398-1404.
- Abdulaziz, A.D.M., Alwin R.A., Braham, R., Abdallah A.H.A., Al Saeed, A., Ahmed A.R., & Sulaiman A.S.F. (2016): Diabetes mellitus in Saudi Arabia: A review of the recent literature. *Current Diabetes Reviews*, 12(4), 359-368.
- Albikawi, Z.F., & Abuadas, M. (2015): Diabetes self-care management behaviours among Jordanian type two diabetes patients. *Am Int J Contemp Res*, 5(3), 87-95.
- Al-Hussaini, M., & Mustafa, S. (2016): Adolescents' knowledge and awareness of diabetes mellitus in Kuwait. *Alexandria Journal of Medicine*, 52(1), 61-66.
- Allen, J.V., Noser, A.E., Littlefield, A.K., Seegan, P.L., Clements, M., & Patton, S.R. (2018): Measuring Self-Efficacy in the Context of Pediatric Diabetes Management: Psychometric Properties of the Self-Efficacy for Diabetes Scale. *J Pediatr Psychol*; 43(2): 143-151.
- Alruwaili, A.F., AlArjan, F.M., Alruwaili, A.S. K., Almulhim, F.A., Alenazi, A. H., Aldandani, R.R.A. & Alanazi, A.O.A. (2018): Awareness, frequency and prevalence of DKA with DM type 1 children in Al-Jouf Region. *The*

- Egyptian Journal of Hospital Medicine*, 73(6), 6955-6958.
- American Diabetes Association. *Standards of Medical Care in Diabetes-2018* Abridged for Primary Care Providers. Clin Diabetes. 2018, Jan,36(1),14-37. doi: 10.2337/cd17-0119. PMID: 29382975; PMCID: PMC5775000.
- An-Hsuan, C., Chyi-Feng, J., San-Ging, S., & Bee-Hong, L. (2010): Self-efficacy affects blood sugar control among adolescents with type 1 diabetes mellitus. *J Formos Med Assoc*, 109, 503-510.
- Cho, N.H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J.D., Ohlrogge, A.W., & Malanda, B. (2018): IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Research and Clinical Practice*, 138, 271-281.
- Datye, K.A., Moore, D.J., Russell, W. E. and Jaser, S.S. (2013). Association of self-efficacy and self-care with glycemic control in diabetes. *Diabetes Spectrum*, 26(3), 172-178. Available at: <https://doi.org/10.2337/diaspect.26.3.172>
- Driscoll, K.A., Raymond, J., Naranjo, D., & Patton, S.R. (2016). Fear of hypoglycemia in children and adolescents and their parents with type 1 diabetes. *Current Diabetes Reports*, 16(8), 1-9.
- Eigenmann, C. A., Skinner, T., & Colagiuri, R. (2011). Development and validation of a diabetes knowledge questionnaire. *Practical Diabetes International*, 28(4), 166-170d.
- El-Ziny, M.A. E. M., Salem, N. A.B., El-Hawary, A.K., Chalaby, N. M., & Elsharkawy, A A. E. (2014). Epidemiology of childhood type 1 diabetes mellitus in Nile Delta, Northern Egypt-aretrospectivestudy. *Journal of Clinical Research in Pediatric Endocrinology*, 6(1), 9.
- Gerense, H., Moges, A., Shumiye, B., Abrha, F., Yesuf, M., Birihan, T. & Getahun, Z. (2015): Knowledge and attitude on insulin self administration among type one diabetic patients in Mekele hospital, Tigray, Ethiopia. *Advances in Surgical Sciences*, 3 (5): 32-36.
- Gomes, M.B., Santos, D.C., Pizarro, M.H., Barros, B., de Melo, L. & Negrato, C.A. (2018) :Does knowledge on diabetes management influence glycemic control? a nationwide study in patients with type 1 diabetes in Brazil. Patient Preference and adherence, 12, 53-62. Available at: <https://doi.org/10.2147/PPA.S146268>
- Hosseini, S., Shojaeizadeh, D., Sanagu, A., Vakili, M., Mirkarimi, K., & Jahanshahi, R. (2017): Effect of educational intervention on self-care behaviors among patients with diabetes: An application of PRECEDE model. *Annals of Tropical Medicine and Public Health*, 10,3.
- International Diabetes Federation, IDF (2017): *Diabetes Atlas* (8th ed). Brussels, Belgium: International Diabetes Federation. Available at: <http://www.diabetesatlas.org/> Google Scholar
- International Diabetes Federation, IDF (2019): *Diabetes Atlas*. 9th ed. Brussels, Belgium: International Diabetes Federation.
- Jönsson, L. (2014). Children with type 1 diabetes The initial education process and the impact on children and their parents over the first two years.
- Lawrence, J.M., Joyce, P., Black, M. H., Anderson, A., Hood, K., Imperatore, G., & Seid, M. (2012): Demographic and clinical correlates of diabetes-related quality of life among youth with type 1 diabetes. *The Journal of Pediatrics*, 161(2), 201-207. e202. Available at: <https://doi.org/10.1016/j.jpeds.2012.01.016>.
- Lindquist, L.A., Jain, N., Tam, K., Martin, G.J., & Baker, D.W. (2011): Inadequate health literacy among paid caregivers of seniors. *Journal of General Internal Medicine*, 26(5), 474-479.
- Marchante, A.N., Pulgaron, E.R., Daigre, A., Patiño-Fernandez, A. M., Sanchez, J., Sanders, L. M., & Delamater, A M. (2014): Measurement of parental self-efficacy for diabetes management in young children. *Children's Health Care*, 43(2), 110-119.
- Moawad, S., Badawy, A S., Al-saffar, Z.A., Al-Hamdan, N., & Awadien, A.M. (2014): Assessment of knowledge among Saudi

- diabetic children/adolescents at Riyadh City. *Am J Nurs Sci*, 3(1), 5-12.
- Noorani, M., Ramaiya, K., & Manji, K. (2016):Glycaemic control in type 1 diabetes mellitus among children and adolescents in a resource limited setting in Dar es Salaam-Tanzania. *BMC endocrine disorders*, 16(1), 1-8.
- Othman, A.,Awwad, M.A., Aziz, K. M. A., Asiri, S.M.,& Alqahtani, N.M. (2018):Knowledge and Awareness of Mothers about diabetic ketoacidosis among type-1 diabetic children and their action and response in emergency conditions in Aseer Region of Saudi Arabia. *Journal of Diabetic Complications & Medicine*, 3(2), 122.
- Rovner,A.J., Nansel, T. R., Mehta, S. N., Higgins, L.A., Haynie, D. L., & Laffel, L. M. (2012): Development and validation of the type 1 diabetes nutrition knowledge survey. *Diabetes care*, 35(8), 1643-1647.
- Van Allen,J.,Noser,A.E.,Littlefield,A. K., Seegan, P. L., Clements, M., & Patton, S. R. (2018): Measuring self-efficacy in the context of pediatric diabetes management: Psychometric properties of the self-efficacy for diabetes scale. *Journal of Pediatric Psychology*, 43(2), 143-151.
- Whittemore, R., Jaser, S., Chao, A., Jang, M., & Grey, M. (2012). Psychological experience of parents of children with type 1 diabetes: A systematic mixed-studies review. *The Diabetes Educator*, 38(4), 562-579.