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Evaluation of the Health Related Quality of Life of Children Aged 5 – 18 Years with Type 1 Diabetes Mellitus Seen in South Eastern Nigeria

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Abstract: Health related quality of life (HRQoL) evaluation quantifies the degree to which a medical condition or its treatment impacts an individual's life. A major goal of diabetes care is to enable individuals to manage their condition without experiencing diminished quality of life. Identifying impaired quality of life is a recognized component of diabetes management with no published data in Nigerian children with diabetes. The aim was to evaluate the HRQoL of children with T1DM aged 5-18years in Nigeria compared with that of healthy control and other children with T1DM in other countries and to identify the impact of age, gender, age at onset of diabetes, duration of diabetes, metabolic control and socioeconomic status on HRQoL. The Quality of life scores were obtained using the Paediatric Quality of Life inventory. Diabetes and Generic Modules were administered to 58 children with T1DM and their parents. Generic Module was completed by 58 age and sex-matched control participants and their parents. A questionnaire was completed recording their socio-demographic data and the HbA1c levels of the children with T1DM determined. Two hundred and thirty two participants took part in the study. The mean total generic scores of the children with and without diabetes were 80.5±1.7 and 82.5±1.2 respectively (p=0.3). The school functioning was significantly lower in the children with diabetes when compared with the control 63.3±2.9 and 73.9±2.0 respectively (p=0.003). Lower HbA1c values (p=0.04), Short duration of diabetes (p=0.002) and young age (p=0.01) were associated with better QoL scores. The perception of HRQoL was similar in children with and without T1DM. However, the school functioning domain was significantly impaired in the former. Young age, lower HbA1c value and short duration of diabetes, were associated with better HRQoL in children with diabetes.

Keywords: Health-Related Quality of Life, Type 1 Diabetes Mellitus, Children, Short Duration, HbA1c

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1. Introduction

Health-Related Quality of Life (HRQoL) has increasingly been acknowledged as an essential health outcome measure in paediatric medicine. [1] HRQoL has been defined as the specific impact of an illness or injury, medical treatment or health care policy on an individual's quality of life (QoL). [2] It can be measured reliably and has proved clinically useful. [3] From the individual patient's perspective, HRQoL, though subjective, can guide the choice of best treatment made by the patient and the health care professionals [4]. The value of HRQoL measurement in patients with chronic health conditions like diabetes mellitus has repeatedly been demonstrated as an invaluable tool in assessing health outcome. [5]

Diabetes mellitus is a largely self-managed disease with an impact on the daily physical, emotional, and social well-being of patients and their families, which may adversely affect the QoL of the patients and their families [6]. The complexity of managing type 1 diabetes mellitus can be overwhelming even for the most competent patient, let alone for children and adolescents. Children and adolescents may feel abnormal or different from their peers and this may impact negatively on their HRQoL.

A major goal of diabetes care is to enable individuals to manage their condition without experiencing diminished quality of life. [7] HRQoL as an integral part of diabetes care is recommended to ensure recognition of the teenagers' perspective of their QoL, identify psychosocial barriers and promote healthy coping [8].

Some studies suggest that children and adolescents with diabetes mellitus perceived their HRQoL to be lower than their healthy peers while others reported no difference in the HRQoL of adolescents with diabetes mellitus and their healthy peers [6, 9].

In sub-Saharan Africa, there is dearth of data on the HRQoL of children and adolescents with type 1 diabetes mellitus. This study aims to evaluate the HRQoL of children and adolescents with type 1 diabetes mellitus and to answer the following research questions: - How does the HRQoL of children and adolescents with type 1 diabetes mellitus compare with that of their healthy peers? And how does age, gender, age at onset of disease, socioeconomic status and metabolic control influence the HRQoL of the child with diabetes? This information will be necessary to improve the quality of care offered to them and hence improve their quality of life.

2. Methodology

2.1. Study Design and Population

This was a multi–centre; cross sectional hospital / community-based study of children with type 1 diabetes mellitus (T1DM) aged 5-18years. These patients were consecutively enrolled from the paediatric endocrine clinics of three Teaching hospitals located in the South-Eastern Nigeria viz:-Federal Teaching Hospital Abakaliki, University of Nigeria Teaching Hospital Ituku Ozala, and Enugu State University Teaching Hospital Enugu.

The Federal Teaching Hospital Abakaliki (FETHA) which formed the base for the study provided two third of the children with diabetes. Children from this centre benefit from free supply of insulin, blood glucose metre and glucose test strips from the hospital unlike children with diabetes from the other two centres involved in the study.

Apparently healthy age, sex and socioeconomic class matched school children without diabetes from the same geographical locations were selected from the schools of these children with T1DM as control. A multistage random sampling method was used in the selection of the control. Socioeconomic status was established using the Oyedeji's classification. [10] This classification system is based on parents/caregivers level of education and occupation.

Those with chronic clinical conditions e.g. sickle cell anaemia, congenital heart disease, seizure disorders, children with diabetes suffering from acute illness or other chronic medical illness including co-morbidities of diabetes mellitus e.g hypothyroidism that may influence quality of life scores, were excluded from the study. Children who had difficulties in understanding the questionnaire or whose parents did not give consent were also excluded.

Ethical approval was obtained from the Health Research and Ethics Review Committee of the various hospitals before commencement of the study. Permission to use the PedsQL™ 4.0 Generic Core Scales and PedsQL™ 3.0 Diabetes Module questionnaire was obtained from the copyright owners. Parental consent and assent from children aged ≥7years were obtained.

Subjects and their parents/guardian were interviewed separately and individually in a quite office to ensure confidentiality.

Children found to have diminished HRQoL in any domain were referred to the paediatric endocrinologist for further intervention.

2.2. Measurements and Data Collection

2.2.1. Demographic and Diabetes-Related Information

A questionnaire was completed recording demographic information which includes: age, gender, nationality, socioeconomic status. Diabetes-related information including: age at onset of diabetes; duration of diabetes mellitus, mode of treatment, insulin regimen and mean glycosylated haemoglobin (HbA1c) level of the children with diabetes over a one year period from the time of evaluation were also obtained. Height and weight measurement were done using standard procedure. The BMI z score was calculated and participants were classified based on the WHO classification as underweight (SDS <-2), normal weight (SDS >-2 to<+2) and overweight (SDS>+2).

2.2.2. Quality of Life Measures

The Pediatric Quality of Life Inventory (PedsQL ™) was used to assess the HRQoL of children and adolescents with T1DM in this study. The questionnaire was grouped according to chronological age into ages: 5-7years, 8-12years and 13-18years and 18-25years

2.2.3. Generic Measures

The 23-item PedsQL™ 4.0 Generic Core Scale which includes a child self-report and a parent proxy-report was used to assess the general health of children with and without diabetes. These 23 items were divided into four subscales which include:(i) physical (8 items) characterized using the following parameters: Running, walking more than one block, participating in sports activity or physical exercise, lifting something heavy, taking a bath, doing chores, having hurts or aches, low energy level, (ii) Emotional functioning (5items) characterized using the parameters: feeling afraid or scared, feeling sad, feeling angry, trouble sleeping, worrying, (iii)

Social functioning (5 items) characterized using the parameters: getting along with other children, other children not wanting to be his or her friend, getting teased by other children, not able to do things other children can do, keeping up when playing with other children, and (iv) School functioning (5items). School function was characterized using the parameters: paying attention in class, forgetting things, keeping up with schoolwork, and missing school because of not feeling well or to go to the doctor or hospital. The recall period for items was one month. Scoring of each item was done using the Likert response scale with five categories ranging from never a problem (0) to almost always a problem (4).[11] The scores for each subscale was summed and transformed to a 0 - 100 score. Never a problem: 0= 100, Almost never: 1=75, sometimes: 2=50, often: 3= 25 and almost always: 4=0. To create scale scores, the scores for each domain are summed and the mean obtained. The mean is computed by totalling the item scores and dividing by the number of items answered. If ≥50% of the items in the scale is missing, it is recommended that the scale score should not be computed. In this study two third of the respondents were not using bracelet, as such that item was excluded for them, For younger children (5-7years), the ordinal scale is reworded and simplified to a 3-point scale: 0 (not at all a problem: score 100%), 2 (sometimes a problem: score 50%), and 3 (a lot of a problem: score 0%) with pictorial representation added.

Higher scores represent perception of minimal problems and better HRQoL, while lower scores indicates poorer HRQoL. [11]

2.2.4. Disease Specific Measures

PedsQL™ 3.0 Diabetes Module, is a multi-dimensional, diabetes-specific instrument used in assessing the disease specific HRQoL of the children with diabetes. It involves both child self-report and parent proxy-reports. There were 28 questions to assess 5 subscales of HRQOL which include: diabetes symptoms (11 items), treatments barriers (4 items), treatment adherence (7 items), worry (3 items) and communications (3 items).[12] Recall period for items was also one month. The Likert response scale and subscale scores were also applied. All questionnaires were researcher administered in a face–to–face interview. It took 10-15 minutes to complete the questionnaire using the UK English version of the PedsQL. ™

2.3. Data Management and Analyses

Information obtained were transferred to electronic data base prepared using Microsoft Office Excel 2007. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) software for Windows, version 19.0. The relationship between diabetes-related QoL and the different variables were assessed using Pearson's correlation coefficients. Unpaired t tests were used to compare scores between groups (e.g. children with diabetes vs. controls, males vs. females). One-way ANOVA was used to compare age groups. A p value of ≤ 0.05 was considered statistically significant in all analyses.

3. Results

A total of 232 participants made up of 58 subjects with type 1 diabetes mellitus, 58 controls matched for age, gender and socioeconomic class and 116 parents/guardians took part in the study. Of the 58 subjects, 32 (55.2%) were males and 26 (44.8%) were females. Six children with diabetes were excluded from the study because they did not meet the inclusion criteria. They were either younger than 5years or older than 18years. All the participants were Nigerians and of the Ibo ethnic group. The characteristics of the participants are shown in Table 1. Respondents for the proxy-report was 54 (93.1%) mothers, 2 (3.4%) fathers and 2 (3.4%) guardians; a male and a female for the children with diabetes. For the children without diabetes, 48 (82.8%) proxy report was obtained from mothers, 2 (3.4%) from fathers and 8 (13.8%) from guardians who were all females. Mean duration of diabetes was 2.2years (range 0.25-8years), Mean HbA1c value: 10.7 (6.4-14%), Mean age at onset of diabetes: 11.6years (range: 4 – 16years). All the children with T1DM were on subcutaneous insulin injection. Fifty three of these children were on premixed insulin (Biosulin 30/70) while 5 were on insulin glargine and lispro.

Table 1. *Characteristics of the study participants.*

	Children with diabetes (n=58)	**Children without diabetes (n=58)**
Gender:		
Male:	32 (55.2%)	32 (55.2%)
Female:	26 (44.8%)	26 (44.8%)
Mean age (years):	13.98±0.3	14.1±0.44
5-7years	4 (6.9%)	4 (6.9%)
8-12years	14 (24.1%)	14 (24.1%)
13-18years	40 (69.0%)	40 (69.0%)
Socioeconomic class:		
I	6 (10.3%)	6 (10.3%)
II&III	8 (13.8%)	3 (13.8%)
IV&V	44 (75.9%)	44 (75.98%)
Mean height ±SD	153.1±1.9	159.4±1.1
Mean weight ±SD	41.8±1.4	48.3±1.9
Mean BMI±SD	17.1±0.3	18.7±1.8
Mean BMI z score	- 1.33	-0.8
Overweight	3 (5.3%)	5 (8.6%)
Normal weight	44 (77.2%)	46 (79.3%)
Underweight	10 (17.2%)	7 (12.1%)
Mean HbA1c	10.7% (range: 7.1 – 14%)	
HbA1c <7.5%	12 (20.7%)	
HbA1c 7.5-9%	10 (17.2%)	
HbA1c>9%	36 (62.1%)	

Generic QoL mean scores

3.1. Comparison of Generic HRQoL Scores of the Children with and Without Diabetes and the Parent's Proxy-Report

The mean generic QoL scores of the children with and without diabetes using the PedsQL^{TM} 4.0 Generic Core scale module were 80.5 ±1.7 and 82.5±1.2 respectively (t=0.95, p=0.3). The children without diabetes had higher scores in all the QoL domains though without statistical significance. The

QoL scores of the children with and without diabetes are shown in Table 2.

Table 2. *The generic Health-Related Quality of life scores of the children with diabetes and the children without diabetes (controls) and parent's proxy report using the PedsQL.*^{TM} *4.0 generic core scale.*

PedsQL GCS	Children with diabetes mean scores (SEM)		Children without diabetes mean scores (SEM)		
	(n=58)	**(n=58)**	**mean diff**	**t**	**p**
Physical	82.0±3.1	86.3±2.1	4.3	-1.1	0.2
Emotional	80.6±2.6	80.8±1.8	0.1	-0.5	0.9
Social	88.6±2.7	89.2±1.6	0.6	-1.2	0.8
School functioning	63.3±2.9	73.9±2.0	10.6	-2.99	0.003
Total	80.5±1.7	82.5±1.2	4.0	0.95	0.3
Parent's proxy report					
Physical functioning	81.0±2.9	85.4±1.8	4.4	-1.2	0.2
Emotional functioning	79.7±2.0	80.1±1.6	0.4	-0.6	0.9
Social functioning	86.6±2.6	88.2±1.5	1.6	-0.5	0.5
School functioning	64.2±3.1	72.0±1.9	7.8	-2.0	0.04
Total scores	79.4±2.0	81.7±1.0	2.3	- 1.0	0.3

GCS=Generic Core Scale; t=unpaired t-test; $p<0.05$ is significant

When specific domains of the PedsQL^{TM} 4.0 Generic Core scale module were assessed, the mean QoL scores for the children with and without diabetes in the school functioning domain were 63.3±2.9 and 73.9±2.0 respectively. This difference was statistically significant; (t=-2.99, p = 0.003). The 5 items of the school functioning domain which include: paying attention in class, forgetting things, keeping up with school work, and absence from school because of not feeling well or missing school to go to the doctor or hospital was further assessed. Deficit in QoL scores was noticed in 3 items: keeping up with school work, missing school because of not feeling well and missing school to go to the doctor or hospital among the children with diabetes.

Thirty four subjects (56.8%) reported not being able to keep up with school work often, 32 (55.1%) reported missing school because they were not feeling well while 51 (87.9%) reported missing school often because they had to go to the hospital to see the doctor.

3.2. Effect of Gender, Age and Socioeconomic Status on Quality of Life Scores

The mean total QoL scores were not significantly different for both genders; 81.1±2.3 and 83.1±1.6 respectively (t=0.7, p=0.5) for the males with and without diabetes and 79.7±2.7 and 81.7±1.7 respectively (t=-0.6, p=0.5) for females with and without diabetes. With regard to QoL scores in relation to age, the children with diabetes demonstrated decrease in the generic QoL scores with increasing age; 91.7±5.1, 83.6±1.9 and 75.6±2.3 respectively p=0.002 for ages 5-7years, 8-12years and 13-18years respectively (figure 1). The reverse was observed in the children without diabetes. The generic QoL scores increased with increasing age for this group; 69.0±3.6, 81.0±2.2 and 84.4±1.3 (p=0.002) for ages 5-7years, 8-12years and 13-18years respectively. Comparing the generic QoL scores of the children with and without diabetes in the various SEC using one way ANOVA, the difference in the QoL scores were not statistically significant (79.8±1.7 and 82.4±1.2 respectively, p=0.9).

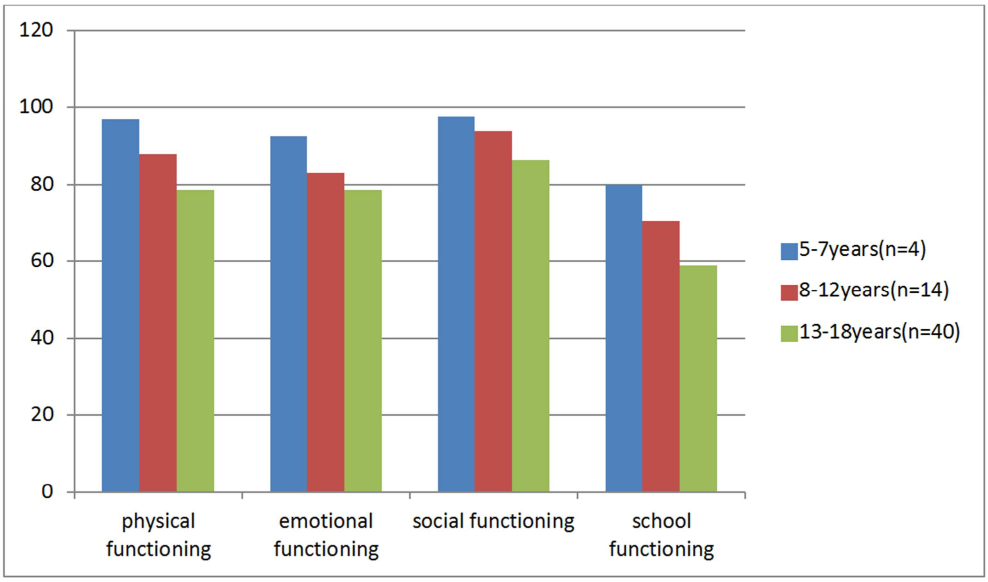

Figure 1. *HRQoL scores among children with T1DM in the different domains of the PedsQL*^{TM} *Generic Core Scale in relation to age.*

3.3. Effect of Clinical Variables on the Generic QoL

The effect of clinical/diabetes related variables; age at onset of diabetes, duration of diabetes and HbA1c values on the generic QoL scores of the children with diabetes were also studied.

Children with young age at onset of diabetes showed better generic QoL scores. Their generic QoL scores were 88.3±3.1 and 77.8±2.9 respectively, p=0.003. Children with HbA1c values <7.5% reported better QoL scores compared to those with values >7.5% in the entire domains (HbA1c <7.5% and >7.5% 91.4±1.7 and 67.1±6.6 p=0.0001). Children with duration of diabetes <2years, had better QoL scores than those with duration >2years (83.7±1.8 and 75.2±3.2 respectively t=2.5 p= 0.01).

3.4. Diabetes-Specific HRQoL as Reported by Children with T1DM and Their Parents

The mean total diabetes-specific QoL scores from child self-report and the proxy-reports were not statistically significant. Statistically significant differences were found in the worry and treatment adherence domain as shown in Table 3. The mean diabetes-specific QoL scores from the child self-report were also compared with that obtained from children with diabetes in other countries. This is shown in table 4.

Table 3. *Diabetes-specific QoL scores reported by children with diabetes and their parents (mean ± SEM).*

PedsQL^{TM}DM	**Children-self report (n=58)**	**Parents proxy report (n=58)**	**t**	**p**
	mean (±SEM)	**mean (±SEM)**		
Diabetes symptoms	71.8± 1.8	72.2 ±1.8	-0.1	0.8
Treatment barriers	75.1± 2.4	77.0 ±2.2	-0.6	0.5
Treatment adherence	73.5 ± 2.5	66.1± 2.5	2.1	0.04
Worry	79.9 ±3.2	70.0±2.7	1.8	0.03
Communication	65.6±3.8	66.6±4.2	0.4	0.7
Total	73.2±1.8	70.4±1.7	0.6	0.5

DM=Diabetes Module

Table 4. *Diabetes-specific QoL scores reported by patients from four different countries. (mean ± SEM).*

PedsQL ^{TM} DM	**Children with T1DM (SE Nigeria)**	**Abdul (Kuwait)**	**Jafari**	**(Iran)**	**Vermi (multi-ethnic)**
Diabetes symptoms	71.8± 1.8	63.4±13.1	59.21±14.46		65.31 ±15.79
Treatment barriers	75.1± 2.4	70.3 ±11.5	58.38±21.51	73.72 ±20.91	
Treatment adherence	73.5 ± 2.5	76.6±10.2		60.18±18.12	80.81±15.50
Worry	79.9 ±3.2	69.9±11.1	56.47±23.35	71.54±22.48	
Communication	65.6±3.8	75.3±11.3	61.08±27.34	74.07±25.08	
Total		73.2±1.8	70.2±9.8	59.32±20.96	73.09 ±19.95

DM=Diabetes Module

3.5. Effect of Gender, Age, Social Status and Clinical Variables on Diabetes Specific QoL Scores

The mean diabetes-specific QoL in relation to gender were 73.9±1.6 and 69.8±1.9 for male and female respectively (t=1.7, p=0.09). The mean diabetes-specific QoL score for the different age groups were 78.8±7.9, 75.5±2.2 and 71.2±2.3 for ages 5-7years, 8-12years and 13-18years respectively, p=0.03. There was no significant difference noted between the mean scores of the various socioeconomic classes; 74.4±3.9, 72.2±9.6, 76.2±5.1, 72.6±2.8 and 72.1±3.0 respectively, p=0.98.

Subjects with HbA1c values <7.5% reported a better QoL Scores than those with higher HbA1c values in the treatment barrier: 86.0±5.6, 69.4±7.7 and 73.0±2.4 (p=0.05) and Treatment adherence: 77.3±3.2, 60.3±5.6 and 73.2±4.6 (p= 0.04) domain. Children with early onset of diabetes reported better QoL scores although this difference was not statistically significant p=0.3. Children with diabetes duration ≤ 2years had better QoL scores than those with diabetes duration >2years (75.1±1.9 and 69.1±3.4 respectively, t=1.6, p=0.04).

3.6. Correlation Between the PedsQL^{TM} 4.0 Generic core Scale Scores and the PedsQL^{TM} 3.0 Diabetes Module Scores

The mean quality of life scores using the PedsQL^{TM} 3.0 diabetes module compared with the PedsQL TM 4.0 generic core scale QoL scores among the children with diabetes had a strong correlation using the Spearman's rho correlation coefficient p=0.003. Better QoL scores in the diabetes-specific module were associated with better generic QoL scores. Figure 2.

Figure 2. *Correlation between the PedsQL^{TM}4.0 generic core scale scores and the PedsQL^{TM}3.0 diabetes module scores.*

4. Discussion

This study has demonstrated similarity in the perception of HRQoL among children with and without diabetes in the same environment and this was generally positive. Although the children and adolescents with T1DM in this study reported lower mean generic HRQoL scores than those without diabetes, the difference in the mean generic HRQoL scores were not statistically significant. This finding is consistent with that of Lukács *et al,* [17] Laffel *et al* [19] and Emmanouilidou *et al.* [20]

On further analysis of the sub-scales in the generic module, there was similarity in the physical, emotional and social functioning of the children and adolescents with and without diabetes in this study showed similarity. Cultural and social factors associated with support from our extended family system might, at least partly, have strengthened these children with T1DM to cope physically, emotionally and socially with their disease. The children with T1DM however, had a significantly lower QoL scores in the school functioning domain compared to their peers without diabetes. This implies a significantly impaired school functioning among the children with T1DM in this study. The finding of low scores in the school functioning QoL domain however has been reported by Al-Akour *et al* [21] and other researchers. [1, 18] Al-Akour *et al,* [21] attributed this low QoL score in the school functioning in their cohort to frequent absence from school and the subtle neurophysiologic changes associated with poor glycaemic control. In our subjects, frequent absence from school and inability to keep up with schoolwork were found.

There was no significant difference in the mean generic scores of the children and their parents/guardian proxy report. The children and parents/guardian concordance showed similarity in both children with and without diabetes. The parent's proxy report therefore confirmed the report obtained from the children. This is similar to the finding of Lukács *et al* [17] and Stahl *et al.* [22]

Regarding the diabetes-specific QoL using the PedsQL^{TM} 3.0 Diabetes Module, children with T1DM report a satisfactory diabetes-related HRQoL similar to that obtained by Varni *et al* [12] using the same measure. This finding differ from that obtained by Jafari *et al* [10] and Abdul-Rasoul *et al. [*1] The children with diabetes in this study reported better diabetes-related HRQoL than the Iranian and Kuwait children in their respective studies. [1, 10] The difference observed may be attributed to the instruments used. In their studies, Jafari *et al* [10] and Abdul-Rasoul *et al* [1] used the Persian version of the PedsQL^{TM} 3.0 diabetes module which has been said to have good reliability and convergent validity, but should be assessed with caution when interpreting its discriminate validity of diabetes symptoms subscale in children [10]. In this study, the English version of the PedsQL^{TM} 3.0 Diabetes Module was used. This tool was also used by Varni *et al* [12] in a multi-ethnic study involving children of White/non-Hispanic, Hispanic/Latino, Black/non-Hispanic, Asian/Pacific Islander, American Indian/Alaskan Native ethnicity.

Comparing the child self report and parents/guardian proxy report of the diabetes-related QoL scores, the difference in the QoL scores were not statistically significant. This is consistent with the finding of Lukács *et al* [17]. Significant discrepancy was observed in the worry and treatment adherence scales a finding similar to that of Abdul-Rasoul *et al* [1] and Lukács *et al* [17]. This significant differences in these domains highlights the importance of not relying only on information collected from the children and adolescents alone. Caregivers should be involved whenever possible so as to obtain accurate and valid reports on QoL that will be useful in the management of the children and adolescents.

The females reported lower QoL scores compared to the males in the entire domain in both children with and without diabetes. However, these differences were not statistically significant. Similar finding was reported by Lukács *et al* [17]. Several studies [23 - 25] have shown that gender differences affect QoL scores both in the healthy population as well as chronic diseases including diabetes. Females have been found to report poorer QoL scores than males [17]. Using the diabetes-specific QoL module to assess the QoL of children with diabetes. Females reported lower scores compared to the males in all the domains, but this was not statistically significant. This observation among children with T1DM may be attributed to the impact of puberty and adolescence on the optimal management of diabetes which may be more critical for girls. Social pressures and self-consciousness associated with puberty may be marked in females compared to males, and this may affect their diabetes management and hence negatively impacting the HRQoL in girls. This finding is consistent with that of De Wit *et al* [4] and Huang *et al* [22].

The age of the patient was an important predictor of QoL in the generic and diabetes- specific module among children with T1DM. The young children (5-7years) reported better QoL scores in the diabetes symptoms, treatment barrier, treatment adherence and worry domain with treatment barrier being most statistically significant. This is similar to the findings of Wagner *et al* [23]. The impact of parental involvement in the management of diabetes in the 5-7years age group which may be diminishing in the older age group, as the adolescents strive for autonomy may partly contribute to better quality of life in the younger age group. Wagner *et al* [23] associated parental involvement in the young children with better monitoring of blood glucose level and better quality of life. Preoccupation with the thought of the short-term and long-term consequences of the disease, conflicts with parent over diabetes management which may lead to more stressful parent - adolescent relationship and physical limitations due to complications of diabetes that may be seen more frequently in adolescents may have negative impact on their QoL.

A younger age at onset of diabetes was associated with better total mean diabetes–specific QoL scores as has previously been reported by Wagner *et al* [23] Children with age at onset of diabetes between 4-7years were found to have better QoL scores in the diabetes symptoms, treatment barrier, treatment adherence and worry domains. In this study however, all the children with age at onset of diabetes between 4-8years had diabetes duration less than 2years. Short duration of diabetes has been found to be associated with good QoL. Furthermore, there was a huge disparity in the number of children diagnosed between 4-7years (n=6) and those diagnosed between 8-16years (n=52). Comparing such groups may not be ideal; as such may in part contribute to the observed outcome.

Diabetes duration greater than 2 years predicted a poorer generic/diabetes-specific QoL score and hence poor HRQoL. This may be attributed to the impact of the disease on the children and the demand of its management on the children and their parents to maintain good glycaemic control. This is similar to the report of Padua *et al* [5] Graue *et al* [24] and other researchers. [1, 20, 25]

Lower HbA1c which as an indication of good metabolic control was found in this study to be associated with better QoL scores in both generic and diabetes-specific modules. The association between HbA1c and better QoL has consistently been reported such that it is now justified to consider QoL and metabolic control equally important in the management of T1DM. [14, 24, 25] Good metabolic control is associated with better physical and neuro-psychological functioning which impact on the QoL scores. Also, better QoL may facilitate better metabolic control through improved self-care as part of a positive circle. This study also found a correlation between low HbA1c values and treatment barrier. High quality of life scores in the treatment barrier domain, implies limited perceived problem with treatment barrier. This translates to better blood glucose testing and insulin administration and these has consistently been associated with good metabolic control evidenced by low HbA1c value. This is congruent with the finding of Kalyva *et al.* [14]

Socioeconomic status (SES) did not significantly affect the mean QoL scores in both generic and diabetes-specific HRQoL, consistent with the finding of Ayuk *et al,* [26] in a related study of children with a chronic disease (Asthma) in South–East Nigeria. One would assume that availability of resources and better parental education could mean better management of diabetes and thus better metabolic control and better QoL. Seventy five percent of the study participant belongs to the lower SEC (IV&V) and this had no negative impact on their HRQoL. The fact that two third of the children with diabetes involved in this study receive free supply of insulin and blood glucose test strips from the hospital where they are followed up might have alleviated the financial burden of diabetes care from the patients and thus may have at least in part contributed to the SES not significantly impacting on their HRQoL. This may have influenced the outcome of this study.

A limitation of this study is the cross-sectional nature of the data which precludes our ability to examine the effects of demographic and diabetes-related variables on HRQoL over time. It is suggested that, in the future, a longitudinal study to determine these be undertaken.

5. Conclusion

The perception of HRQoL was similar in children with and without T1DM. However, the school functioning domain was significantly impaired in the former. Young age, lower HbA1c value and short duration of diabetes, were associated with better HRQoL in children with diabetes.

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