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Quality of Life among Adolescents with Diabetes Mellitus Type 1 Attending Pediatric Unit of Diabetes Mellitus, Suez Canal University Hospital

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ABSTRACT

Background: Type 1 diabetes mellitus (T1DM) is one of the most common chronic diseases during childhood and adolescence. It threatens the health and endangers life with consequences for the physical and emotional development of the child and adolescent. **Objectives:** This study aimed to evaluate the health-related quality of life of adolescents with type 1 diabetes mellitus, associating it with socio-demographic, clinical and biochemical variables.

Subjects and methods: A cross sectional study included 124 adolescents with T1DM. Sociodemographic information, metabolic control measures, general and diabetes-related quality of life (QoL), illness profiles, and self-care behaviours were evaluated. **Results:** Participants' median age was. Males, single, with higher educational level had significantly higher level of quality of life than others.

Conclusion: Lower health-related quality of life (HRQoL) was more likely to be experienced by single male adolescents with lower levels of education and high glycated hemoglobin levels.

Keywords: T1DM, Adolescents, Metabolic control, QOL.

INTRODUCTION

There has been a rise in interest in studying chronic diseases in certain groups in recent years. Type 1 diabetic mellitus (T1DM) in teenagers is one example, since this illness necessitates intensive care and degrades quality of life over time due to specific care requirements [(1)].

Teenagers with T1DM should receive therapy that takes into account their unique characteristics, including variations in insulin sensitivity brought on by physical and sexual development, their ability to take care of themselves, and their neurological susceptibility to hypo- and possibly hyperglycemia. Thanks to advances in technology, science, the understanding of the psychological aspects of diabetes, the treatment of type 1 diabetes is now focused on the triangle of insulin, monitoring, and education about diabetes, which includes a healthy diet, frequent physical activity and social issues associated to the condition. In this context, an effective treatment strategy also depends on paying attention to family dynamics. The intricacy of the intensive care plan may degrade quality of life as these needs persist throughout life [(2)].- Teenagers with chronic illnesses may be subjected to pressures that lower their quality of life. Having a chronic illness like T1DM throughout this stage of human development has an effect on the psychosocial environment since it alters many aspects of one's social and personal identity and raises the likelihood of developing emotional and behavioral disorders. Diabetes distress, which is defined as unpleasant feelings brought on by having the condition and the responsibility of managing it on one's own, might set off these disorders [(3)].

While research on the prevalence of distress in adults is well established, it has not been examined in teenagers. A thorough study found that one-third of teenagers with type 1 diabetes had elevated diabetes distress. This condition usually results in poor glucose control, low self-efficacy, and inadequate self-care, all of which have a detrimental impact on the individuals' quality of life. Health care professionals need to understand the challenges posed by the adolescent years and how this demographic deals with illness on a daily basis in order to promote self-care and help improve quality of life [(4)].

Only a small number of research have looked at the association between socioeconomic, clinical, and biochemical features and T1DM in children and adolescents, despite the fact that there are numerous scientific studies on the subject in both international and national literature. These factors may have an impact on how the condition is treated and managed, which could decrease the quality of life for young people with T1DM [(5)]. In light of the aforementioned, the study question "Are the HRQoL domains associated with the clinical, laboratory, and sociodemographic features of teenagers with T1DM?" was further developed. Based on the theory that these variables may have an effect on the HRQoL of adolescents with T1DM, this study aimed to evaluate the HRQoL of adolescents with T1DM and connect it with sociodemographic, clinical, and laboratory characteristics [(6)].

According to current diabetes education recommendations, the results will hopefully advance knowledge and contribute to improve quality of life while taking into account the unique characteristics of adolescents (Their personal traits and social context). This study aimed to evaluate the HRQoL of adolescents with type 1 diabetes mellitus, associating it with socio-demographic, clinical and biochemical variables.

PATIENTS AND METHODS

This cross-sectional study was conducted at Pediatric Unit of Diabetes Mellitus at Suez Canal University Hospital and the control group was followed up at Ismailia Health Insurance Hospital. Both clinics

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are at Ismailia round road kilo 4.5. It serves patients coming from both rural and urban settings. They provides outpatient services to pediatric child with diabetes. One hundred twenty four adolescents who were diagnosed with T1DM for at least 1 year and prescribed insulin medication, aged from 12 to 21 years were included in the study.

Exclusion criteria: Adolescent women with T1DM who were pregnant for fear of COVID infection during study, adolescents with T1DM who were diagnosed with severe mental disorders that could interfere with communication or comprehending questions and adolescents who were involved in other studies related to diabetes currently.

Sampling techniques: A total number of 124 adolescents with T1DM were chosen randomly from 500 eligible patients attending pediatric unit of DM at Suez Canal University Hospital for the intervention group and from 1000 eligible patients attending Ismailia Health Insurance Hospital for control group.

All Adolescents with T1DM in both groups were assessed for their metabolic control parameters (HbA1c, FBS, 2hpp and LDL) and for their improvement in self-care activities, following carbohydrate counting diet and skills of insulin injections. Samples were collected at the baseline and after 6 months.

Data collection tools of the study:

All patients were subjected to:

Part 1: validated scoring system of socio-economic status [7]: It contained 7 domains: Education domain, culture domain, occupational domain, health care domain, economic domain, family domain, and home sanitation domain with a combined score of 84. The score was categorized into four levels: Extremely low, low, middle and high based on the quartiles of the computed score.

Part 2: Quality of life: The PedsQL Generic Core Scales and the PedsQL Diabetes Module [8]. The PedsQL Generic Core Scales**:**

It is 23 item generic HRQL questionnaire. The questionnaire took 5 minutes to complete. The 23-item PedsQL 4.0 Generic Core Scales encompassed: 1) physical functioning (8 items), 2) emotional functioning (5 items), 3) social functioning (5 items), and 4) school functioning (5 items) during the previous 4 weeks. Mean scores were calculated based on a 5-point response scale for each item and transformed to a 0 to 100 scale with a higher score representing better quality of life. (0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; 4 = almost always a problem). Items were reverse-scored and linearly transformed to 0–100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0), so that higher scores indicated better HRQoL.

PedsQL Diabetes Module: The PedsQL3.0 diabetes module consisted of surveys regarding children's and teenagers' quality of life. Every questionnaire included 28 items, classified into five domains or subscales as follows: (1) diabetes symptoms (11 items); (2) treatment barriers (4 items); (3) treatment adherence (7 items); (4) worry (3 items); and (5) communication (3 items). In the first set of instructions, participants were asked to rate on a five-point scale how difficult each item had been over the previous month (0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; and 4 = almost always a problem). Items were then reverse-scored and linearly transformed into a Likert scale with a 0–100 range (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0), so that higher scores indicated better HRQoL.

Part 3: physical examination data: Included anthropometric measurements: A portable digital scale and portable stadiometer were used to measure the subjects' height and weight. Then calculation of BMI, was measured. Using a validated electronic sphygmomanometer, blood pressure (BP) measurements (systolic and diastolic) were taken after the individuals had rested in a seated position for ten minutes with an empty bladder.

Part 4: Laboratory investigations: Included fasting plasma glucose, HBA1c, fasting lipid profile, urine albumin creatinine ratio.

Part 5: Disease profile: included duration of DM (years), DM-related complications [Diabetic ketoacidosis (DKA)] in the preceding 6 months of the study, hypoglycemic frequency in the past month preceding intervention, site of insulin injection and method of injection application, frequent self-monitoring and following carbohydrate counting diet.

Ethical approval: Relevant authorities from Suez Canal University Hospital and Ismailia Health Insurance Hospital were contacted for permission to carry out the study in Pediatric Unit of DM. Informed written consents were obtained from adolescents with T1DM and their guardians for participating in this study. The study was conducted in accordance with Declaration of Helsinki.

Statistical analysis

All Data were coded, analyzed using statistical package for social sciences version 22.0 (SPSS, Chicago, IL, USA). Descriptive data were presented as mean ± SD or percentages. Chi-square test or Fisher exact was used for statistical analysis of categorical variables. Distribution of the data was assessed using Shapiro Wilk test. Mean differences between groups were assessed by Mann Whitney U. Kruskal Wilcoxon signed rank was used to evaluate the mean differences before and after the intervention, whereas the Wallis test was used based on the number of groups. Spearman's correlation coefficient was utilized to evaluate the correlation between various variables. A p value ≤ 0.05 was deemed statistically significant.

RESULTS

Figure (1) showed that majority of patients had moderate socioeconomic level, followed by low level.

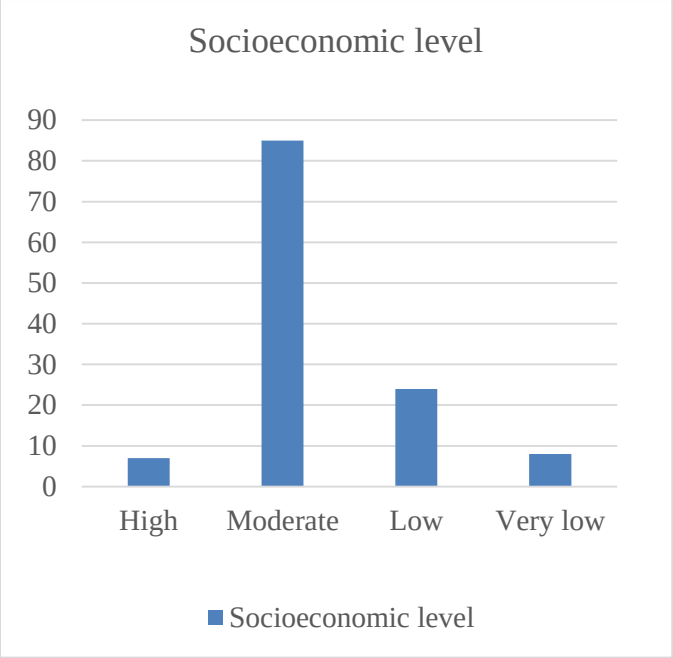

Figure (1): social characteristics of interventional and Control group.

Table (1) summarized the baseline and clinical characteristics of the studied patients. Patients had median age of 15 years old ranged from 12 to 21 years, females were more than males (54.8%), 93.5% were singles, 95.2% were students and 56.5% had rural residence.

Table (1): Demographic characteristics of the studied patients

Variables	(n=124)
Age (years), median (range)	15 (12 – 21)
Gender, n (%)	
○ Male	54 (45.2)
○ Female	70 (54.8)
Marital status, n (%)	
○ Single	120 (93.5)
○ Married	4 (6.5)
Occupation, n (%)	
○ Working	1 (1.6)
○ Not working	1 (1.6)
○ Student	121 (95.2)
○ House wife	1 (1.6)
Educational level, n (%)	
○ Illiterate or read	1 (1.6)
○ Preparatory	70 (48.4)
○ Secondary	35 (29)
○ University	18 (21)
Residency, n (%)	
○ Urban	53 (43.5)
○ Rural	71 (56.5)

Table (2) summarized the distribution of disease profile and metabolic control parameters of the studied patients. Patients had median systolic BP of 120 mmHg and diastolic BP of 80 mmHg. Most of them had normal or overweight BMI. Most of them had disease duration <10 years old. 88.7% had no foot care, 82.3% use accurate method of insulin injection, 86.3% didn't do self monitoring, 87.9% had more than one Hypoglycemic episodes in the previous 1 month and 10.5% had DKA episodes in the previous 6 months. Only 5.6% had Microalbuminuria.

Table (2): Frequency distribution of disease profile and metabolic control parameters of the studied patients

Variables	(n=124) n(%)
Systolic BP (mmHg), median (range)	**120 (100 – 140)**
Diastolic BP (mmHg), median (range)	**80 (60 – 90)**
BMI (Kg/m^2)	
○ **Underweight**	**7(5.7)**
○ **Normal**	**54(43.5)**
○ **Overweight**	**54(43.5)**
○ **Obese**	**9(7.3)**
Disease duration	
○ **< 10 years**	**105(84.7)**
○ **≥ 10 years**	**119(15.3)**
Foot care application	
○ **No**	**110(88.7)**
○ **Yes**	**14(11.3)**
Method of insulin injection	
○ **Inaccurate**	**22(17.7)**
○ **Accurate**	**102(82.3)**
Insulin injection sites	
○ **2 sites**	**16(12.9)**
○ **3 sites**	**105(84.7)**
○ **4 sites**	**3(2.4)**
Self-monitoring performance	
○ **Yes**	**17(13.7)**
○ **No**	**107(86.3)**
Carbohydrate counting application	
○ **No**	**119(96)**
○ **Yes**	**5(4)**
Hypoglycemic episodes in the previous 1 month	
○ **0 – 1**	**15(12.1)**
○ **>1**	**109(87.9)**
DKA episodes in the previous 6 months	
○ **Yes**	**13(10.5)**
○ **No**	**111(89.5)**
HBA1c (%)	**9 (7 – 13)**
Fasting blood sugar, mg/ dl	**130 (79 – 190)**
2hpp, mg/ dl	**284 (24 – 400)**
LDL, mg/ dl	**90 (66 – 150)**
Alb/creat ratio, n(%)	
Normoalbumuria	**117(94.4)**
Microalbuminuria	**7(5.6)**

Table (3) showed the scores of PedsQL diabetes module domains and PedsQL diabetes module. Patients had highest median score in school functioning among of PedsQL diabetes module domains and diabetes treatment berriers in PedsQL diabetes module.

Table 3: Scores of PedsQL Generic Core Scales domains and PedsQL Diabetes Module score among the studied patients

Generic Core Domains	(n=124)
○ **Physical functioning**	18.75 (0 – 37.5)
○ **Emotional functioning**	20 (0 – 45)
○ **Social functioning**	25 (0 – 40)
○ **School functioning**	25 (0 – 90)
PedsQL Diabetes Module score	
○ **Diabetes symptoms**	18.18 (0 – 29.5)
○ **Treatment barriers**	18.75 (0 – 50)
○ **Treatment adherence**	14.28 (0 – 42.8)
○ **Worry**	16.66 (0 – 41.67)
○ **Communication**	25 (0 – 33.33)

Table (4) showed that males, single and with higher educational level had significantly higher level of quality of life than others.

Table 4: Evaluation of socio-demographic variables associated with health-related quality of life of adolescents with T1DM

Variables	PedsQL Generic Core Scale	P-value
Gender, n (%)		
○ Male	64.3±13.2	**0.018***
○ Female	32.4±9.8	
Marital status, n (%)		
○ Single	78.9±11.5	**0.006***
○ Married	37.8±10.5	
Educational level, n (%)		
○ Illiterate or read	19	**0.011***
○ Preparatory	33.4±8.9	
○ Secondary	30.5±10.5	
○ University	54.2±5.6	
Residency, n (%)		
○ Urban	66.7±9.6	0.066
○ Rural	54.7±11.8	

DISCUSSION

The study found that the mean HRQoL scores and its dimensions were close to the lowest values, indicating that the researched teenagers with T1DM generally had high HRQoL. On the other hand, men who were unmarried and had elevated glycated hemoglobin levels were more prone to experiencing bad HRQoL. Therefore, it is important to take into account the findings provided here to assist diabetes education initiatives emphasizing the traits particular to this developmental stage and the enhancement of life quality when evaluating the HRQoL of adolescents with T1DM in outpatient follow-up. These findings support the originality of the study and its progress of the body of information required to assist the educational process [(9)]. Similar findings were foud in a Southeast-based study on the general health-related quality of life (HRQoL) and its domains among adolescents residing in the Northeast [(10)].

Research from eastern nations, on the other hand, showed that HRQoL ranged from moderate to low, a study with teenagers with DM in Portugal reported good HRQoL. The most unsatisfactory responses in each domain were connected to the length of time spent on laboratory and ophthalmic examinations, the food's adaptability, and the impact the disease had on family relationships. The most important factors the effective domain had to do were parents' excessive overprotectiveness and concern for their kids' glycemic control. In order to promote diabetes care and enhance glycemic control, family members can be taught effective problem-solving and conflict-resolution techniques. This reduces diabetic distress and, as a result, improves quality of life. Children and adolescents must go through this process throughout their lives [(11)].

The item with the highest value in the realm of concerns pertained to the respondents' capacity to complete their education. These findings, which are supported by additional research on the topic, point to overprotective parenting, teenagers' uncertainty about their ability to complete their education, and the potential for encountering discrimination at school [(4)].

When analyzing the high HRQoL observed among adolescents with T1DM, it is important to keep in mind that the participants in this study were in a diabetes reference center receiving care from a multidisciplinary team consisting of nurses, doctors, nutritionists, dentists, psychologists, social workers, and physical educators. For youth with T1DM, this clinic also provided support in the form of therapeutic groups, a teaching kitchen for nutritional cookery, and a cardiopulmonary rehabilitation project that encourages physical activity [(12)].

When teens with diabetes mellitus (DM) were compared to their counterparts in good health, the findings indicated that those who rated their HRQoL as bad also had greater impairment of overall HRQoL. This fact implied that, in spite of the intricacy of T1DM therapy and the chronicity of diabetes, the researched teenagers believed they were in good health. These findings demonstrated the necessity of long-term adaptability for effective illness management. Teenagers must therefore constantly adapt to and internalize elements of the illness, the treatment process, and how this ailment affects their day-to-day existence. Another study found a strong correlation

between HRQoL and self-perceived health. The findings highlight the significance of providing T1DM patients with assistance, counseling them on the best course of action to lower their risk of both acute and chronic issues, improve their quality of life, and encourage continued involvement in educational initiatives [13].

Multiple analyses revealed a relationship between gender and HRQoL in adolescents with T1DM. Compared to boys, girls with the illness experience more coercive control over their families and cultures, according to a review research, which has been linked to lower teenage quality of life. Females reported more effect and worries than males, according to another study. Except for the impact domain, the study indicated that female teenagers had greater HRQoL across all DQOLY scale dimensions [5].

In a study conducted in Germany on the association between HRQoL and socioeconomic position, it was discovered that, despite free access to healthcare, poor socioeconomic status was strongly linked to inadequate T1DM management. Life quality could suffer as a result of this. In the current study, differences in overall HRQoL (p-value =0.02) and the impact domain (p-value =0.009) were statistically significant. Another study, however, revealed no conclusive link between teenage quality of life and socioeconomic status. Lower socioeconomic group members who have T1DM in children and adolescents may be more vulnerable to the disease's complications. According to the bivariate analysis carried out in this study, the higher incidence of diabetic complications also contributed to a lower HRQoL and a shorter life expectancy [3].

National and international research have looked at the relationship between the length of the disease, the length of the treatment, and HRQoL. These variables were utilized in the multivariate and bivariate analyses of this study, however neither of them showed statistically significant changes, a finding that is corroborated by other authors. But a related study discovered a substantial association, indicating that these characteristics should be examined in subsequent research. In line with a different study, the total HRQoL and its domains were not significantly correlated with age at diagnosis [14].

The findings presented here expand our understanding of HRQoL in young people with T1DM and showed that specific personal perceived quality of life was associated with features and indicators relevant to glycemic management. Adjustments made to the logistic regression provided evidence on how to assess the likelihood of poor quality of life among adolescents with type 1 diabetes, given that risk factors (gender, civil status, education, and glycated hemoglobin) may affect HRQoL in these adolescents. Additionally, the total HRQoL score as well as statistically significant variations were discovered in this study across all scale domains. Despite the rise in HbA1c levels during the years of follow-up, the preventive effects of aggressive T1DM treatment were acknowledged. Clinical evidence and everyday practice, however were still at odds since it was challenging to attain and maintain the therapeutic goal as the disease progresses. This is a result of the numerous challenges associated with managing diabetes. Elements that affect teenagers' quality of life include the frequency and anxiety surrounding hypoglycemia episodes, the difficulty of treatment, the daily routine, and the need for frequent monitoring and insulin dose adjustments [1].

The findings enhance the development of health prevention and promotion initiatives by reiterating the significance of assessing the HRQoL of adolescents with T1DM and outlining potential related factors. Additionally, this research might influence healthcare by influencing how health professionals view care in a way that goes beyond its purely biological component. For health management and public initiatives intended to enhance the quality of life for adolescents with T1DM, an understanding of the consequences of T1DM on HRQoL is also important [15].

Even though there were statistically significant relationships between HRQoL and the following variables: the frequency of hospitalizations, the existence of complications, the number of daily insulin injections, home self-monitoring, and biochemical outcomes. Of these, it is believed that the first four are particularly associated with poor quality of life in diabetic adolescents due to their special characteristics and direct effects. Individuals who did not self-monitor and those who received four or more insulin injections daily showed higher levels of impairment and dissatisfaction in their HRQoL. These findings are supported by a prior study, which contends that measurements created for adults may not be responsive enough to the issues that T1DM-affected adolescent patients face on a daily basis. Therefore, cognitive rewiring, goal-setting, and problem-solving techniques should be included in therapies to lessen diabetes misery in the near term and improve quality of life [16].

A multicenter study revealed a robust correlation between better glycemic control and HRQoL, with the lower the HRQoL increases with increasing glycated hemoglobin levels. This study also made the case that behavioral aspects of glycemic management that may be changeable may facilitate the use of therapeutic therapies to enhance HRQoL [17].

To enhance understanding on this subject, additional research should examine the clinical, biochemical, and sociodemographic aspects of T1DM in adolescents that are related to HRQoL. Due to the study's design and cultural and regional differences that could affect quality of life, including the characteristics of the health care under consideration, the current study had a number of limitations including the inability to compare data and generalize conclusions.

CONCLUSION

Adolescent boys who were single, had lower levels of education, and had higher levels of glycated hemoglobin were more likely to have a lower quality of life compared to their healthy colleagues.

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