

(RESEARCH ARTICLE)



## Quality of life in pediatric patients suffering from Type 1 Diabetes Mellitus. Comparative study of the reports of young patients and their parents

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### Abstract

**Background:** For the effective management of type 1 diabetes, patients are called upon to adopt changes in lifestyle, diet, and exercise. However, it appears that living with diabetes often disrupts their quality of life.

**Methods:** The study involved recording reports from pediatric patients with type 1 diabetes aged 5-18 years, as well as their parents, to assess the quality of life of the affected individuals. The questionnaire used was the PedsQL Diabetes Module Version 3.0, which evaluates: the symptoms of type 1 diabetes, treatment-related issues, concerns about the disease, and communication.

**Results:** The study sample consisted of 102 patients with type 1 diabetes. The collected data revealed that living with the disease affects the quality of life. Some indicative examples of this would be how high levels of HbA1c and episodes of hypoglycemia or diabetic ketoacidosis, can complicate the lives of patients who suffer from type 1 diabetes. Additionally, the quality of life depends on various demographic factors, such as father's educational level, presence of siblings in the family, place of residence, and age of the patients.

**Conclusions:** Although this study has some limitations, it is evident that living with type 1 diabetes complicates daily life. Therefore, it is important to design strategies to help patients and their families better manage the disease, ensuring they receive the required psychological support for optimal disease management.

**Keywords:** Type 1 diabetes; Pediatric patients; Quality of life; Diabetes Mellitus; Parents

### 1. Introduction

Diabetes mellitus is one of the most common diseases of today, affecting approximately 537 million people worldwide. It is the most prevalent metabolic disorder, categorized into types such as type 1 diabetes, type 2 diabetes, gestational diabetes, and monogenic diabetes [1]. Type 1 diabetes, the focus of this study, is an autoimmune disease where the immune system targets the beta cells in the pancreas, gradually destroying them. This results in the reduced ability to produce insulin, leading to elevated blood glucose levels, known as hyperglycemia [2].

Thus, type 1 diabetes is a chronic disease that requires insulin administration. It's noteworthy that more than 96,000 children under fifteen are diagnosed with type 1 diabetes annually, and globally there are 1.1 million children and

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adolescents under 20 living with the disease [3]. Effective disease management involves daily dietary restrictions, regular blood glucose monitoring, and exercise. However, maintaining optimal glycemic control, which is necessary to minimize the risk of complications, is difficult to achieve. For this reason, educating diabetic youth about potential risk factors is important since caregiving practices can cause stress in many aspects of life [4].

Parents of young children with type 1 diabetes also experience an emotional burden, from constantly worrying about hypoglycemic crises, future complications, and the impact on the children's quality of life [5]. The disease imposes restrictions on activities, causes discomfort and fear about the future, and to financial problems related to treatment. Parents usually feel guilty as they search for the causes of the disease and have high expectations of scientific progress that can lead to more effective treatment and the child's emancipation from current treatment approaches [6].

Despite the importance of understanding the factors affecting the quality of life of individuals with type 1 diabetes, there has been insufficient research of the primary contributors to this disturbance. Furthermore, limited efforts have been made to identify demographic factors that may put certain subgroups of the diabetic population at a higher risk for poor quality of life.

The primary aim of this study is to assess the quality of life of children with type 1 diabetes and their parents, examining the impact of the chronic disease on their lives. Participants' responses will be collected through age-specific questionnaires. Additionally, the study will compare the reports of parents with those of the pediatric patients. Finally, the study will evaluate the influence of demographic factors on the quality of life of young individuals with type 1 diabetes.

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## 2. Material and methods

### 2.1. Study design and population

The data collection initially took place at the General Children's Hospital of Athens "Panagiotis and Aglaia Kyriakou," which is the second-largest purely pediatric hospital in Greece. The study sample consisted of children and adolescents aged 5 to 18 years diagnosed with Type 1 Diabetes and their parents or guardians. Additionally, contact was made with parent associations of children with Type 1 Diabetes, and questionnaires were sent to members to expand the sample and ensure the reliability and validity of the study. The goal was to collect over 200 questionnaires to make the sample as representative as possible of the general population of Greece.

Inclusion criteria for the research study were:

- Age of children 5-18 years, of both genders, diagnosed with Type 1 Diabetes.
- Good communication of parents and children in Greek language.
- Consent of parents and children/adolescents participating in the research.
- Absence of mental illness or cognitive impairment.

Exclusion criteria included:

- Age of children 0-4 years.
- Diagnosis of other types of diabetes besides Type 1.

Data was collected using the "Quality of Life in Children with Diabetes" questionnaire (PedsQL Diabetes Module Version 3.0), which evaluates symptoms of Type 1 Diabetes, treatment-related problems, concerns about the disease, and communication. The 28 questions are divided into 5 categories and are formulated differently based on the age group of the child or adolescent completing them (5-7 years, 8-12 years, and 13-18 years) [12]. The questionnaire is self-administered, except for the age group of 5-7 years, where data collection is done through an interview. Along with the questionnaire, a form was provided for collecting demographic information of the parents, ensuring anonymity and protection of participants' personal data. Additionally, an information-consent form was provided to secure informed consent from participants. The questionnaires were collected by the researcher, who was present for any questions or assistance, and the completion of all tools did not exceed 20 minutes. Parents and young patients were thoroughly informed before completing the tools.

## 2.2. Statistical analysis

The processing and statistical analysis of empirical data were conducted using the IBM SPSS 28.0 (Statistical Package for Social Sciences) software for Windows. The reliability of the tool versions was assessed by calculating the Cronbach's alpha coefficient. The sample size for the research was determined to achieve a statistical power of 80%, with a significance level of  $p < 0.05$ , using the GPower 3.1 program. The statistical analysis included:

(a) Univariate analysis: Frequency distributions of variables to study the values of each variable separately and independently of others. Continuous variables were expressed as mean (standard deviation) or median (interquartile range), while nominal variables were expressed as absolute (N) and relative frequencies (%). Kolmogorov-Smirnov and Shapiro-Wilk tests, as well as skewness and kurtosis coefficients, were used to check the normality of quantitative variables.

(b) Bivariate analysis: Appropriate statistical tests were applied depending on the type and distribution of variables, such as independent samples t-test with calculation of 95% confidence intervals for the difference in means, paired t-test, Analysis of Variance (ANOVA) for normally distributed variables. Cohen's d coefficient,  $\eta^2$ , and 95% confidence interval were calculated for the effect size of the difference in means. Non-parametric tests like Mann-Whitney, Wilcoxon signed-rank test, and Kruskal-Wallis test were selected for variables not following normal distribution.

Correlations between quality of life scores for the two groups (patients-parents) and for each age group were assessed using Pearson's correlation coefficient or Spearman's correlation coefficient, depending on the normality of variables. The Intra-class Correlation Coefficient (ICC) was also calculated.

(c) Multivariate analysis: In case the outcome was a quantitative variable, linear regression models were used. In this case, coefficients of linear regression (b values) with respective 95% confidence intervals, levels of statistical significance (p values), and determination coefficients ( $R^2$ ) were calculated. A significance level of  $\alpha=0.05$  was considered, all statistical tests were two-tailed, and results with values less than 0.05 were considered statistically significant.

## 2.3. Ethical implication

For the conduct of this study, adherence to ethical values was ensured through participant anonymity and the completion of an informed consent form. The use of data collected exclusively for this specific study was emphasized. Necessary approvals were obtained from the Ethics and Deontology Committee of the "Panagiotis and Aglaia Kyriakou" Children's Hospital in Athens and the Medical School of the National and Kapodistrian University of Athens.

## 3. Results

The study sample consisted of 102 patients with type 1 diabetes (T1D), the majority of whom were girls (60 out of 102, 58.8%), along with one of their parents/guardians. The demographic characteristics of the participants are presented in Table 1, both overall and by age group. The age range of the patients varied from 5 to 18 years, with a median age of 14.25 (6.0) years. The median age for boys was 14.25 (5.5) with a range of 5 to 18 years, while for girls, the corresponding median age was 14.5 (6.0) with an age range of 5.5 to 18 years.

**Table 1** Demographic characteristics of the sample

Variables	Total (N=102)		5-7 years (N=12)		8-12 years (N=30)		13-18 years (N=60)	
	N	%	N	%	N	%	N	%
Sex								
Girls	60	58.8	8	66.7	18	60.0	34	56.7
Boys	42	41.2	4	33.3	12	40.0	26	43.3
Age of the mother								
20-30	3	2.9	3	25.0	-	-	-	-
31-40	32	31.4	6	50.0	15	50.0	11	18.3

41-50	56	54.9	3	25.0	15	50.0	38	63.3
>51	11	10.8	-	-	-	-	11	18.3
Age of the father								
20-30	1	1.0	-	-	1	3.3	-	-
31-40	17	17.0	7	58.3	7	3.3	3	5.2
41-50	52	52.0	4	33.3	18	60.0	30	51.7
>51	30	30.0	1	8.3	4	3.3	25	43.1
Educational level of mother								
Illiterate	-	-	-	-	-	-	--	
Primary school	6	5.9	-	-	1	3.3	5	8.3
Secondary education	52	51.0	5	41.7	15	50.0	32	53.3
Bachelor degree	38	37.3	6	50.0	12	40.0	20	33.3
Postgraduate	5	4.9	1	8.3	1	3.3	3	5.0
Ph.D	1	1.0	-	-	1	3.3	-	-
Education level of father								
Illiterate	1	1.0	1	8.3	-		--	
Primary school	12	12.0	-	-	4	13.3	8	13.8
Secondary education	52	52.0	5	41.7	16	53.3	31	53.4
Bachelor degree	32	32.0	6	50.0	10	33.3	16	27.6
Postgraduate			-	-	-	-	3	5.2
Ph.D	3	3.0	-	-	-	-	-	-
Occupation of mother								
Domestic/ Unemployed	32	31.4	6	50.0	10	33.3	16	26.7
State Employee	19	18.6	3	25.0	4	13.3	12	20.0
Private Employee	37	36.3	2	16.7	11	36.7	24	40.0
Freelancer	11	10.8	1	8.3	4	13.3	6	10.0
Other	3	2.9	-	-	1	3.3	2	3.3
Occupation of father								
Domestic/ Unemployed	3	3.0	-	-	-	-	3	5.2
State Employee	22	22.0	6	50.0	4	13.3	12	20.7
Private Employee	53	53.0	5	41.7	16	53.3	32	55.2
Freelancer	22	22.0	1	8.3	10	33.3	11	19.0
Other	-	-	-	-	-		-	
Residence								
Athens	63	61.8	8	66.7	17	56.7	38	63.3
Others parts of Greece	39	38.2	4	33.3	13	43.3	22	36.7
Family status								
Two parents	88	86.3	0	0	26	86.7	50	83.3

One parent	6	5.9	12	100.0	1	3.3	5	8.3
Divorced	8	7.8	0	0	3	10.0	5	8.3
Siblings								
Yes	84	82.4	5	41.7	27	90.0	52	86.7
No	18	17.6	7	58.3	3	10.0	8	13.3

The duration of the disease for the entire patient population ranged from 0.5 to 18 years, with a median value of 3.0 (6.5) years. Regarding the duration of the disease, there was no difference between the two genders. Specifically, the median value for boys was 3.75 (6.6) years, while for girls it was 3.0 (6.0) years. Similarly, glycosylated hemoglobin (HbA1c) for the overall patient population had a median value of 7.30 (1.23) with a range of 5.20-11.60, and it did not differ between the two genders. The median value for boys was 7.4 (1.3), and for girls, it was 7.2 (1.2). Also, neither the mean of their glycosylated hemoglobin over the last 12 months, with median values of 7.35 (1.0) and 7.2 (1.07) for boys and girls, respectively, showed a statistically significant difference. The median value for the mean glycosylated hemoglobin over the last 12 months for the entire patient population was 7.2 (1.0) with a range of 2.0-11.5. The quantitative parameters of the disease by age group are presented in Table 2.

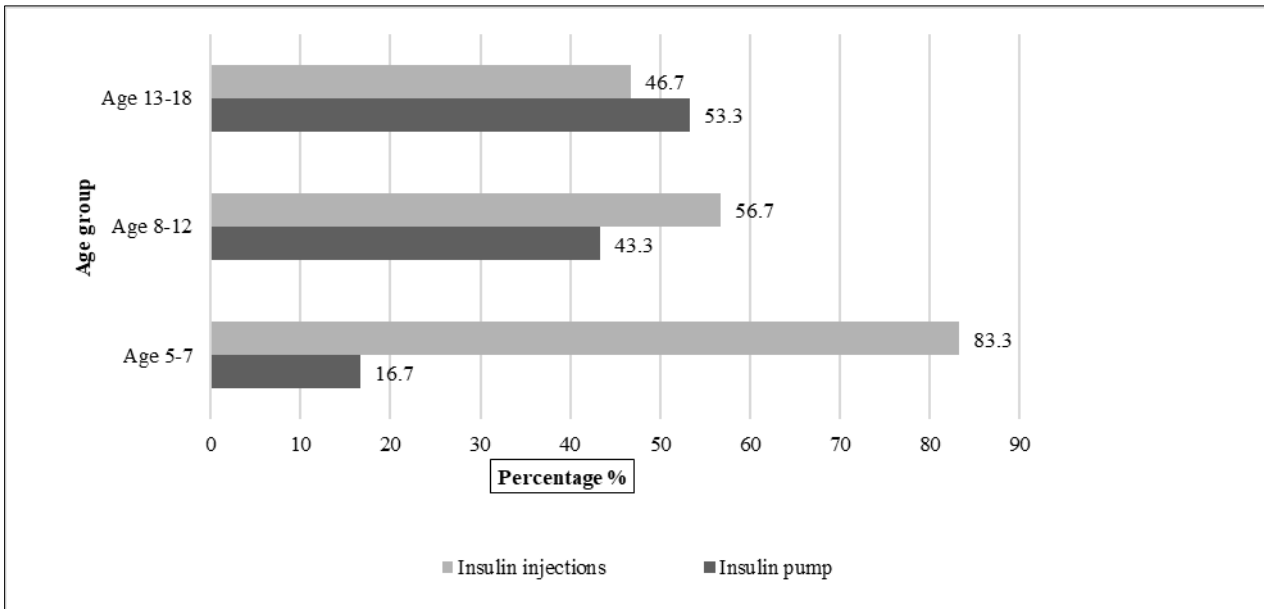
**Table 2** Demographic characteristics and disease parameters per age group

Variable	Age group 5-7 years				Age group 8-12 years				Age group 13-18 years			
	Mean (SD)*	95% CI <sup>‡</sup> mean	Median (IQR) <sup>‡</sup>	Range Min Max	Mean (SD)	95% CI mean	Median (IQR)	Range Min Max	Mean (SD)	95% CI mean	Median (IQR)	Range Min Max
Age	6.21 (0.81)	5.69-6.72	6.25 (1.50)	5.0-7.0	11.10 (1.04)	10.71-11.45	11.50 (1.25)	8.0-12.0	16.13 (1.54)	15.73-16.52	16.0 (2.38)	13.0-18.0
Disease duration in years	2.13 (1.11)	1.42-2.83	2.25 (2.4)	0.5-3.5	2.76 (2.46)	1.84-3.68	2.0 (3.0)	0.5-9.0	6.31 (4.26)	5.21-7.41	5.5 (6.5)	0.5-18.0
HbA1c	7.45 (1.14)	6.72-8.18	7.10 (1.03)	6.40-10.50	7.29 (1.30)	6.80-7.77	7.05 (1.13)	5.20-11.60	7.71 (1.14)	7.42-8.0	7.45 (1.58)	5.80-11.10
Mean HbA1c in the past 12 months	7.50 (0.75)	7.02-7.98	7.30 (0.90)	6.60-9.50	7.02 (1.85)	6.33-7.71	7.0 (1.0)	2.0-11.0	7.63 (0.99)	7.38-7.89	7.50 (1.0)	6.0-11.50

\* Standard Deviation ‡ Interquartile Range † 95% Confidence Interval

The 89.2% (91/102) of the patients did not experience any episodes of diabetic ketoacidosis (DKA) in the last 6 months, while 17 (17/102, 16.7%) of them had a severe episode of hypoglycemia (<50 mg/dl).

Specifically, and by age group, in preschool and early school-age children (5-7 years old), the majority of whom were of Greek nationality (11/12, 91.7%), the preferred method of managing the disease was insulin injections (10/12, 83.3%). None of them experienced an episode of diabetic ketoacidosis, while only 2 (2/12, 16.7%) had an episode of severe hypoglycemia. Similarly, in the group of school-age children (8-12 years old), the majority of whom were of Greek descent (22/30, 73.3%), the most popular way to regulate blood glucose was insulin injections (17/30, 56.7%). Six children (6/30, 20.0%) experienced an episode of diabetic ketoacidosis in the last six months, and also, 4 (4/30, 13.3%) reported an episode of hypoglycemia. Finally, in the group of adolescents, where the majority were of Greek descent (46/60, 76.7%), the use of an insulin pump was preferred for blood glucose regulation (32/60, 53.3%). Out of the adolescents participating in the study, 5 (5/60, 8.3%) reported an episode of diabetic ketoacidosis in the last 6 months, and 11 (11/60, 18.3%) reported an episode of severe hypoglycemia. The distribution of patients based on the method of blood glucose regulation and age group is presented in Figure 1.



**Figure 1** The distribution of sample patients by age group and method of blood glucose regulation

The statistical analysis of the overall quality of life score, based on patients' self-reports, regardless of their age, revealed a statistically significant relationship between hypoglycemic episodes and the quality of life score of patients with type 1 diabetes, as indicated by their self-reports ( $t=-2.37$  (100),  $p=0.02$ , 95%CI: -16.40 - -1.44, Cohen's  $d=-0.63$ , 95%CI: -1.16 - -0.10). Specifically, patients who did not report hypoglycemic episodes had a higher overall quality of life score compared to those who reported an episode. Additionally, a statistically significant relationship was found between patients' self-report scores and the father's educational level ( $F_{4,95}=3.28$ ,  $p=0.02$ ,  $\eta^2=0.12$ , 95%CI: 0.005- 0.22). No other statistically significant relationship or difference was observed between demographic factors and the overall quality of life score, as calculated from patients' self-reports.

**Table 1** Means and Degree of agreement in PedsQL 3.0 between patients and their parents/ guardians (total)

Sub- scales PedsQL 3.0	Mean of patients (SD)*	Mean of parents (SD)	Mean difference (95% CI) <sup>‡</sup>	Correlation coefficient Spearman**	ICC** (95% CI)
Type I Diabetes	64.39 (16.23)	63.37 (14.88)	1,02 (-3.27-5.32)	<b>0.54</b>	<b>0.57</b> (0.42-0.69)
Treatment I	69.18 (21.33)	63.91 (22.04)	<b>5.27</b> (-0.72-11.26)	<b>0.58</b>	<b>0.55</b> (0.40-0.67)
Treatment II	68.94 (16.38)	68.87 (16.20)	0.07 (-4.43-4.57)	<b>0.48</b>	<b>0.55</b> (0.40-0.67)
Concerns	64.46 (26.48)	66.83 (23.77)	-2.37 (-9.32-4.58)	<b>0.57</b>	<b>0.60</b> (0.46-0.71)
Communication	65.69 (31.28)	60.05 (32.67)	<b>5.64</b> (-3.19-14.47)	<b>0.65</b>	<b>0.67</b> (0.54-0.76)
PedsQL 3.0 (Total)	66.36 (14.51)	64.84 (13.31)	1.52 (-2.32-5.37)	<b>0.63</b>	<b>0.65</b> (0.53-0.75)

\* Standard Deviation    \*\* Spearman's Rho    ‡ 95% Confidence Interval

The statistical analysis of the overall life quality assessment score resulting from parental reports showed a statistically significant difference between age groups ( $\chi^2=9.25$ ,  $df=2$ ,  $p=0.01$ ). Higher scores were recorded by parents of young children (5-7 years old), followed by the scores of parents of adolescents, with a slight difference from the scores of

parents of patients aged 8-12 years. Additionally, a statistically significant and negative correlation was found between the quality of life assessment score and HbA1c (Spearman's  $\rho=-0.23$ ,  $p=0.02$ ), as well as between the average HbA1c over the past 12 months (Spearman's  $\rho=-0.23$ ,  $p=0.02$ ). Moreover, a statistically significant relationship was found between the quality of life assessment score and the father's educational level ( $\chi^2=12.12$ ,  $df=4$ ,  $p=0.02$ ). Table 3 presents the means as well as the correlation between young patients and their parents according to PedsQL 3.0 in total (statistical significant differences and correlations are presented in bold numbers).

Finally, the bivariate analysis did not reveal a statistically significant relationship at the 0.20 level ( $p<0.20$ ) between the independent variables (demographic factors) and the absolute value of the difference in the quality of life scores between patients aged 13-18 years and their parents. The results of the linear regression are presented in Table 4.

**Table 4** Multivariate linear regression with quality of life score as dependent variable

	<b>Independent variable</b>	<b>Coefficient b</b>	<b>95% CI of b</b>	<b>P</b>
Age group 5-7 years	Presence of siblings	-0.71	-1.31 - -0.12	<b>0.03</b>
	Age of father			<b>0.008</b>
	31-40	-1.18	-2.62 - 0.27	0.09
	41-50	-2.08	-3.30 - -0.86	<b>0.006</b>
	Age of mother			<b>0.03</b>
	20-30	0.67	-0.04 - 1.37	0.06
	41-50	1.39	0.36 - 2.42	<b>0.02</b>
Age group 8-12 years	Sex	-1.48	-2.45 - -0.50	<b>0.004</b>
	Age	-0.17	-0.64 - 0.31	0.48
	Ethnicity			<b>0.01</b>
	Albanian	-1.52	-2.97 - -0.08	<b>0.04</b>
	Other	-2.01	-3.44 - -0.57	<b>0.008</b>
Total	Age	-0.67	-1.20 - -0.15	<b>0.01</b>
	Ethnicity			<b>0.007</b>
	Albanian	-0.79	-1.63 - 0.05	0.06
	Other	-1.19	-2.04 - -0.35	<b>0.006</b>
	Age of mother			0.12
	20-30	0.19	-1.49 - 1.87	0.83
	31-40	0.09	-0.87 - 1.06	0.85
	41-50	0.76	-0.13 - 1.65	0.09
	Occupation of father			<b>0.02</b>
	State employee	-1.50	-2.86 - 0.15	<b>0.03</b>
	Private employee	-0.92	-2.23 - 0.39	0.17
	Freelancer	-1.70	-3.07 - -0.32	<b>0.02</b>

#### 4. Discussion

Regarding the levels of glycosylated hemoglobin, there were no significant differences between boys and girls. The median value was approximately 7.3%, although values reaching up to 11% were observed. In the overall sample, about half of the patients (53.9%) managed high blood glucose levels by administering insulin injections. When dividing children into age groups, some differences were observed. For example, in ages over 12 years, the use of insulin pumps

was more prevalent. Additionally, in the age range of 5-7 years, episodes of diabetic ketoacidosis and hypoglycemia were more frequent. The exploration of a possible correlation between the overall quality of life score and various disease parameters revealed an interesting result. Specifically, the absence of hypoglycemic episodes in the last period was associated with statistically significant improved quality of life, and this held true across all age groups examined. This result aligns with findings from other studies, indicating that either hypoglycemia itself or its consequences, such as post-traumatic stress or complications, are associated with a disruption in the quality of life of patients, regardless of age [7].

Additionally, some statistically significant results were observed in certain age groups regarding the quality of life and certain demographic characteristics. For example, a correlation was found between the quality of life score and the father's educational level in the group of children aged 8-12 years. This finding could be linked to the provision of better psychological support and access to medical care due to the higher economic comfort of parents with higher educational levels. Indeed, the study by Baharvand and Hormozi in 2019 showed that higher parental education levels were associated with statistically lower HbA1c levels as well as a greater sense of support for children from their parents [8].

Furthermore, in the present research, it was observed that in the ages of 13-18 years, patients with siblings had significantly higher quality of life compared to only children patients. This finding is of significant interest and could be attributed to the care and support that siblings could provide to a family. However, most studies in the literature focus on examining the impact of a chronic illness on the quality of life of healthy siblings rather than the patients themselves, primarily due to the neglect and anxiety that the former might feel due to the increased needs of their affected siblings [9].

The responses provided by parents for the assessment of the quality of life indicated variations based on the age of the child, with patients aged 5-7 years having better quality of life than older children. This finding may be linked to the negative impact of the disease on the quality of life, which becomes more pronounced over the years as the child with type 1 diabetes grows. Additionally, it was observed that the quality of life significantly improved when the father's educational level was higher and decreased when glycated hemoglobin levels were elevated.

A significant negative correlation was found between the quality of life and the duration of the disease in patients aged 5-7 years and between the quality of life and the average HbA1c over the last 12 months in children aged 8-12 years and 13-18 years. Regarding the treatment method, parental statements revealed that the quality of life was better in children using insulin pumps compared to those using insulin injections. This specific result of our study aligns with other international research, as it is found that the use of insulin pumps facilitates the daily lives of children with diabetes and contributes to better adherence to treatment compared to the need for continuous insulin injections [10].

From the comparison of responses in the questionnaires of parents and patients, it emerges that parents tend to underestimate the quality of life of their children, as they rate it lower than the patients themselves. This specific finding is not only characteristic of families with a diabetic child. On the contrary, it also applies to other chronic diseases, including cancer. For instance, in the study by Matziou et al., 2008, it was found that children suffering from cancer were more optimistic about their health prognosis and quality of life compared to their parents' perspective [11].

Moreover, a statistically significant difference was observed between the responses of parents and patients in certain parameters, which, in some cases, exists only in one of the two genders. Specifically, differences were noted in the subscale "Treatment II," particularly in the case of boys, and in the subscale "Concerns," with the difference being more pronounced in girls. An interesting finding is that in "Treatment II," the problems arising from disease management through daily actions that young patients must follow, were statistically significantly associated with a higher incidence of diabetic ketoacidosis episodes.

Regarding the "Communication" of the problem patients face, this significantly depends on the family situation. The examination of each age group separately revealed certain differences. For example, in the age category of 5-7 years, the presence of hypoglycemia episodes was significantly related to more pronounced concern, and also, residing in areas outside the country's capital was associated with poor communication. The first observation could be attributed to the fact that young children find it challenging to perceive and handle a hypoglycemic episode on their own promptly, while the second finding might be related to the characteristics of life in a more closed society or the lack of adequate support from relevant institutions in the country.

It is also noteworthy that a statistically significant difference was found in the "Communication" and "Concerns" subscales based on the educational level of the mother and father, respectively, in the adolescent age group (13-18 years). Further data analysis led to the conclusion that differences in reports between parents and children were smaller



when the patient was a girl, when the family originated from another country (not Greece or Albania), and when the father was a state employee or a freelancer. Regarding the ages of fathers, it seems that they agreed with their children to a greater extent regarding their quality of life when they were under the age of 51, although this finding needs further investigation, as in the present study, only one father was over 51 years old. In contrast, mothers under the age of 51 seemed to agree less frequently with their children compared to those who were over 51 years old.

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## 5. Conclusion

Living with this particular condition is associated with both a disruption of the quality of life and concerns about the health burden of the patients. It seems that certain demographic parameters complicate the daily lives of families with a child with type 1 diabetes, as well as communication and disease management. Some of these factors include residing away from urban centers in the country, low educational levels of parents, or the absence of siblings for the affected child. Furthermore, living with the disease for more years appears to increase concerns about the patient's health. Additionally, in all age groups, elevated HbA1c levels and hypoglycemic episodes are considered to burden the quality of life of patients.

Although this particular research has some weaknesses, such as a small sample size and the absence of questions in the questionnaire that could capture a more comprehensive picture of reality, it is concluded that type 1 diabetes is a challenging condition to manage for both patients and their parents. However, besides dedication to treatment, it appears that appropriate psychological support is needed for better coping with anxiety related to the problems caused by the disease.

Therefore, it would be useful to conduct future studies aimed at capturing the opinions of patients and their families on issues that could improve their daily lives. For example, better information from healthcare professionals, access to support services, or more effective therapeutic approaches.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of ethical approval*

Necessary approvals were obtained from the Scientific Committee of the "Panagiotis and Aglaia Kyriakou" Children's Hospital in Athens and the Ethics and Deontology Committee of the Medical School of the National and Kapodistrian University of Athens. Moreover, a written informed consent was obtained by any of the parents who he/she and his/her kid participate in the research work. Children and adolescents who participated in the study were informed by the main researcher too. Data will be secured for 3 years with no permission to anyone, except of the main researcher.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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