Health-Related Quality of Life and Its Associated Factors in Children and Adolescents with Type 1 Diabetes, Addis Ababa, Ethiopia

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Abstract

Background. In the clinical management of diabetes, fixing metabolic variables is insufficient, and thus, health-related quality of life assessment is becoming an important indicator of the outcome of the treatment and detector of a problem in children and adolescents with chronic disease. Therefore the main aim of this study was to assess the Quality of life of children with type 1 diabetes in Addis Ababa, Ethiopia. Methods. A cross-sectional study design was included 229 study participants with type 1 diabetics aged between 8 and 18 years in Addis Ababa governmental hospitals. Samples were selected by a systematic sampling method and interviewed face to face. Health-related quality of life was determined by the pediatric quality of life inventory. Multivariable linear regression was done and a significant association was declared at $P < .05$. Result. The total mean score of health-related quality of life was $78.8 \pm 15.6$ reported by child and $61 \pm 7.9$ reported by parents. In this study well-controlled glycemic level ($\beta = 11.8, 95\% CI: 8.7, 14.9$), health education on diabetes ($\beta = 5.92, 95\% CI: 2.9, 8.9$) and frequency of hospital admission ($\beta = -2.6, 95\% CI: -4.8, -0.42$) were clinically predicting factors of health-related quality of life. Conclusion. This study found that there was a somewhat reduction in school and emotional functions of health-related quality of life. The glycemic level, health education of diabetes and frequency of hospital admission was clinically significant factors of health-related quality of life. This study will recommend to the health professional to sustain a health education program on diabetes.

Keywords
Quality of life, children, adolescents, type 1 diabetes

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Background

Diabetes is becoming one of the health-related emergencies in the 21st century; type 1 diabetes (T1D) is defined as an endocrine disease characterized by a rising in blood glucose levels resulted from the autoimmune distraction of insulin-producing beta cells in the islets of the pancreas gland and requiring a lifelong insulin replacement therapy.1

Research has confirmed that living with T1DM has numerous challenges for children, adolescents, and parents related to its management such as intensive therapeutic insulin regimes, a restrictive lifestyle, careful eating habits, and daily monitoring of blood glucose levels to avoid various complications.2,3

Diabetes has a psychological impact on children and adolescents. They have an increased risk of depression, worries, and an eating disorder.4,5 Children with chronic

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illness have experienced a greater frequency of peer rejection and asocial behavior compared with healthy peers. It has a potential impact on their future development and mental health outcomes.6

Thus all hurt the daily life of children and adolescents, and it has an impact on their health-related quality of life (HrQoL).7 Previous studies have confirmed that HrQoL is an important indicator of the outcome of treatments and is also used to describe the impact of the diseases on the child.6,9 Even though there is no universal definition regarding HrQoL, it is used to describe the impact of the disease in terms of physical functioning, psychological functioning (emotional and cognitive), level of independence, personal beliefs, and social function.10

Traditionally, the management of T1DM has been dedicated to achieving a target glycemic level to prevent the complications of the disease. However in current Medicine, health is not merely the absence of the clinical parameters or markers of disease but it is holistic to all the domains of health, and it recognizes the importance of treating all dimensions of patient health.11 As such, previous studies have recommended a regular measurement of HrQoL in children and adolescents with diabetes.6,9

Generally, evaluation of the HrQoL and addressing its determinant factors should have been 1 part of diabetes management for a better outcome of the disease in addition to medical management. Despite this, until recently as per the knowledge of the investigator, studies on the quality of life of children and adolescents with diabetes have not been conducted in the local area and only a few studies have been done on adults. Most of the studies had done in other foreign countries. Since there is a great difference in the health care delivery system, religion, culture, and family dynamics in different societies, a study is needed on quality of life in different communities to address different determinant factors.

Therefore, this study aimed to assess the health-related Quality of life and its associated factors of diabetics among children and adolescents in Addis Ababa governmental hospitals.

Methods

Study Design and Setting

The institutional-based cross-sectional study design was used to conduct a study in Tikur Anbesa Specialized Hospital, Yekakit 12, and Zewuditu hospitals at Addis Ababa, these are government hospitals that provided diabetics services to the population. The study was conducted from March 1 to May 30, 2018. A total of 470 diabetics patients aged between 8 and 18 years had been identified in the 3 hospitals. The total population size of the town was estimated to be 3 433 999 of which 1 624 999 were males and 1 809 000 were female.12

Source and Study Population

Source populations were all children and adolescents with their parents/caregivers who had diabetics follow up in Addis Ababa governmental hospitals. And the study population were all systematically selected children and adolescents with their parents/caregivers who had been attending the endocrine clinic. A child aged between 8 and 18 years who had been diagnosed with diabetes for at least 3 months was included in the study.

Variables

Dependent variable. Quality of life in children and adolescents with diabetes

Independent Variables

Sociodemographic variable
- Age of children/adolescent
- Gender
- Maternal education
- Father education
- Socioeconomic status of a family
- Number of children in a family

Clinically related variable
- Metabolic control
- Duration of illness
- Drug regimen/injection per day
- Number of hospital admission
- Family history of diabetes

Operational Definition

Impaired HrQoL: Respondents who had a mean score of more than 1 standard deviation (1SD) below the sample mean of the total HrQoL score of the self-report in each subscale.

Good HrQoL: Respondents who had a mean score above 1 standard deviation (1SD) of the sample mean of the total HrQoL score of the self-report in each subscale.

Glycemic control: For this study fasting glucose level (FBS) was used according to American diabetics associations13
Well-controlled FBS level:
1. For age group (8-12): 90 to 180 mg/dl
2. For age group (13-18 years): 90 to 130 mg/dl

Poor glycemic control:
1. For age group (8-12): <90 or >180 mg/dl
2. For age group (13-18 years): <90 or >130 mg/dl

Age group from 8 to 12 years considered as children.
Age group from 13-18 years considered adolescents.

Sample Size Calculation and Sampling Procedure
The sample size was calculated by the Single population proportion formula with the following assumption: about 50% of the population proportion had good quality of life, 95% confidence interval, 5% margin of error (absolute level of precision) which gives 384. The sample size was adjusted to 213 by correction formula. About 10% of none respondent’s rate was considered and the final sample size becomes 234.

After the proportional allocation of the sample size in each hospital, the study participants were selected by a systematic sampling method. The sampling interval “K” was calculated. So to calculate, The Source population was 470. Then $K = \frac{N}{n} = 470/234 = 2$. The first eligible study subject was selected randomly. Then every two-interval of children and adolescents with diabetes respective to their parents/caregivers who had been visiting the Endocrinology clinic during the data collection period were selected.

Data Collection Tool and Procedure
Data were collected by pretested, structured, interviewer-administered questionnaires. The questionnaires had two-part;

(I) socio-demographic question and medical-related question which was developed from different literature

(II) The Pediatric Quality of Life Inventory 4.0 Generic Core Scale (PedsQL™ 4.0 GCS) was used to measure HrQoL. It was adopted from mapi-trust. It was available for the age group (5-7, 8-12, 13-18, and >19 years). The 2 age-appropriate instruments respective to the child age (8-12 and 13-18) were used in this study. It has a 23-item, multidimensional quality-of-life instrument. Items in each 4 sub Scales were Physical functioning (8 items), Emotional Functioning, Social Functioning, and School Functioning (5 items each). It was reported with both children and parents. They had been asked to rate the problem on 5 Likert scales from 0 to 4. (0=never a problem; 1=almost never a problem; 2=sometimes a problem; 3=often a problem, and 4=almost always a problem) in the last 1 month. Then each items were reversely scored and linearly transformed to a 0-100 scale (0=100, 1=75, 2=50, 3=25, and 4=0), so that higher scores indicate better HrQOL. Scale scores were computed as the sum of the Items divided by the number of items answered. If >50% of the items in the scale are missing, the scale score is not computed.

Both instruments were prepared in English and translated to Amharic. It was translated back to English by an independent translator to maintain consistency of the tool.

Data collection was started by obtaining permission from Tikur Anbesa Specialized Hospital, Yekakit 12, and Zewuditu hospitals. The purpose of the study was explained and confidentiality was assured then, children and adolescents with their respective parents were interviewed separately. Six diplomas data collectors and 2 BSC supervisors have participated.

Data Quality Control
Data quality was ensured during collection, coding, entry, and analysis. The internal consistency reliability test for PedsQL™ 4.0 GCS was done, Cronbach’s Alpha ($\alpha = .86$). A pre-test was done on 5% at Saint Paulo’s hospital which was not included in the study. The training was given to data collectors and supervisors. Regular Supervision of data collectors was done. Before data entry, the filled questioner was checked by data collectors, supervisors, and Principal investigators for completeness and clarity daily. Incomplete data were discarded.

Data Analysis
Data were entered by Epi data version 4.20 and analyzed by SPSS version 21. Data were summarized by Frequencies, Percentage, mean and standard deviation and presented by a table. A paired $t$-test was done to compare children’s, adolescent’s self-report and parent proxy reports. One sample independent $t$-test and one-way ANOVA were done to compare the mean score of children for PedsQL™ 4.0 GCS according to sociodemographic and clinical variables. Multivariable linear regression analysis was adjusted for determinant factors.
Finally, both the mean difference in PedsQL™ 4.0 GCS score and statistically associated factors were declared at $P < .05$.

**Result**

**Socio-Demographic Characteristics**

A total of 229 participants was included in the study give a response rate of 97%, from this about 127 (55.5%) of them were males and about 102 (44.5%) of them were females. One-fourth of 58 (25.3%) of them were a member of a family having more than 4 children. The mean age of children and adolescents was 12 ± 3. About 110 (48%) of children’s mothers and 143 (62.4%) children’s fathers had secondary and above educational levels (Table 1).

**Clinical characteristics.** The mean age for diabetes onset was 7 ± 3 (mean ± Standard deviation) years and the median duration of participants with diabetes was 5 years. All participants were used only injectable insulin. They had 185 ± 81 mean levels of fasting blood sugar (FBS). About 55(24%) children and adolescents had a history of admission in the last 6 months and 30 (13.1%) of children and adolescents had a family history of diabetes (Table 2).

**Comparison of Child- Self and Parent Proxy Report of PedsQL™ 4.0 GCS**

The paired sample $t$-test was revealed that there was a statistically significant difference in child self-report and parent proxy report in all subscales and total PedsQL™ 4.0 GCS. The total PedsQL™ 4.0 GCS mean score reported by the child was 78.8 ± 15.6 compared to parent proxy report 61 ± 7.9 ($t = 24.67$, $P \leq .001$).

There was a relatively lower score in the school function and emotional function of children and adolescents. About 34.5% of study participants in school functions and 35.8% in emotional functions had scored more than 1 standard deviation (>1 SD) below the total PedsQL™ 4.0 GCS mean score of self-report (Table 3).

**HrQoL Scores According to Sociodemographic Variables**

According to the sociodemographic variables, the total HrQoL mean score of study participants were statistically deferent within age group ($t = 4.2$, $P = .001$), gender ($t = 2.06$, $P = .041$), number of children in the family ($t = 5.2$, $P = .0001$), educational level of mother ($t = 4.8$, $P = .0001$), educational level of father ($t = 4.9$, $P = .0001$) and monthly incomes of parents ($t = -8.04$, $P = .0001$) (Table 4).

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**Table 1.** Socio-Demographic Characteristics of Children and Adolescent with Diabetes, Addis Ababa, 2018.

| Variables                | Categories                  | Frequency (n = 229) | Percent (%) |
|--------------------------|-----------------------------|--------------------|-------------|
| Age                      | 8-12                        | 120                | 52.4        |
|                          | 13-18                       | 109                | 47.6        |
| Sex                      | Male                        | 127                | 55.5        |
|                          | Female                      | 102                | 44.5        |
| Number of children in the family | <4                          | 171                | 74.5        |
|                          | ≥4                          | 58                 | 25.3        |
| Mother Educational status| No education                | 66                 | 28.8        |
|                          | Primary (1-8)               | 53                 | 23.1        |
|                          | Secondary and above         | 110                | 48.0        |
| Father educational status| No education                | 41                 | 17.9        |
|                          | Primary (1-8)               | 45                 | 19.7        |
|                          | Secondary and above         | 143                | 62.4        |
| Mother occupation        | Employed in private sector  | 47                 | 20.5        |
|                          | Employee in government institution | 57             | 24.9        |
|                          | Merchant                    | 90                 | 39.3        |
|                          | House wife                  | 35                 | 15.3        |
| Father occupation        | Employed in private sector  | 6                  | 2.6         |
|                          | Employee in government institution | 81             | 35.4        |
|                          | Merchant                    | 142                | 62          |
| Family monthly income    | Low                         | 122                | 53.3        |
|                          | Medium/high                 | 107                | 46.7        |
**Table 2.** Clinical Characteristics of Children and Adolescent with Diabetes, Addis Ababa, 2018.

| Variables               | Categories | Frequency (n = 229) | Percent (%) |
|-------------------------|------------|---------------------|-------------|
| Age of onset/year       | 1-8        | 156                 | 68.1        |
|                         | >8         | 73                  | 31.9        |
| Duration with diabetes/year | <5        | 134                 | 58.5        |
|                         | ≥5         | 95                  | 45.5        |
| Health education        | Yes        | 135                 | 59.0        |
|                         | No         | 94                  | 41.0        |
| Injection per day       | 1          | 29                  | 12.7        |
|                         | ≥2         | 200                 | 87.3        |
| Glycemic level          | Controlled | 120                 | 52.4        |
|                         | Uncontrolled | 109                | 47.6        |
| Admission in last 6 month | Yes     | 55                  | 24          |
|                         | No         | 174                 | 76          |
| Frequency of admission  | <2         | 35/55               | 63.6        |
|                         | ≥2         | 20/55               | 36.3        |
| Family history of diabetes | Yes  | 30                  | 13.1        |
|                         | No         | 199                 | 86.9        |

**Table 3.** Comparison of Child Self-Report and Parent Proxy Reports of HrQoL (Mean ± Standard Deviation), Addis Ababa, 2018.

| Items HrQoL | Score Mean ± SD | Percent (%) | >1SD | Score Mean ± SD | Percent (%) | >1SD | t-test | P value |
|-------------|-----------------|-------------|------|-----------------|-------------|------|--------|---------|
| Physical function | 81.9 ± 19.6 | 27.9        | 63.6 ± 10 | 19.7 | 19.1 | <.001 |
| Emotional functioning | 75.6 ± 19.5 | 35.8        | 58.3 ± 11.7 | 42.4 | 18.1 | <.001 |
| Social functioning | 85.8 ± 18.8 | 22.7        | 64 ± 11.6 | 31.9 | 25.5 | <.001 |
| School functioning | 71.9 ± 15.8 | 34.5        | 58.4 ± 8.9 | 41.9 | 18.5 | <.001 |
| Total QoL | 78.8 ± 15.6 | 24.9        | 61 ± 7.9 | 23.9 | 24.7 | <.001 |

**HrQoL Scores According to Clinical Variables**

Regarding the clinical variables, the total HrQoL mean score of study participants were statically deferent within health education of diabetes ($t=4.3$, $P=.0001$), blood glycemic level ($t=9.5$, $P=.0001$), and frequency of hospital admission ($t=3.9$, $P=.002$) (Table 5).

**Predictor of quality of life.** Based on multivariable linear regression analysis: female sex, number of children in the family, family income, health education of diabetes, glycemic level, and frequency of hospital admission were independent influencing factors of the HrQoL of children and adolescents. This had explained approximately half of the variability of the total HrQoL mean score ($R^2=0.493$, $F=37.910$, $P<.001$).

Children who had well-controlled glycemic level had a better score in all subscale score of physical functioning ($β=17.6$, 95%CI: 13.5, 21.7) emotional function ($β=8.4$, 95%CI: 3.8, 12.9), social function ($β=13.5$, 95%CI: 9.8, 17.1) school function ($β=8.6$ 95%CI: 4.8, 12.3) and total HrQoL ($β=11.8$, 95%CI:8.7,14.9) when compare to children who had no well-controlled glycemic level.

Health education on diabetes were positively associated with to all sub scale score of physical functioning ($β=6.4$, 95%CI: 2.4, 10.4), emotional functioning ($β=5.97$, 95%CI: 1.5, 10.4), social functioning ($β=6.3$, 95%CI: 2.76, 9.8), school function ($β=4.9$, 95%CI: 1.3, 8.5) and the total HrQoL ($β=5.92$, 95%CI: 2.9, 8.9).

A rising in number of children in the family were negatively associated with to all sub scales score of
family monthly income

| Items of HrQoL | Categories | Physical function | Emotional function | Social function | School function | Total |
|---------------|------------|-------------------|-------------------|-----------------|----------------|-------|
| Age           | 8-12       | 86.8 ± 18         | 79.8 ± 17.8       | 90.2 ± 15.7     | 74.7 ± 15.9    | 82.8 ± 13.9 |
|               | 13-18      | 76.5 ± 19.9       | 71.1 ± 20         | 81.0 ± 20.8     | 68.9 ± 15      | 74.0 ± 16   |
| t-test        |            | 4.07              | 3.4               | 2.8             | 3.7            | 4.2    |
| P-value       |            | .001              | .001              | .001            | .001           | .001   |
| Sex           | Male       | 83.8 ± 19         | 77 ± 18.9         | 87.8 ± 18       | 74.2 ± 15      | 80.7 ± 14.9 |
|               | Female     | 79.6 ± 19.9       | 73.7 ± 20         | 83.3 ± 19.5     | 69.14 ± 16     | 76.5 ± 16.1 |
| t-test        |            | 1.12              | 1.31              | 1.78            | 2.41           | 2.06    |
| P-value       |            | .112              | .191              | .075            | .017           | .041   |
| Number of children | <4  | 84.9 ± 18         | 78.3 ± 19         | 89.5 ± 16.5     | 74.9 ± 15.3    | 81.9 ± 14.2 |
|               | ≥4         | 72.94 ± 20        | 67.9 ± 17.9       | 74.8 ± 20.9     | 63 ± 13.9      | 69.7 ± 15.9 |
| t-test        |            | 3.97              | 3.6               | 4.9             | 5.24           | 5.2    |
| P-value       |            | .0001             | .0001             | .0001           | .0001          | .0001   |
| Mother educational status | No education | 74.0 ± 19.8       | 68.58 ± 19.0      | 79.0 ± 20.8     | 67.4 ± 15.2    | 72.4 ± 15.7 |
|               | Primary (1-8) | 80.5 ± 22.1       | 74.38 ± 18.9      | 80.8 ± 19.1     | 70.6 ± 16.9    | 76.6 ± 17.2 |
|               | Secondary and above | 87.3 ± 16.4     | 80.73 ± 18.2      | 92.7 ± 13.3     | 75.27 ± 15     | 83.8 ± 12.8 |
| t-test        |            | 3.9               | 3.76              | 5.73            | 3.03           | 4.8    |
| P-value       |            | .0001             | .0001             | .0001           | .0001          | .0001   |
| Father Educational status | No education | 72.6 ± 19.7       | 65.4 ± 15.7       | 76.8 ± 20.6     | 67.6 ± 16.1    | 70.6 ± 15.7 |
|               | Primary (1-8) | 78.9 ± 20.4       | 71.67 ± 19.3      | 79.1 ± 20.5     | 68.1 ± 16.5    | 74.1 ± 17.6 |
|               | Secondary and above | 85.5 ± 18.5     | 80.18 ± 18.8      | 90.8 ± 14.9     | 74.1 ± 15.1    | 82.7 ± 13.5 |
| t-test        |            | 3.7               | 4.7               | 5.08            | 2.99           | 4.9    |
| P-value       |            | .0001             | .0001             | .0001           | .003           | .0001   |
| Family monthly income | Low | 74.4 ± 20.5       | 68.5 ± 18.5       | 78 ± 20         | 68 ± 16        | 72 ± 16.7   |
|               | Medium/high | 90.5 ± 14.3       | 84 ± 16.6         | 94.8 ± 10       | 76 ± 14.3      | 86 ± 9.6   |
| t-test        |            | -6.9              | -6.7              | -7.7            | -6.06          | -8.04    |
| P-value       |            | .0001             | .0001             | .0001           | .0001          | .0001    |

Discussion

This study revealed that the emotional and school function of HrQoL of children and adolescents were somewhat low when compared to the other subscale of HrQoL. Which was in line with a study done in Turkey. The impaired emotional function can be explained as children and adolescents might be worried about long-term complications of diabetes. On the other hand, reduction in school function might be due to children and adolescents have missed a class for hospital follow-up or might be due to being unwell. So, health professionals, the school community, and parents must work integrally to improve the emotional and school function of children and adolescents.

In this study, the child self and parent proxy reports of total HrQoL of children and adolescents were statistically different (t = 24.7, P < .001). Parent proxy reports for children and adolescents HrQoL were lower which was similar to previous studies finding in Kuwait and Greece. This might be explained by the closeness and involvement of parents in disease management forced them to perceive more likely about the impacts the diseases. This indicates that health professionals should not depend only on the information of parents/caregivers should be flexible to incorporate children’s information in clinical practice.

Even though gender did not affect the physical and emotional functions of HrQoL, it was a statistically significant predictor of the total HrQoL (β = −3.6, 95% CI: −6.6, −0.7) of children and adolescents. Females have reported lower total HrQoL scores compared to males.
Table 5. HrQoL Items According to the Clinical Variables of Children and Adolescents, 2018 (Mean ± Standard Deviation).

| Variables | Categories | Physical function | Emotional function | Social function | School function | Total |
|-----------|------------|-------------------|-------------------|----------------|----------------|-------|
| Age of onset/ year | 1-8 | 82.9 ± 18.9 | 76.6 ± 18.5 | 85.4 ± 9 | 72.6 ± 16 | 79.4 ± 15.5 |
| | >8 | 79.8 ± 20.8 | 73.6 ± 21 | 86.7 ± 18 | 70.5 ± 14.7 | 77.7 ± 15.7 |
| | t-test | 1.10 | 1.01 | −0.49 | 0.94 | 0.77 |
| | P-value | .272 | .313 | .618 | .350 | .44 |
| Duration with diabetes | <5 | 83.1 ± 19.9 | 78.2 ± 15 | 88.5 ± 16.9 | 73 ± 15.6 | 80 ± 15 |
| | ≥5 | 80.3 ± 19 | 79.4 ± 14.5 | 82 ± 20.7 | 70.34 ± 16 | 76.7 ± 16 |
| | t-test | 3.06 | 2.91 | −0.49 | 0.94 | 0.77 |
| | P-value | .44 | .44 | .618 | .350 | .44 |
| Injection per day | 1 | 78.4 ± 20.6 | 73.4 ± 16.1 | 78.9 ± 18.7 | 70.4 ± 18.8 | 75.3 ± 16.3 |
| | ≥2 | 82.4 ± 19.4 | 75.9 ± 19.9 | 86.8 ± 18.7 | 72.4 ± 15.4 | 79.3 ± 15 |
| | t-test | 1.06 | 1.01 | −0.49 | 0.94 | 0.77 |
| | P-value | .272 | .313 | .618 | .350 | .44 |
| Glycemic level | Controlled | 92.3 ± 13 | 81.9 ± 17 | 95.2 ± 9.5 | 77.9 ± 13.7 | 86 ± 13.7 |
| | Uncontrolled | 70.19 ± 17 | 68.6 ± 19.7 | 75.5 ± 21 | 65.3 ± 15.5 | 69.9 ± 16 |
| | t-test | 9.98 | 9.98 | −0.49 | 0.94 | 0.77 |
| | P-value | .0001 | .0001 | .618 | .350 | .44 |
| Admission in last 6 month | Yes | 75 ± 19.6 | 71.5 ± 21.7 | 77.4 ± 22.0 | 66.8 ± 15.9 | 72.8 ± 17.7 |
| | No | 83.9 ± 19.2 | 76.9 ± 18.6 | 88.5 ± 16.7 | 73.6 ± 15.5 | 80.7 ± 14 |
| | t-test | −2.9 | −1.66 | −3.4 | −2.8 | −3.03 |
| | P-value | .0005 | .005 | .001 | .006 | .003 |
| Frequency of admission | <2 | 77 ± 19.7 | 72.9 ± 21.7 | 79 ± 22.5 | 68 ± 15.9 | 74.6 ± 17.8 |
| | ≥2 | 58.38 ± 3.70 | 60 ± 19.8 | 61.7 ± 14 | 52 ± 12 | 58 ± 8 |
| | t-test | 5.9 | 5.9 | −3.4 | −2.8 | −3.03 |
| | P-value | .0001 | .0001 | .001 | .006 | .003 |
| Attending health education | Yes | 85.9 ± 18 | 79 ± 18 | 89.9 ± 15.6 | 74.9 ± 15 | 82.5 ± 13.7 |
| | No | 76.2 ± 20 | 70.5 ± 20.5 | 79.9 ± 21.3 | 67.7 ± 15.7 | 73.9 ± 16.7 |
| | t-test | 3.7 | 3.7 | 3.9 | 3.9 | 3.9 |
| | P-value | .0001 | .0001 | .001 | .001 | .001 |

Table 6. Multivariable Linear Regression Analysis of Predictor of HrQoL and its β Coefficients (95% Confidence Interval) of Children and Adolescents with Diabetes, Addis Ababa, 2018.

| Items of health-related quality of life | Physical subscale | Emotional function | Social function | School function | Total |
|--------------------------------------|-------------------|-------------------|----------------|----------------|-------|
| Sex (male=Ref) | – | – | −3.9 (−7.42,−0.46)* | −4.8 (−8.3,−1.2)* | −3.6 (−6.6, −0.69)* |
| No of children in family (<4 children=Ref) | −2.4 (−4.7, 0.05)* | −2.8 (−5.4, −1.9)* | −3.9 (−5.9, −1.8)* | −3.7 (−5.8, −1.6)* | −2.9 (−4.6, −1.3)* |
| Family monthly income (low=Ref) | 10.5 (6.5, 14.5)* | 12.2 (7.7, 16.7)* | 10.2 (6.6, 13.8)* | 3.9 (0.34, 7.6)* | 9.4 (6.4, 12.4)* |
| Attending health education (No=Ref) | 6.4 (2.4, 10.4)* | 5.97 (1.5, 10.4)* | 6.3 (2.76, 9.8)* | 4.9 (1.3, 8.5)* | 5.92 (2.9, 8.9)* |
| Glycemic level (uncontrolled=Ref) | 17.6 (13.5, 21.7)* | 8.4 (3.8, 12.9)* | 13.5 (9.8, 17.1)* | 8.6 (4.8, 12.3)* | 11.6 (8.7, 14.9)* |
| Hospital admission frequency (<2=Ref) | – | – | −3.4 (−5.9, −0.75)* | −3.7 (−5.4, −0.10)* | −2.6 (−4.8, −0.42)* |
| R adjusted square | 0.42 | 0.25 | 0.488 | 0.277 | 0.49 |

*Significant at P < .05, Ref: indicates a category used as a standard reference.

Which was in agreement with studies done in Saudi Arabia and Kuwait. The possible justification might be due to that female supposed to work in the home, like caring for young children and home activities this will limit the time of peer play or it might be due to more social pressure and self-consciousness related to marriage and future birthing as girls approach puberty and adolescent.

In similar to a study conducted in Zambia this study showed that health education about diabetes had significant positive associations with HrQoL of children and adolescents with diabetes (β=5.92, 95%CI: 2.92, 8.9). Children and adolescents who had been participated in health education had a better HrQoL score. So health professionals should provide health education on diabetes self-management and diabetes care of
children and adolescents to improve their quality of life (QoL).

In this study, children and adolescents who had well-controlled blood glucose levels had a better score in HrQoL ($\beta = 11.8$, 95%CI: 8.7, 14.9), this finding was in agreement with previous studies. The result of the current study can be explained by the fact that children and adolescents who had a well-controlled blood glucose level were associated with a decrease in cognitive function and associated with fewer structural changes in the brain, they had better academic performance and also the fact that in targeted blood glucose level the common acute complication of diabetes, like hypoglycemia, hyperglycemia and diabetics ketoacidosis will be minimized. This implies that children and adolescents should have been monitored and manage blood glucose levels at a targeted level. A health professional should strengthen health education in diabetes self-management and parents must work integrally to improve the QoL.

The other observed finding of this study was the monthly income of the parents had a statistically significant positive association with HrQoL ($\beta = 9.4$, 95%CI: 6.4, 12.4). Children and adolescents whose family members are high/medium monthly income had scored a better HrQoL. This was in line with studies conducted in Egypt, this explained as having a good monthly income, enables the family to pay the requested fee for medical laboratories, medication and to purchase needed materials in diabetes self-management. So governmental or non-governmental organizations must compensate children and adolescents who are family members having low monthly incomes.

This study showed that the frequency of hospital admission was negatively associated with the total HrQoL ($\beta = -2.6$, 95%CI: -4.8, -0.42). HrQoL was compromised in children and adolescents who had 2 or more hospital admission in the last 6 months. This finding was contrary to the study done Taranaki children indicated that more hospital admission was a predictor of better HrQoL.

Having more hospital admission in the last 6 months and raised the number of children in the family was an important predictor of impaired HrQoL scores of children and adolescents.

Female gender was an influencing predictor of lower HrQoL scores.

**Limitation**

The main limitation of this study included: this study had no control group to compare with the study group, other determining factors are not explored in this study such as family conflict, family relation.

**Conclusion**

In conclusion, this study found that there was a somewhat reduction in school function and emotional function of HrQoL of children and adolescents.

This study also concludes that well-controlled blood glucose level, medium/high monthly incomes, and health education of diabetes were an important predictor of better HrQoL.

Based on the result, this study will be recommended to:

**Health professional:** Health education program about diabetes was encouraged and it should be sustainable and long-lasting to improve the quality of life of children and adolescents.

**School community:** Children and adolescents with diabetes must be supported by the school community, like preparing a tutorial for the missed class, making a conducive environment for injection, and checking blood glucose levels.

**Children’s Parents:** Children from large siblings should be incorporated in diabetes health education and all family members should have been aware of the impact of the disease on Quality of life.

**Organization:** Government and non-Government (NGO) organization must look for children and adolescents with diabetes, those are a member of the family have a low monthly income and must prioritize them for compensation.

**Researchers:** There might be another factor that determines QoL beyond what we examined, this study recommends the researcher explore other factors.
We would like to pass our gratitude to the Addis Ababa University for the approval of ethical clearance and technical support.

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Ethical clearance was obtained from the Ethical review committee of the department of nursing and midwifery from Addis Ababa University. An official letter of cooperation was written to the Addis Ababa health bureau and each health institution. After explaining the purpose of the study, written informed consent was obtained from parents of all participating children. Written consent was also requested from children over 12 years old. Participants were also informed that participation was voluntary and that they can withdraw at any time if they are not comfortable with the questionnaire. Personal identifiers were not included in the written questionnaires to ensure participants’ confidentiality.

Assessment of Health-related quality of life (HRQoL) is important to indicate the outcome of treatment and to predict the impact of disease on children and adolescents with diabetes. Measurement of HRQoL is an increasing clinical practice in a patient with chronic disease and it was recommended routinely to be done in conjunction with medical treatment.

We assessed the level of HrQoL of children and adolescents with diabetes in Ethiopia. We developed a predictive model to predict HrQoL of children and adolescents with diabetes.

The data sets collected and analyzed for the current study are available from the corresponding author and can be obtained at a reasonable request.

1. International Diabetes Federation. Diabetes Atlas. 8th ed. International Diabetes Federation; 2017. Accessed February 21, 2018. https://diabetesatlas.org/upload/resources/previous/files/8/IDF_DA_8e-EN-final.pdf
2. Soltész G. Worldwide childhood type 1 diabetes epidemiology. Endocrinol Nutr. 2009;56:53-55.
3. Zysberg L, Lang T. Supporting parents of children with type 1 diabetes mellitus: a literature review. Patient Intell. 2015;7:21-31.
4. Reynolds KA, Helgeson VS. Children with diabetes compared to peers: depressed? Distressed? A meta-analytic review. Ann Behav Med. 2011;42(1):29-41.
5. Ducat L, Rubenstein A, Philipson LH, Anderson BJ. A review of the mental health issues of diabetes conference. Diabetes Care. 2015;38(2):333-338.
6. Curtis CE, Luby JL. Depression and social functioning among preschool children with chronic medical condition. J Pediatr. 2008;153(3):408–413.
7. International Diabetes Federation. Diabetes Atlas. International Diabetes Federation; 2015. Accessed January 7, 2018. https://www.diabetesatlas.org/upload/resources/previous/files/7/IDF%20Diabetes%20Atlas%202015.pdf
8. Baş V, Bideci A, Yeşilkaya E, Soysal A, Çamurdan O, Cinaz P. Evaluation of factors affecting quality of life in children with type 1 diabetes mellitus. J Diabetes Metab. 2011;2(8):154-158.
9. Delamater AM, de Wit M, McDarby V, Malik J, Acrini CL. Psychological care of children and adolescents with type 1 diabetes. Pediatr Diabetes. 2014;15(S20):232-244.
10. World Health Organization. The World Health Organization Quality of Life assessment (WHOQOL). Position paper from the World Health Organization. Unpublished. Accessed January 13, 2018. https://www.who.int/mental_health/media/68.pdf
11. WHO. Preamble to the constitution of the World Health Organization as adopted by international health conference. New York, June 19-22, 1946; signed on 22 July 1946 by the representatives of 16 state and entered into force 7 April 1948. 1948. Accessed December 26, 2017. https://apps.who.int/iris/bitstream/handle/10665/85573/Official_record2_eng.pdf
12. Federal Democratic Republic of Ethiopia Central Statistical Agency: population projection of Ethiopia for all regions at woreda level from 2014-2017. Accessed February 7, 2018. https://www.statsethiopia.gov.et/population-projection/
13. Association AD. Standards of medical care in diabetes—2013. Diabetes Care. 2013;36(suppl 1):S11-S66.
14. Varmi J. Pediatrics quality of life inventory. Updated 2014. Accessed January 26, 2018. https://eprodive.mapi-trust.org
15. Özyazıcıoğlu N, Avdal EÜ, Sağlam H. A determination of the quality of life of children and adolescents with type 1 diabetes and their parents. *Int J Nurs Sci*. 2017;4(2):94-98.

16. Abdul-Rasoul M, AlOtaibi F, Abdulla A, et al. Quality of life of children and adolescents with type 1 diabetes in Kuwait. *Med Princ Pract*. 2013;22(4):379-384.

17. Kalyva E, Malakonaki E, Eiser C, Mamoulakis D. Health-related quality of life (HRQoL) of children with type 1 diabetes mellitus (T1DM): self and parental perceptions. *Pediatr Diabetes*. 2011;12(1):34-40.

18. AlBuhairan F, Nasim M, Al Otaibi A, Shaheen NA, Al Jaser S, Al Alwan I. Health related quality of life and family impact of type 1 diabetes among adolescents in Saudi Arabia. *Diabetes Res Clin Pract*. 2016;114:173-179.

19. Malipa M, Menon J. The relationship between compliance and quality of life among adolescents with diabetes mellitus type1. *Med J Zambia*. 2013;40(3):93-103.

20. Tahirotić H, Toromanović A, Tahirotić E, Begić H, Varni JW. Health-related quality of life and metabolic control in children with type 1 diabetes mellitus in Bosnia and Herzegovina. *Coll Antropol*. 2012;36(1):117-121.

21. Pourabbasi A, Tehrani-Doost M, Qavam SE, Larijani B. Evaluation of the correlation between type 1 diabetes and cognitive function in children and adolescents, and comparison of this correlation with structural changes in the central nervous system: a study protocol. *BMJ Open*. 2016;6(4):e007917.

22. Knight MF. *The Effects of Glucose Levels on Academic Performance of Children and Adolescents with Type 1 Diabetes Mellitus*. The University of Arizona; 2017.

23. Gadallah MA, Ismail TA, Aty NSA. Health related quality of life among children with Type I diabetes, Assiut city, Egypt. *J Nurs Educ Pract*. 2017;10(7):73.

24. Mills SA, Hofman PL, Jiang Y, Anderson YC. Health-related quality of life of Taranaki children with type 1 diabetes. *N Z Med J*. 2015;128(1427):25-32.