QUALITY OF LIFE IN CHILDREN AND ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS: STUDY FROM SAUDI ARABIA.

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Abstract

Background: Children and adolescents with Type 1 Diabetes Mellitus (T1DM) often experience adverse impacts on their quality of life (QoL), affecting growth, development, and disease management. This study aimed to assess the QoL of children and adolescents with T1DM in Saudi Arabia and explore the relationship with socioeconomic, demographic, clinical, and anthropometric factors;

Methods: A cross-sectional study conducted in the Northern Border Region, Saudi Arabia, from June to August 2022. The Arabic-translated version of the PedsQL 3.0 DM questionnaire was self-administered. Data were analyzed using SPSS (version 27);

Results: Key findings indicated varied physical, emotional, social, and school-related functioning. Emotional challenges, such as fear (23.4%) and anger (23.4%), were common, while 52.5% struggled to pay attention in class. Treatment barriers (e.g., adherence issues, needle pain) correlated significantly with QoL. Academic performance positively influenced QoL, with a 5.957-unit increase per performance level improvement (p < 0.001);

Conclusion: Physical functioning is generally well-managed; however, emotional, social, and school-related challenges persist. Addressing these issues through diabetic education, psychological counseling, and peer support is recommended

Keywords: Quality of Life, Type 1 Diabetes Mellitus, Children

Introduction

Type 1 diabetes is one of the most common chronic childhood disorders, affecting 0.25 percent of children and adolescents under the age of 20 worldwide [1]. Children must deal with the illness's immediate and long-term consequences. Treatment for type 1 diabetes, as well as its examination and management, differs between children and adolescents. Developmental and emotional issues are common during adolescence, and it has been suggested that HbA1c levels should be kept below 7.5 percent to minimize diabetes-related long-term health concerns [2, 3]. As a result, the primary goal of diabetic care for children and adolescents must be to maintain optimal social and psychological development as well as glycemic control [4].

According to the eighth edition of the Diabetes Atlas, 35,000 children and adolescents in Saudi Arabia have T1DM, ranking the country eighth in terms of total TIDM patients and fourth in terms of TIDM incidence rate (33.5 per 100,000 people) [5]. T1DM and associated consequences can have a long-term impact on teenagers' living situations, as well as their quality of life (QOL) [6]. Hormonal changes, immaturity, challenges gaining autonomous control, and a low rate of disease acceptance can all make daily blood glucose control challenging. Adolescents, in general, are more resistant to accepting the sickness than younger children since they are no longer reliant on their parents or guardians and are responsible for their own health. Adolescents' behavior is also influenced by psychosocial factors, which reflect their beliefs toward diabetes [7].

In the recent decade, health-related quality of life (HRQoL) has become widely recognized as an important health outcome indicator in pediatric medicine. It is critical to develop and deploy pediatric HRQoL measurements to identify at-risk children and implement early intervention programmers [8]. In a Saudi study by Marques et al. [9], more than 13 percent of 53 teenagers with T1DM assessed their quality of life as bad. The lowest QoL in the Satisfaction dimension was linked to overweight, as measured by BMI; greater cardio metabolic risk, as measured by waist circumference; the adolescent's older age (15–18 years); and the adolescent's later age of diagnosis (11–17 years). In the Impact dimension, the female sex was related to the worst QoL. The Total QoL score, and the Concerns component were not linked to socioeconomic, demographic, clinical, or anthropometric characteristics.

Children and adolescents, in general, are more resistant to accept sickness than younger children since they are no longer reliant on their parents or guardians and are responsible for their own health. T1DM and associated consequences may have an impact on teenagers' living conditions and quality of life throughout time (QOL). Saudi Arabia is ranked eighth in the world in terms of the number of TIDM patients and fourth in terms of the incidence rate. The number of research interventions on the sociodemographic components of T1DM is severely low compared to that in industrialized nations. The purpose of this research is to evaluate the QoL related to the health of children and adolescents with type 1 diabetes, Northern Border Region, Saudi Arabia.

Materials and Methods

Study design and population: This study was conducted a across-sectional study of children and adolescents with T1DM in the Northern border Region, Saudi Arabia between June 2022 to August 2022. The study will involve children and adolescents 11-18 years' old who have been observed for at least 12 months, do not have any other concomitant chronic disease, and can read and write Arabic independently. Psychopathology, medical instability, visual, hearing, or cognitive impairment in adolescents will be excluded from the study. Children and adolescents who are not with type 1 diabetes mellitus were excluded from the study.

Study sample: Epi info -7 programs was used to estimate the sample size using the following parameters: Population size = 150, Expected frequency = 25 %, Acceptable error = 5%, Confidence coefficient =95 %, and Minimum sample size =99 patients A non-probability consecutive sampling techniques will be used to collect the sample.

Data Collection: After providing instructions in the diabetes education room, socio-demographic and clinical data will be collected during routine follow-up visits, and they will be asked to complete the Arabic translated version of the PedsQL 3.0 DM questionnaire independently by self-administered data collection by children and teens after introductory instructions from the administrator and taking permission from their parents.

Study tools: The PedsQL 3.0 DM is a modular tool for assessing HRQoL in children and adolescents [10]. The survey takes about 5-8 minutes to complete. The PedsQL 3.0 DM is a 28-item multidimensional scale with five scales: diabetic symptoms (11 items), treatment obstacles (4 items), treatment adherence (7 items), worry (3 items), and communication (3 items). The instructions inquire about the severity of each item's difficulty over the previous month. The format, instructions, Likert type response scale, and scoring method are: 0 = never a problem, 1 = almost never a problem, 2 = sometimes a problem, 3 = often a problem, and 4 = almost always a problem. Items are reverse scored and linearly transformed to a 0-100 scale (0 = 100, 1= 75, 2 = 50, 3 = 25, and 4 = 0), so the higher scores indicate better HRQoL or fewer symptoms/ problems. he PedsQL 3.0 DM has been validated for Arabian usage [11, 12].

Statistical analysis: Data were managed and processed properly. Baseline data will be tabulated and analyzed by descriptive. Continuous variables will be described as mean and standard deviation, whereas categorical variables will be described as percentages. The significance level (P-value) is set to

≤0.05. Categorical variables will be tested by chi-square test while continuous variables will be tested by t- independent test. Multivariate linear regression analysis was carried out to find out the variables associated with HRQoL. Statistical analysis is going to be carried out using SPSS software.

Results

A total of 158 participants took part in the study, as indicated by Table 1. Within the study sample, the gender distribution was 42 (26.6%) males and 116 (73.4%) females. The participants' average age was 13.07±1 0.1 years, with a standard deviation of 0.1 years. A little over half of the participants, 81 (51.3%), had outstanding academic achievements, while the majority of the participants, 111 (70.3%), were from middle-class socioeconomic backgrounds. Lastly, 110 participants, or 69.6%, of the participants had both parents.

In regard to physical functioning as shown in Table 2. Half of the participants 80(50.6%) walked always, less than half 61(38.6%) run always, 52(32.9%) did sport activity always, 68(43.0%) did chores around the house always, 49(31.0%) were hurt or had ache sometimes, 52(32.9%) had low energy sometimes and most of them 107(67.7%) took shower by themselves always. In terms of emotional functioning, the responses varied with 37(23.4%) indicating they felt afraid or scared always, 39(24.7%) felt sad or blue sometimes, 50(31.6%) felt angry sometimes, 42(26.6%) find trouble sleeping sometimes and 46(29.1%) worried about what will happen to them sometimes. Further, on social functioning, 37(23.4%) had trouble getting along with other kids always, 40(25.3%) never experienced other kids not rejecting to be their friends, 37(23.4%) rarely experienced tease from other friends, 35(22.2%) never had challenges to do things that other kids with similar age can do and 38(24.1%) rarely find it hard to keep up when they play with other kids. Moreover, on school functioning, more than half of the participants 83 (52.5%) reported that they find it difficult to pay attention in class. Regarding forgetfulness, 42 (26.6%) rarely encounter this problem, but 40 (25.3%) sometimes face this problem. In terms of keeping up with classwork; 36 respondents (22.8%) reported that they always struggle to stay on task. Being sick is a popular reason for kids to miss school; 36 (22.8%) of them have done it always, and 35 (22.2%) rarely did it. Lastly, 45 (28.5%) of the participants reported that they sometimes miss school to go to the doctor.

The results of the continued table 2 indicate that the most common treatment barrier is associated with needle sticks causing pain to them sometimes, 48 (30.4%) indicated this, 42 (26.6%) reported feeling embarrassed oftenly about having diabetes. It can be difficult to argue with a spouse about how to care for their diabetic spouse; 40 (25.3%) reported having conflicts most of the time. According to 56 (35.4%) of the participants, following the diabetes treatment plan is always one of the treatment barriers. Regarding adherence, 47 individuals (29.7%) reported that they always had difficulty taking glucose testing, 38 (24.1%) mostly suffer with insulin injections. Of the participants, 47 (29.7%) sometimes found exercise difficult. Another challenge is keeping track of cars, which 47 (29.7%) always find challenging to handle. For 40 (25.3%) of the participants, wearing a diabetic card is difficult mostly to some and always to others among the participants. Furthermore, 40 (25.3%) sometimes find it challenging to carry a quick-release carbohydrate. A snack can be difficult for 44 participants, or 27.8%, at times. Worry is a major concern among the participants, 51 (32.3%) are always concerned about their health declining, 44 (27.8%) mostly question the efficacy of their medical care, and 51 (32.3%) reported it always reduces diabetes complication in the long run. Communication problems are common; 39 (24.7%) of the participants reported that they mostly find it difficult to express their feelings to nurses and

doctors. Furthermore, 40 (25.3%) mostly find it difficult to question medical professionals. For 41 participants, or 25.9%, it can be difficult to explain their sickness to others sometimes.

Table 3 shows the relationship between family dynamics and other aspects of kids' and teens' quality of life (QoL). The children who reported treatment barriers with only one parent had a score of 37.89, which was 1.2 points lower than the children who reported treatment barriers with both parents (39.09). This difference has a confidence interval of -10.61 to 8.21, and a p-value of 0.045, which denotes statistical significance (p<0.05).

Table 4 shows the multiple regression analysis of socio demographic factors related to quality of life (QoL). Academic performance and quality of life were significantly positively correlated. In particular, the quality of life rises by 5.957 units when student performance moves by one unit. This estimate's p-value was less than 0.001, suggesting strong statistical significance (p<0.05). The 95% confidence interval ranged from 2.853 to 9.061.

Discussion

The aim of this study was to evaluate the QoL related to the health of children and adolescents with type 1 diabetes, Northern Border Region, Saudi Arabia. The results revealed key insights into physical, emotional, social, and school functioning across various activities. The most striking observations are in physical functioning, where a significant majority consistently engage in essential activities like walking (50.6%) and taking showers independently (67.7%), but many struggle with more demanding tasks like sports activities (32.9%) and lifting heavy objects (31.0%). Emotionally, feelings of fear (23.4%) and anger (23.4%) are prevalent, while socially, issues like trouble getting along with peers (23.4%) and being teased (20.9%) are notable. In school functioning, a large proportion has difficulty paying attention in class (52.5%) and experiences frequent forgetfulness (26.6%). This reveals that physical activities are generally well-managed, with notable challenges in emotional, social, and school-related aspects that may impact overall well-being. Similar to our findings a study by Alanazi et al., which reported high average scores in social functioning (73.81±15.57) and emotional functioning (51.59±46.10), yet lower scores in emotional well-being (48.10±17.52) and physical functioning (48.45±18.82) [13]. Similarly, Shetty et al. identified a higher prevalence of inactivity, comorbidities, cognitive decline, depression, and anxiety among participants [14].

The findings of the study reveal that a significant portion of participants face notable treatment barriers. About a third, 48 (30.4%), reported that needle sticks sometimes cause them pain, and 56 (35.4%) indicated that they always struggle to follow the diabetes treatment plan. Regarding treatment adherence, common challenges experienced consistently include difficulties in taking glucose tests, exercising, and keeping track of carbohydrates, each reported by 47 participants (29.7%).Worry is also a major concern, with 51(32.3%) participants always concerned about their health declining, 44 (27.8%) participants frequently questioning the efficacy of their medical care, and 51 (32.3%) participants believing that these concerns reduce the risk of long-term diabetes complications.

In terms of communication, 39 (24.7%) participants reported often finding it difficult to express their feelings to nurses and doctors. Additionally, 40 participants (25.3%) indicated that they frequently struggle to ask medical professionals questions, and 41 (25.9%) participants sometimes find it difficult to explain their illness to others. In a study by Babiker et al., there was a significant correlation between treatment barriers and HbA1c levels in

Table 1. Sociodemographic characteristics of the respondents (N=158).

Variable	Category	(N %)
Sex	Feminine	116(73.4%)
	Male	42(26.6%)
Age	Mean± Std	13.07±1.184
Socioeconomic Status	A Little	9(5.7%)
	High	38(24.1%)
	Middle	111(70.3%)
School Performance	Bad	7(4.4%)
	Excellent	81(51.3%)
	Good	21(13.3%)
	Middle	20(12.7%)
	Very Good	29(18.4%)
Family Dynamics	All Parents	110(69.6%)
	Single Parent Only	48(30.4%)
Data was presented has n, % and mean ± SD		

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Table 2. The Pediatric Quality of Life Inventory (PedsQL).

Physical Functioning	Never	Rarely	Sometimes	Often/Mostly	Always
To Walk	2(1.3%)	7(4.4%)	35(22.2%)	34(21.5%)	80(50.6%)
To Run	6(3.8%)	15(9.5%)	47(29.7%)	29(18.4%)	61(38.6%)
To Do Sports Activity	7(4.4%)	30(19.0%)	39(24.7%)	30(19.0%)	52(32.9%)
To Lift Heavy Something	14(8.9%)	35(22.2%)	39(24.7%)	21(13.3%)	49(31.0%)
To Take Shower My Self	1(0.6%)	7(4.4%)	19(12.0%)	24(15.2%)	107(67.7%)
To Do Chores Around The House	10(6.3%)	16(10.1%)	36(22.8%)	28(17.7%)	68(43.0%)
Hurt Or Ache	13(8.2%)	27(17.1%)	49(31.0%)	24(15.2%)	45(28.5%)
Low Energy	11(7.0%)	20(12.7%)	52(32.9%)	29(18.4%)	46(29.1%)
Emotional Functioning	Never	Rarely	Sometimes	Often	Always
Afraid Or Scared	29(18.4%)	34(21.5%)	33(20.9%)	25(15.8%)	37(23.4%)
Sad Or Blue	26(16.5%)	32(20.3%)	39(24.7%)	32(20.3%)	29(18.4%)
Angry	16(10.1%)	23(14.6%)	50(31.6%)	32(20.3%)	37(23.4%)
Trouble Sleeping	19(12.0%)	28(17.7%)	42(26.6%)	37(23.4%)	32(20.3%)
Worry About What Will Happen to Me	18(11.4%)	24(15.2%)	46(29.1%)	29(18.4%)	41(25.9%)
Social Functioning	Never	Rarely	Sometimes	Often	Always
Trouble Getting Along with Other Kids	26(16.5%)	30(19.0%)	35(22.2%)	30(19.0%)	37(23.4%)
Other Kids Do Not Want to Be My Friend	40(25.3%)	38(24.1%)	28(17.7%)	25(15.8%)	27(17.1%)
Other Friends Tease Me	33(20.9%)	37(23.4%)	38(24.1%)	17(10.8%)	33(20.9%)
Cannot Do Things That Other Kids with Similar Age Can Do	35(22.2%)	31(19.6%)	33(20.9%)	30(19.0%)	29(18.4%)
It Is Hard to Keep Up When I Play With Other Kids	36(22.8%)	38(24.1%)	25(15.8%)	24(15.2%)	35(22.2%)
School Functioning	Never	Rarely	Sometimes	Often	Always
To Pay Attention in Class	6(3.8%)	7(4.4%)	23(14.6%)	39(24.7%)	83(52.5%)
Forget Things	11(7.0%)	42(26.6%)	40(25.3%)	33(20.9%)	32(20.3%)
Trouble Keeping Up with My Class Work	24(15.2%)	34(21.5%)	34(21.5%)	30(19.0%)	36(22.8%)
Miss School Because of Not Feeling Good	25(15.8%)	35(22.2%)	36(22.8%)	27(17.1%)	35(22.2%)
Miss School to Go to The Doctor	19(12.0%)	28(17.7%)	45(28.5%)	32(20.3%)	34(21.5%)
Data was presented as n, and %					
Treatment barriers	never	rarely	sometimes	Often/mostly	always
Needle sticks causing him/her pain	14(8.9%)	19(12.0%)	48(30.4%)	36(22.8%)	41(25.9%)
Getting embarrassed about having diabetes	20(12.7%)	21(13.3%)	39(24.7%)	42(26.6%)	36(22.8%)
Arguing with my spouse about diabetes care	24(15.2%)	29(18.4%)	27(17.1%)	40(25.3%)	38(24.1%)
Sticking to my diabetes care plan	12(7.6%)	13(8.2%)	30(19.0%)	47(29.7%)	56(35.4%)
Treatment adherence	never	rarely	sometimes	Often/mostly	always
It is hard for him/her to take glucose tests	21(13.3%)	32(20.3%)	27(17.1%)	31(19.6%)	47(29.7%)
It is hard for him/her to take insulin shots	21(13.3%)	31(19.6%)	31(19.6%)	38(24.1%)	37(23.4%)
It is hard for him/her exercise	16(10.1%)	24(15.2%)	47(29.7%)	28(17.7%)	43(27.2%)
It is hard for him/her to keep track of carbohydrates	13(8.2%)	19(12.0%)	36(22.8%)	43(27.2%)	47(29.7%)
It is hard for him/her to wear my diabetic card	22(13.9%)	23(14.6%)	33(20.9%)	40(25.3%)	40(25.3%)
It is hard for him/her to carry a fast acting carbohydrate	15(9.5%)	26(16.5%)	40(25.3%)	38(24.1%)	39(24.7%)
It is hard for him/her to eat snack	20(12.7%)	22(13.9%)	44(27.8%)	34(21.5%)	38(24.1%)
worry	never	rarely	sometimes	Often/mostly	always
Worry about decrease	11(7.0%)	14(8.9%)	32(20.3%)	50(31.6%)	51(32.3%)
Worry about whether medical treatment will work or not	16(10.1%)	20(12.7%)	36(22.8%)	44(27.8%)	42(26.6%)
Reduce diabetes complications in the long run	10(6.3%)	17(10.8%)	36(22.8%)	44(27.8%)	51(32.3%)
communication	never	rarely	sometimes	Often/mostly	always
It's hard to tell doctors and nurses how you feel	22(13.9%)	23(14.6%)	36(22.8%)	39(24.7%)	38(24.1%)
It is difficult for him/her to ask questions to doctors and nurses	26(16.5%)	22(13.9%)	38(24.1%)	40(25.3%)	32(20.3%)
It is difficult for him/her to explain his/her illness to others	19(12.0%)	25(15.8%)	41(25.9%)	34(21.5%)	39(24.7%)
Data was presented as n and %.					

Table 3. Association of family dynamics and clinical and anthropometric factors associated with children and adolescent QoL.

Parameters	Both parents report	Single parent report	Difference	95% CI (lower, upper)	P-Value*
Physical functioning	30.93	31.90	0.964	-6.28, 8.20	0.459
Emotional functioning	45.95	43.65	2.309	-12.43, 7.81	0.717
Social functioning	52.59	50.94	1.653	-12.99, 9.69	0.124
School functioning	40.59	41.88	1.28	-7.28, 9.85	0.296
Treatment barriers	39.09	37.89	1.2	-10.61, 8.21	0.045
Treatment adherence	28.64	29.46	0.827	-6.35, 8.00	0.130
worry	34.55	33.16	1.39	-11.00, 8.23	0.132
communication	43.48	42.88	0.60	-11.30, 10.10	0.120
Independent t-test was considered statistically significant p<0.05					

Table 4. Multiple regression of the Social demographic factors associated with QoL

Parameters	Predictors	Estimate	Standard Error	95% CI (lower, upper)	P-Value*
Constant		9.133	22.323	-34.97, 53.24	
Age	11-14	0.787	4.086	-7.29, 8.86	0.116
Gender	Male vs female	0.336	1.700	-3.022, 3.694	0.605
Social economic status	Low, medium, high	-1.076	3.779	-8.542, 6.391	0.287
School performance	Poor, Average, Good Very good, Excellent	5.957	1.571	2.853, 9.061	<0.001
Family dynamics	Single parent vs both parents	1.764	3.901	-5.943, 9.470	0.899
Multiple regression analysis was considered statistically significant p<0.05					

the younger age group (P = 0.019). Moreover, HbA1c values were significantly correlated with quality of life (QoL) ratings in the communication category among teenagers (P = 0.042) [15]. Similarly, Murillo et al. found that treatment adherence and mental health significantly impact health-related quality of life (HRQoL) [16].

The relationship between family dynamics and the quality of life (QoL) of children and teens reveals that those reporting more treatment barriers often come from single-parent households. Children with only one parent had a QoL score of 37.89, which was 1.2 points lower than those with both parents, who had a score of 39.09. This difference, with a confidence interval of -10.61 to 8.21 and a p-value of 0.045, indicates a statistically significant association (p < 0.05).While Anderson et al. did not directly assess this specific association, their study did find a significantly poorer diabetes-related health-related quality of life (D-HRQOL) (P < 0.001) in families where additional money was needed to cover the medical costs of diabetes [17]. Similarly, Piechowiak et al. found that young children living in single-parent households with parents of lower educational levels are more likely to receive inadequate diabetes treatment [18].

The current study findings agree with the previously published related studies. According to a study by Marques et al., 2021 [19], more than 13 percent of 53 teenagers with T1DM assessed their quality of life as bad. The lowest QoL in the Satisfaction dimension was linked to overweight, as measured by BMI; greater cardiometabolic risk, as measured by waist circumference; the adolescent's older age (15–18 years); and the adolescent's later age of diagnosis (11–17 years). In the Impact dimension, the female sex was related with the worst QoL. The Total QoL score, and the Concerns component were not linked to socioeconomic, demographic, clinical, or anthropometric characteristics. Also, Özyazıcıoğlu et al., 2017 [20] suggested that affective and school function ratings among diabetic children and adolescents were fairly low, whereas social function scores were high. The children's and teenagers' quality-of-life scores were shown to be related to their parents'. Furthermore, they showed a negative association between HbA1c levels and teenage quality of life, a positive correlation between the kid's age and the child and parent's quality of life, and a negative correlation between the number of children in the household and the child and parent's quality of life. da Costa et al., 2015 [21] showed that teenagers rated their quality of life as generally good. However, public assistance, duration since diagnosis, sedentary lifestyle, and female gender were found as specific characteristics that contributed to the decline in quality of life.

According to Abdul-Rasoul et al., 2013 [22], the mean total score of the PedsQL Diabetes Module was 70.2 9.8 for children and 59.9 11.1 for parents in Kuwait (higher scores indicate better QoL). Poor QoL was linked to a young age and a long history of diabetes (p 0.001). In most age groups, boys outperformed girls in terms of overall scores; however, girls outperformed boys in terms of treatment obstacles and adherence. Lower QoL scores were linked to higher HbA1c levels. Children and adolescents with T1DM have consistently lower HRQoL than their peers. Parents' QoL scores were consistently lower than their children's.

Female gender, multiple daily injection (MDI), longer duration of T1DM (>7 years), diabetic ketoacidosis (DKA), and adolescents with a HbA1c level of >7 had at least one poor HRQoL outcome, according to Al-Hayek et al., 2014 [23]. Age, treatment type (MDI), DKA, and >7 HbA1c were independent influencing variables for subscale diabetic symptoms, whereas >7 HbA1c was the independent influencing factor for treatment barriers and overall HRQoL, according to multivariate linear regression analysis. For the subscale of worry, the DKA was the independent influencing factor, while for the subscale of communication, female gender was the independent influencing factor.

AlBuhairan et al. did another Saudi study [24]. Parents reported substantially lower ratings of 60.3 (p = 0.003) than adolescents, who reported a cumulative mean HRQoL score of 64.8. "Worry" received the lowest rankings from both adolescents and parents. For adolescents with T1DM, female gender and late adolescence age were predictive of worse HRQoL. The FIM revealed that "Emotional functioning" (59.8) had low scores and "Family relationships" had good scores (80.9).

The current study finding from multiple regression analysis revealed that academic performance and quality of life were significantly positively correlated. In particular, the quality of life rises by 5.957 units when student performance moves by one unit. This estimate's p-value was less than 0.001, suggesting strong statistical significance (p<0.05). Similar to this finding, a study by John et al. revealed a statistically significant correlation between QoL and education which also was found to affect the overall health and food satisfaction [25]. In a study by Bekele et al., it was revealed that educational status, and frequency of blood glucose monitoring all have a significant impact on children's HRQoL [26].

The main limitation of this study was that it depended on self-reported data, which could be influenced by recalling bias or misinterpretation of questions. Furthermore, the study lacked a control group, making it impossible to determine causal links between factors. The study also did not analyze the degree or probability of comorbidities, which may have influenced the study's outcomes. Finally, the study population was restricted to a single region, which may limit the generalizability of the results.

Conclusion

The results reveal that while physical functioning is generally well-managed, significant challenges persist in emotional, social, and school-related areas. The study also underscores notable treatment barriers, including pain from needle sticks, adherence difficulties, and communication challenges with healthcare providers. The relationship between family dynamics and QoL, particularly in single-parent households, and the positive correlation between academic performance and QoL emphasize the multifaceted nature of diabetes management. Enhanced diabetic education and integration psychological counseling and peer support groups would help address emotional issues such as fear, anger, and social difficulties.

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