Depressive Symptoms and Quality of Life in a Sample of Children and Adolescents with Insulin Dependent Diabetes

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ABSTRACT

Introduction: Depression has been linked to greater morbidity and impairment on quality of life (QOL) in diabetic children, but this issue has not been sufficiently studied in Sharkia school aged children.

Aim of the study: To assess the relationship between depression and insulin dependent diabetes and their impact on QOL and determined the effect of some demographic and diabetes specific data.

Subjects and methods: A total of 105 school- aged children from Sharkia Governorate (aged 8-17 years) who had insulin dependent diabetes mellitus (IDDM) were evaluated and compared with control group of 105 healthy children. Subjects were assessed for presence of depressive symptoms using the Children's Depression Inventory (CDI), and their QOL measured using the Pediatric Quality of Life Inventory™ (PedsQL™) 0.4 generic core scale. Their glycosylated hemoglobin (HbA1c) was measured, and information about their demographic and diabetes specific variables were collected, their association with presence of depressive symptoms and their effect on QOL were studied

Results: Among the children included in the study, 19.19% had symptoms of depression. Depressive symptoms were significantly correlated with HbA1c level, age, and number of hospitalization. The effect of diabetes with depression on QOL is greater than the effect of diabetes alone. QOL in school aged diabetic children was affected by sex ,age, HbA1c level, body mass index (BMI), number of diabetic ketoacidosis (DKA) episodes and hospitalization in last 6 months, but not affected by level of parental education, duration of diabetes, or number of hypoglycemic episodes in last 6 months.

Conclusion: Depressive symptoms is highly prevalent among diabetic school aged children with significant impact on their QOL. Thus, assessment of the presence and monitoring of the associated variables of depression should be part of the clinical management of such patients.

Key words: Diabetes, Depressive symptoms, quality of life, children

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INTRODUCTION

Diabetes mellitus is 1 of the 3 most prevalent chronic diseases among youth, with the majority of affected youth having insulin dependent diabetes mellitus (IDDM) [1]. Diabetes affects one every 400-600 children[2].Diabetes is frequently accompanied by short term complications such as hypoglycemia, but also by disabling long term complications like cardiovascular disease, neuropathy, nephropathy and retinopathy. Less known is the increased risk for depression: individuals with diabetes have a two-fold increased risk for depression, affecting approximately 1 every 5 diabetic patients[(3,4)].

Children with diabetes have a two-fold greater prevalence of depression, and adolescent up to three-fold greater than youth without diabetes[5].

It is important to note that depression may be under diagnosed in children with diabetes because of the overlap of symptoms such as fatigue, weight loss, and impaired memory, which are common in both mood disorder and poor metabolic control[6]. Several factors contribute to the increased prevalence of depression among those with a chronic illness, including the effect of the disease on physical functioning and activity, social relationships, quality of life (QOL) and morale. Loss of self-esteem and poor adjustment to the chronic illness were responsible. Fear of diabetes-related complications and helplessness to avoid them may lead to poorer self-care[7].

Diabetes, especially IDDM, may place patients at risk for a depressive disorder through a biological mechanism linking the metabolic changes of diabetes to changes in brain structure and function[8]. In addition, fluctuations in blood glucose levels such as hypoglycemic episodes and chronic hyperglycemia may directly contribute to alterations in behavior and mood[9]. The recommended treatment regimen for IDDM is complex and demanding, requiring frequent monitoring of blood glucose levels (at least four times a day), monitoring and controlling of carbohydrate intake, frequent insulin administration (3–4 injections/day or infusion from a pump), altering insulin dose to match diet and activity patterns, and checking urine for ketones when necessary[10]. However adherence to the demand of intensive treatment may be burdensome and stressful for youth with IDDM and cause changes in the young person's life style and interfere in their self-image and QOL [11].

A child's diabetes-related QOL is important, not only to overall psychological adaptation, but also to health status, as it is associated with diabetes management, including medical regimen adherence, metabolic control, and risk for long-term complications[12].

In the current study we examine the presence of depressive symptoms in sample of Sharkia Governorate diabetic school aged -children and their effect on QOL and if they were associated with certain demographic or diabetes specific variables as age, sex, body mass index (BMI), duration of diabetes, mean glycosylated hemoglobin (HbA1c) level, parental education level, frequency of diabetic ketoacidosis (DKA) and hypoglycemic episodes, and hospitalizations in the previous 6 months.

PATIENTS AND METHODS

Participants:

Patients: A total of 105 Sharkia school aged children, were recruited from all attendance of the pediatrics endocrinology outpatient clinic, Zagazig University Hospital through the year 2009, with diagnosis of insulin dependent diabetes mellitus, aged 8 to 17 years. These patients had no history of psychiatric, acute or chronic medical illness, no family history of depression, and duration of IDDM is more than one year to exclude events associated with diagnosis and acute phase of illness.

IDDM patients were classified into two groups according to Children's Depression Inventory (CDI) score, group with depressive symptoms (n=20), and group without depressive symptoms (n= 85).

Controls:

One hundred and five matched non diabetic children were recruited from governorate school that had no depression and no history of psychiatric or medical illness.

Informed consent was obtained from all participants or their parents after explaining the full procedure. The study was approved by the Ethical Committee of the Psychiatry and Pediatric departments at Zagazig University Hospital.

Assessment:

All participants were assessed by:

Clinical assessments:

Patients were subjected to semistructured psychiatric interview, a specially designed semistructured interview: derived from the Psychiatry Department sheet of Zagazig University to obtain, clinical data and to confirm diagnosis, family history of depression was obtained.

Data evaluated from all patients and controls included standardized medical history and thorough physical examination.

Depression assessment:

Depressive symptoms were assessed by the Arabic version of Children's Depression Inventory (CDI)[13]. it is a self-reported questionnaire measuring depressive symptoms in school-aged children and adolescents, consisting of 27 items, and yield total scores from 0 to 54. Higher scores reflect greater symptomatolgy. A score of ≥13 is indicative of elevated depressive symptoms. The CDI has wide use across chronic health conditions, specifically diabetes[(14)].

Quality-of-Life assessment: We used the Pediatric Quality of Life Inventory^{MT} (PedsQL^{MT}). It is a 23-item, multidimensional quality-of-life instrument designed for use with children. Child self-report forms are available by age group (5-7, 8-12, 13-18, and -19 years). The form contains the following

5 subscales: physical health, psychosocial health, emotional functioning, social functioning, and school functioning. A total score and individual subscale scores can be calculated. The instrument was translated into arabic and every item was explained for participant. Acceptable levels of reliability and validity for the PedsQL have been reported in both healthy and chronically ill children[15]. Score range from 0 to 100 with higher PedsQL scores indicating better levels of functioning and HRQOL. It is used to compare diabetic and non diabetic youth[16]. We utilized a general measure of QOL rather than a diabetes-specific measure, which may underestimate the overall negative impact of diabetes on life style of these children.

Glycemic control assessment:

Metabolic control was assessed with HbA1c, a measure of the child's average blood sugar over the past 3 months. Average HbA1c for populations without diabetes is <6%. The American Diabetes Association (ADA) recommendation for children ages 6–12 is <8%)[10]. HbA1c was measured by quantitative colorimetric determination of HbA1c in whole blood. Kitts Supplied by STANBIO laboratory. USA[17]. We divided our patients into two groups according to HbA1c values, a group with good metabolic control (HbA1c <8%), and a group with poor metabolic control (HbA1c ≥ 8%).

Body mass index assessment:

Body mass index (BMI) of children was calculated by dividing their measured weight in kilograms by their measured height in meter squared. Over weight defined as a BMI ≥95th% percentile for one's age and sex, and 85- 95th% as border line obesity , and < 85th% as normal weight.

Statistical analysis:

Statistical analysis was performed using SPSS 11.0. Demographic and diabetes specific variables are presented as mean and standard deviation in continuous variables and in absolute numbers and percentages. Unpaired t tests and one-way ANOVA were used for comparisons between the scores in the reports of the diabetic and healthy group. The Pearson and spearman's correlation coefficient were used to assess associations of demographic and diabetes specific variables with depression and QOL. Linear regression models were fit to look at the simultaneous effects of these demographic and diabetes specific variables on the CDI and PedsQL total and subscale scores. For all analyses, p value of ≤ 0.05 was considered to provide statistical significance.

RESULTS

The study sample consisted of 105 diabetic school- aged children and 105 healthy control children with mean age of 11.9±2.8 and 11.6±2.9 years respectively. The diabetic patients were 47.6% males and 52.4% females. Duration of IDDM was 4.9±2.4 years and mean HbA1c was 8.1 ±2.1 %.On the basis of their scores on CDI, 20 diabetic children (19.19%) were grouped as having depressive symptoms ((27.5±7.2), and 85 as without depressive symptoms (7.8±2.1). The CDI scores difference between groups was highly significant (P<0.0001). The characteristics of the participants are shown in table (1). Comparison of IDDM children with and without depressive symptoms and controls revealed no significant differences regarding gender, age, or parent's education. Compared to diabetic children without depressive symptoms, IDDM children with depressive symptoms had significantly longer duration of diabetes, higher HbA1c level, higher BMI, higher numbers of hypoglycemic and diabetic ketoacidosis (DKA) episodes, and higher number of hospitalization in previous 6 months.

Comparison of CDI scores in IDDM children with depressive symptoms according to demographic and diabetes specific variables are given in table (2) which demonstrate that children (8-12 years) reported a significant lower CDI scores than adolescents (13-17 years) (P= 0.004). Girls reported a higher CDI scores but with no significant difference (P=0.4). Patients with HbA1c values ≥ 8 reported significant higher CDI scores (P=0.003), and children with increased frequency of hospitalization in previous 6 months had significant higher CDI scores (P= 0.01), but duration of diabetes, parent's education, BMI, number of hypoglycemic, and DKA episodes in previous 6 months were not significantly related to CDI scores (P > 0.05).

There were significant positive correlation between CDI score and age (r=0.6, P=0.003), HbA1c level (r=0.8, P<0.0001), and number of hospitalization in previous 6 months (r=0.5, P=0.006) in patients who had IDDM with depressive symptoms. By linear regression, CDI is affected by age (P< 0.0001), HbA1c level (P< 0.0001), and number of hospitalization (P = 0.006).

The PedsQL total and subscales mean score of the three groups presented in table (3). QOL total, physical and psychological health, and emotional, social and school functions scores, were found to be significantly lower for children with IDDM with depressive symptoms

compared with those of IDDM without depressive symptoms and higher in healthy control. The diabetic children (8-12 years) reported a higher scores with significantly higher QOL total and subscales scores than adolescents (Figure 1). By sex based effect boys reporting better QOL than girls with significant difference in total score and all subscales (P=0.01) except emotional function (Figure 2). Children and adolescents with good metabolic control (HbA1c < 8) reported better and significant total and subscales scores (P<0.0001) (Figure 3). High BMI was significantly related to low QOL total and all subscales (P<0.05). There were significantly higher QOL total and subscales scores as regard number of DKA episodes and number of hospitalization in the last 6 months (P<0.0001) with no significant difference in QOL total and subscales scores as regard parental education level, duration of diabetes, or number of hypoglycemic episodes (P> 0.05).

IDDM children had significant negative correlation between age and QOL total, and all subscales (P<0.05), and between sex and QOL total and subscales (P < 0.05) except emotional function score (P = 0.1). There were significant negative correlation between QOL all scores and HbA1c level , BMI, CDI scores, and number of hospitalization and DKA episodes in the last 6 months (for each P< 0.0001) but no significant correlation between duration of diabetes, level of parental education ,or number of hypoglycemic episodes in the last 6 months and QOL scores (P > 0.05).

By linear regression the factors with the greatest negative impact on the QOL in IDDM school-aged children were sex which affects all scales except emotional function. Age, HbA1c level, BMI, and number of hospitalization, and DKA episodes in the last 6 months had negative impact on QOL total and all subscales. But duration of diabetes, level of parental education, and number of hypoglycemic episodes had no impact on QOL.

Table 1: Demographic and diabetes specific variables.

	IDDM with dep.sym N=20	IDDM without dep.sym N=85	Control N=105	P
Age(years) mean±SD	12.8 ± 2.9	11.8 ± 2.7	11.6 ± 2.9	0.2
8-12y	9 45%	49 57.6%	72 68.6%	
13-17y	11 55%	36 42.4%	33 31.4%	
Sex				
Boys	7 35%	43 50.6%	49 46.7%	0.4
Girls	13 65%	42 49.4%	56 53.3%	
Duration of diabetes(years) mean±SD	5.9 ± 2.9	4.6 ± 2.3		0.04*
1-3y	6 30%	29 34.1%		
>3-6y	4 20%	35 41.2%		
>6y	10 50%	21 24.7%		
HbA1c%	8.9± 1.1	7.9 ± 1.3		0.001**
<8%	3 15%	42 49.4%		
≥8%	17 85%	43 50.6%		
DKA episodes(n).				
0	8 40%	71 38.5%		<0.0001**
1	10 50%	14 16.5%		
≥ 2	2 10%	0		
Hypoglycemic episodes(n).				
0	11 55%	72 84.7%		
1	7 35%	12 14.1%		0.006*
≥ 2	2 0%	1 1.2%		
Hospitalization(n).				
0	5 25%	72 84.7%		
1	10 50%	12 14.1%		<0.0001**
≥ 2	5 25%	1 1.2%		
Parent education				
-Less than high school graduate.	9 45%	26 30.6%		
-High school graduate.	8 40%	32 37.6%		
-Some collage.	3 15%	26 30.6%		0.4
-Bachelor degree or more.	0 0	1 1.2%		
BMI				
< 85th%	7 45%	68 80%	86 81.9%	
85-95th%	9 35%	13 15.3%	12 11.4%	0.006*
≥ 95th%	4 20%	4 4.7%	7 6.75	
CDI score	27.5± 7.2	7.8± 2.1	5.3± 1.8	< 0.0001**

*=Significantly, **= Highly significant, IDDM = Insulin dependent diabetes mellitus, HbA1c= Glycosylated haemoglobin, DKA= Diabetic ketoacidosis, BMI= Body mass index, CDI= Children's depression inventory , dep.sym= Depressive symptoms, SD=Standard deviation.

Table 2: CDI scores in IDDM patients with depressive symptoms according to demographic data

Variables	N.	CDI score Mean ± SD	F	df	P
Age(years)					0.004*
8-12y	9	22.7 ± 4.6	1.7	18	
13-17y	11	31.4 ± 6.5			
Sex					
Boys	7	25.9 ± 8.4	0.007	18	0.4
Girls	13	28.5 ± 6.6			
Duration of diabetes(years)					
1-3y	6	32.1 ± 7.5			0.1
>3-6y	4	24.2 ± 2.2	2.1	2	
>6y	10	26. 1± 8.2			
HbA1c%					
< 8%	3	17 .0 ± 1.0	4.1	18	0.003**
≥ 8%	17	29.4 ± 6.0			
DKA episodes (n).					
0	8	25. 7 ± 8.3	0.8	2	0.4
1	10	27.9 ± 6.5			
≥ 2	2	33 ± 5.6			
Hypoglycemic episodes (n).					
0	11	28.2 ± 7.7			
1	7	28.1 ± 6.4	0.7	2	0.4
≥ 2	2	21.5 ± 7.7			
Hospitalization (n).					
0	5	20.6 ± 5	5.1	2	
1	10	28.6 ± 5.3			0.01*
≥ 2	5	32.4 ± 7.9			
Parent education					
-Less than high school graduate.	9	27.7 ± 6.6			
-high school graduate.	8	25.6 ± 7.4	0.8	2	0.4
-some collage.	3	32.0 ± 8.8			
-bachelor degree or more.	0	0			
BMI					
<85th%	7	30.5 ±8.4			
85-95th%	9	26.1 ±2.6	1.7	2	0.2
≥ 95th%	4	23.25 ±8.1			

*=Significant, **= highly significant, HbA1c= Glycosylated haemoglobin, DKA= Diabetic ketoacidosis, BMI= Body mass index, CDI= Children's depression inventory, SD= Standard deviation.

Table 3: Comparison between PedsQL scores in children had IDDM with and without depressive symptoms and healthy control.

Scale	N.	Mean ± SD	df	F	P
Total score					
- IDDM with dep.sym	20	43.5 ± 8.5	2	201.7	< 0.0001**
- IDDM without dep.sym	85	77.3± 10.3			
- Healthy control.	105	87.6± 7.9			
Physical health.					
- IDDM with dep.sym	20	54.7 ± 5.8	2	217.5	< 0.0001**
- IDDM without dep.sym	85	84.9 ± 9.1			
- Healthy control.	105	91.4 ± 5.4			
Emotional function.					
- IDDM with dep.sym	20	31.8± 10.4	2	168.9	< 0.0001**
- IDDM without dep.sym	85	71.7± 13.6			
- Healthy control.	105	85.4± 10.7			
Social function.					
- IDDM with dep.sym	20	34.0± 9.3	2	192.2	< 0.0001**
- IDDM without dep.sym	85	72.5± 13.5			
- Healthy control.	105	87.0± 9.5			
School function.					
- IDDM with dep.sym	20	46.3± 5.8	2	70.8	< 0.0001**
- IDDM without dep.sym	85	47.4± 16.1			
- Healthy control.	105	84.4± 11.7			
Psychological function.					
- IDDM with dep.sym	20	36.6± 6.8	2	178.4	< 0.0001**
- IDDM without dep.sym	85	72.6± 12.6			
- Healthy control.	105	85.7± 9.6			

**=Highly significant, IDDM = Insulin dependent diabetes mellitus, dep. Sym. = Depressive symptoms, SD= Standard deviation.

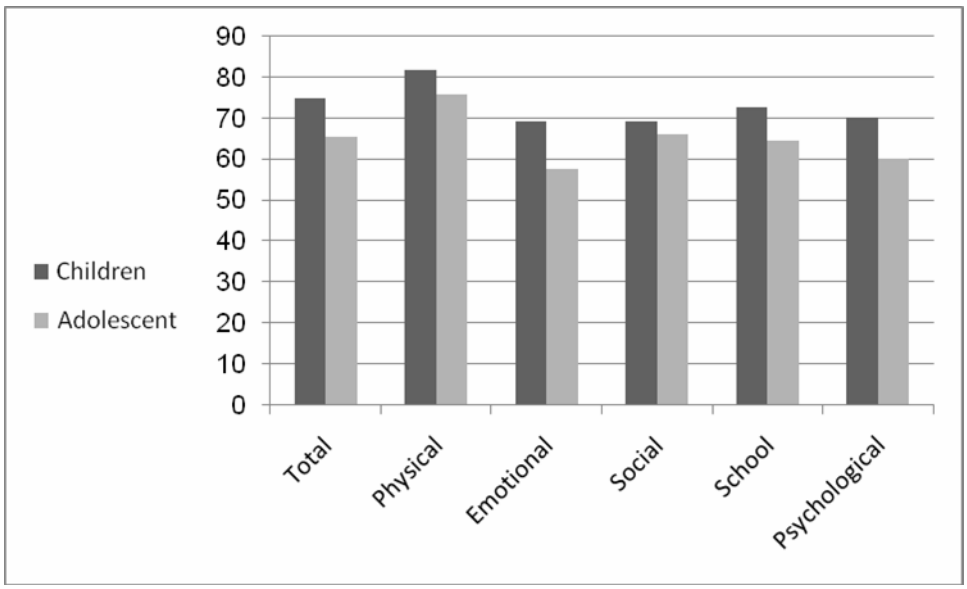

Figure 1: PedsQL scores in school aged children with IDDM according to age groups, children aged 8-12 years , and adolescents aged 13-17 years. ($P < 0.0001$)

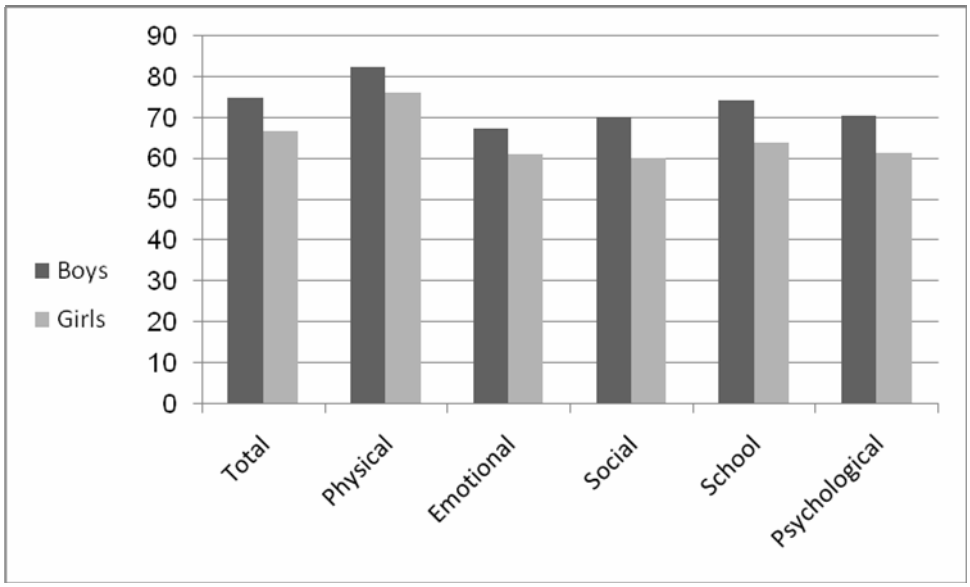

Figure 2: PedsQL scores in school aged children with IDDM according to sex. ($P = 0.01$).

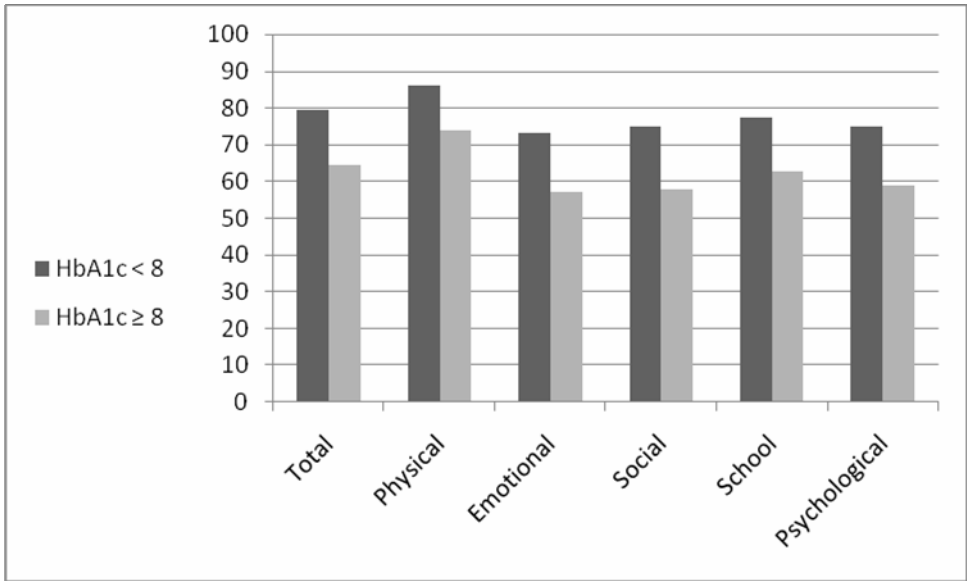

Figure 3: PedsQL scores in school aged children with IDDM according to metabolic control. HbA1c < 8 = good metabolic control, and ≥ 8= poor metabolic control. (P< 0.0001)

DISCUSSION

In view of the increasing prevalence of depression in children and adolescents with insulin dependent diabetes mellitus, detection of depressive symptoms has benefits in controlling of diabetes.

The present study demonstrated that 19.19% of school aged children and adolescent with diabetes had depressive symptoms. This result within the range of 7-21% provided by some studies[5,18], and higher than the 12.3% reported by Jaser et al.[19]. Estimates of the prevalence of depressed mood among school aged children vary by study design, screening or diagnostic tool used, diagnostic criteria used, and the training of the interviewers.[20]

In contrast to these and other studies Lawrence et al.[21] found that the prevalence of depressed mood among youth with diabetes was similar to that in unaffected populations, suggesting that the majority of youth with diabetes do remarkably well in coping with diabetes while also undergoing the often stressful psychosocial and physiological changes that occur during adolescence.

In current study adolescents with IDDM and depressive symptoms reported a significantly higher CDI scores than children, since adolescents are significantly more prone to depression than children at earlier ages[5].

As regard of gender difference most depressed children were females but with no significant difference from

Males. Some studies found that females are more affected by depression[18,21]. On the other hand Grey et al.[5] reported significantly more depression in males over time.

In the current study the score of depressive symptoms was correlated with age, HbA1c levels, and number of hospitalization in the previous 6 months and was not correlated with sex, duration of disease, BMI, level of parental education and number of DKA and hypoglycemic episodes in the previous 6 months.

Meta-analysis reviewing 28 studies measured the associations of depression in relation to glycemic control concluding that depressive symptoms was associated with hyperglycemia in patients with types 1 and 2 diabetes but revealed neither the mechanism nor the direction of the association[22]. The depressive symptoms were associated with high HbA1c values [23,24]. Hassan et al.[25] noted that those with poor metabolic control were three times more likely to be depressed than those with good control and that for each 1% rise in HbA1c there was a 27% increased probability of depression. Other studies did not find any

association[19,26]. In addition, they concluded that individuals with diabetes and HbA1c level ≤ 7% more often had affective disorders than those with poor glycemic control[26]. In the general population, patients with high HbA1c levels reported slightly but significantly higher levels of well-being than patients with low HbA1c levels[27]. These associations can be bidirectional (e.g., more depression causing poorer glycemic control and vice versa)[18].

Our finding are not consistent with those of Lawrence et al.[2)] who found higher prevalence of depressed mood with being overweight. But are consistent with those of Hood et al.[18] who agree with our result.

Our findings are in accordance with previous studies which found relation between duration of diabetes and depressive symptoms[21,28]. Other studies showed that disease duration was significantly correlated with depressive symptoms scores[29,30]. Kovacs et al.,[(31)] reported that depressive symptoms was not uncommon among youth soon after they were diagnosed with diabetes but that the depression tended to resolve within 6 months, and that their mood then remained relatively stable over a 6-year period . Grey et al.[5] found that youth with diabetes reported significantly higher depressive symptomatology than those without diabetes at the time of the diabetes diagnosis and then again at the end of the second year. They characterized this second period of depression as being associated with the end of the physiologic honeymoon period and the necessity of learning to live with diabetes lifelong.

Like Lawrence et al.[21] we found that depressed mood was associated with a higher number of hospitalizations. Others reported that depressive symptoms and behavior problems have been associated with increased risk of multiple diabetes-related hospitalizations[32,33]. In a study using data from the Pediatric Health Information System, there was no association between internalizing disorders (which included depressive disorders) and repeat hospitalizations among children and adolescents with diabetes.[(34)]

There was no association between level of parents education and depressive symptoms in diabetic school aged children in our study. These finding are inconsistent with Lawrence et al. [21]

A major finding of this study was that school-aged children with IDDM reporting significantly lower QOL than did those without diabetes, similar to those reported previously in other pediatric studies, which indicated lower HRQOL among children with chronic conditions, including diabetes, compared with healthy age-matched children[11,15]. Thus, understanding how both diabetes and its treatment influence the child's QOL becomes important. Intensive treatment of IDDM often disrupts a child's usual activities, requires disease-focused behaviors from the child and family, and potentially impacts overall QOL[35].

Our study reported lower QOL in Sharkia School aged children with IDDM and depressive symptoms than those with diabetes only. All studies reported a negative association between depressive symptoms and at least one aspect of QOL in people with diabetes. Diabetic individuals with depressive symptoms also had a severely lower diabetes specific QOL. Generic and domain specific QOL were mild to moderately lower in the presence of depressive symptoms. Therefore, increased awareness and monitoring for depression is needed within different diabetes care settings[36].

Depression has a profound adverse influence on QOL and overall functioning and has additional repercussions with individuals with diabetes because of its association with poor management[37]. This association is poorly understood but has been hypothesized to operate through depression induced abnormalities in neuroendocrine and neurotransmitter function[38], through decreased compliance with diabetes management, or because of as-yet-unknown complex behavioral–physiologic interaction[39].

The age effects in our study confirm the results of previous reports[11,40,41]. Children (8-12 years) rated QOL scores higher than the compared adolescents, indicating a higher stress level with the beginning of puberty[42] Adolescents with IDDM have a higher rate of depression and lower self-esteem than younger children[43.]

We reported that boys had better QOL than girls. This finding are important and complement other published reports[44,45]. As girls approach puberty and adolescence, they may experience more social pressures and self-consciousness, which may affect their QOL and management of their diabetes. Whereas boys may become more accustomed to the management activities that are associated with diabetes over time[46]. But Vanelli et al.[47] found that the impact of diabetes on QOL was similar for both boys and girls.

In current study good metabolic control (HbA1c < 8%) resulted in higher QOL as children with good or satisfactory metabolic control (HbA1c < 8%) reported higher physical wellbeing[40]. Poor metabolic control in youth with diabetes and depression may be associated with both physiological and behavioral factors[5,19,25,40,45,48] nevertheless these findings contradict with other reports[11,40]. The influence of metabolic control on QOL is controversial. In addition, a higher BMI was significantly associated with poorer QOL total

and subscales scores similar to results in some studies[16, 40,46, 49,50]. There is an association between obesity and decreased QOL, specifically dimensions related to psychosocial health, self-esteem, and physical functioning, in school-aged children[51].

Number of hypoglycemic episodes was not significantly associated with QOL similar to that reported by Hilliard et al.[52]

In current study parental education and duration of diabetes were not significant predictors of overall QOL and this is consistent with result of other studies[16,40,46,49,52].

CONCLUSION

There is a high association between depressive symptoms and IDDM in school-aged children in our locality, therefore, it is recommended to monitor not only metabolic values but also the mental condition of these children by using screening instruments for depression as part of regular diabetes care and offer treatment, and to assist youths to better cope with and manage their diabetes to improve their QOL.

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