Psychosocial Illness in Children with Diabetes mellitus

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Abstract:

Introduction

Type 1 Diabetes Mellitus (T1DM) and psychosocial illness influence each other in multiple ways. The extent of psychosocial disorders in children with T1DM remains largely unstudied in Egypt.

Aim

To assess the prevalence, severity, pattern and variables affecting psychosocial aspects in type 1 diabetic patients randomly selected from the pediatric endocrinology clinic in Fayoum university hospital and to study the possible epidemiological risk factors.

Material and Methods

This observational study included 45 children (6-14 years of age) having T1DM at least for 1 year and 45 non diabetic children for comparison. "DSM-5 parent/guardian-Rated Level 1 & 2 Cross-Cutting Symptom Measure –Child age 6-17" was used to assess psychosocial illness, specific domains and severity. Socio-demographic variables were studied and HbA1c levels were measured.

Results

Significantly higher prevalence of psychosocial illness was observed in children with T1DM as compared with non diabetic group (57.78 % vs 17.78%; $p<0.0001$). The prevalence for mild, moderate and severe psychosocial illness was 8.89%, 28.89% and 17.78% respectively in diabetic children. Most common psychosocial abnormality was depression (42.22%), followed by irritation (40%) and anxiety (35.56%). The prevalence of psychosocial illness was significantly higher in T1DM patients with poorer metabolic control (HbA1c>7.5, $p=0.038$). Significant association of psychosocial illness was also noticed with poor dietary compliance ($p=0.040$) and number of self-monitored glucose level per day ($p= 0.035$).

Conclusion

This study established T1DM as a risk factor for development of psychosocial illness. Depression, irritation and anxiety were most common abnormalities. Significant association of psychosocial illness with poor dietary compliance and poor metabolic control was observed. Psychosocial assessment of every diabetic child is suggested for optimal management.

Keywords: Dietary compliance, DSM-5, Irritation, Metabolic control

Introduction

Diabetes mellitus is one of the major public health challenges. It is one of the top ten causes of death in the world. According to the latest global burden of disease study in 2020, more than 476 million people of different ages in the world have diabetes. This number is predicted to reach more than 700 million people by 2045 (1). The prevalence of diabetes in children is increasing day-by-day, and there are more than one million children with diabetes (2).

Psychiatric problems in children are rising and only a small number of cases present in psychiatric Out Patient Department (OPD) mainly due to sparse mental health services, stigma and less awareness to psychiatric problems and as a result of that large number of cases remains unreported and some reports say that 50% of adult psychiatric disorder cases had onset by age of 15 years (3). Epidemiology of childhood psychiatric disorders have showed that onset before adulthood may be a characteristic of the majority of adult psychiatric disorders in which the early intervention for these has the potential to substantially alter the developmental course of these adult disorders, hence significantly reducing the morbidity (4).

It is estimated that 10-20% of children and adolescents are affected annually by psychiatric problems in which surveys conducted have revealed that (7- 30%) of children under the age of 12 years need either evaluation or continuing psychiatric care. It is not surprising that very little work has been done in the area of mental health of children in the world (5).

Type1 diabetes in childhood has been found to be associated with an increased risk of psychiatric comorbidities (6), which might intensify the burden of disease and accelerate metabolic deterioration, subsequently increasing the risk of mortality and long-term complications such as retinopathy, nephropathy, and neuropathy (7).

Metabolic dysregulation is closely linked to age and diabetes duration, showing a peak in adolescence and early adulthood (8).
Early adolescence is also characterized as a time of psychological vulnerability (9), in which the incidence of major psychiatric disorders increases (10).

A diagnosis of type 1 diabetes in early adolescence seems to increase psychological distress (11), and three large population-based studies have shown higher rates of psychiatric disorders in children and adolescents with type 1 diabetes compared with the general population (6).

In particular, increased risk was seen for depression, anxiety, and eating disorders, where the pathogenesis is considered to involve reactive mechanisms and imbalances in the diathesis-stress system (12).

Materials and Methods

This was a cross sectional, comparative study, carried out in Fayoum university hospital. Source of data was patients presenting to the paediatric Endocrinology clinic. After obtaining approval from the institutional ethical and research committee and taking written informed consent from parents/guardians, 45 children were enrolled in the study by convenience non-probability sampling. Patients of either gender, presenting to pediatric hospital with diagnosis of T1DM,

fulfilling all of the following criteria were enrolled: 1) Age group 6-14 Years; 2) Diagnosed for diabetes mellitus type 1 at least one year earlier; 3) He/she has been living with a parent(s) or parent surrogate longer than the last 12 months.

A control group of 45 children, between 6-14 years, of either gender presenting to the hospital either for minor acute illness or accompanying other patients were enrolled for comparison. Patients with any nervous system disease, psychiatric disease (before the diagnosis of T1DM) or any chronic disease other than T1DM (congenital or acquired) were excluded from the study. Patients' parents were explained about the study and were asked to sign a written informed consent.

All the parents of the patients in study group were subjected to detailed history taking using a self-designed proforma regarding their socio-demographic details (age, gender, caste, residential address etc.,), onset and duration of disease, number of times patient has been hospitalized for diabetic ketoacidosis or episodes of hypoglycaemia. Proforma also included family history of diabetes, family structure, attitude of family and friends toward the disease, caregivers' literacy status and their knowledge of the disease and its management, compliance for the advised diet, insulin regime and other relevant information. Compliance for diet was judged as good, fair or poor by the interviewer according to their reported adherence to the prescribed dietary plan. Patients who strictly followed the prescribed diet plan, were recorded as good compliant; who sometimes did not follow the diet plan (approximately 3-4 times a month) were considered as fair and those who mostly/regularly did not follow the diet plan were considered as poor compliant. Metabolic control was assessed according to their HbA1c levels and defined as good (6.0-7.5), fair (7.6-9.9) and poor (>10) (13).

For psychosocial impairments, "DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) parent/guardian rated Level 1 Cross-Cutting Symptom Measure–Child age 6-17" (14) was used to assess mental health domains that are affected. This is a measure offered by American Psychiatric Association (APA) which was developed to be administered at the initial patient interview and to be used for research purpose. There were 12 domains which were studied in this measure: Somatic symptoms, sleep problems, inattention, depression, anger, irritability, mania, anxiety, psychosis, repetitive thoughts and behaviours, Substance use and suicidal ideation/suicide attempts.

After interviewing the parents, each item of the domain was scored on a 5 point scale. If the highest score for the domain exceeded the threshold score, further inquiry for that domain was done using the "DSM-5 Level 2 Cross-Cutting Symptom Measure" (14) according to which the domain could be categorized into mild, moderate or severe. Highest severity in any domain was taken into account for categorization of illness. Similar tools for assessment of psychosocial problems were administered on control group too. Relevant socio-demographic details were also collected for the control group.

Statistical Methods:

Data management will be performed using the Statistical Package for Social Sciences (version 15.0; SPSS Inc., Chicago, IL, USA). Computed standard descriptive statistics (e.g., mean,

standard deviation) will be used to summarize the data. Nominal data will be analyzed using simple X2 test, while independent sample T-test procedure will be used to compare means for two groups of cases; for more than two groups, data will be evaluated with one-way analysis of variance (ANOVA). A probability value (P value) less than 0.05 was considered significant.

Ethical Consideration:

This study will be reviewed by the Faculty of Medicine Research Ethical Committee. The researcher will inform the participants about the objectives of the study, the examination and the investigations that will be done.Also, the confidentiality of their information and their right not to participate in the study.

Results

A total of 45 T1DM children and 45 non diabetic children were evaluated for the presence of psychosocial illness. Mean age for the study population was 11.02 ±2.65 years and there were 26 (57.78%) males and 19 (42.22%) females. Mean age of non diabetic group was 10.5±2.22 years and there were 22 (48.88%) males and 23 (51.11%) females.

Out of 45, 26 children (57.78%) were found to have at least one psychosocial disorder while the prevalence was only 8 (17.78%) in the non diabetic group, the difference being highly significant ($p<0.001$). Amongst children with T1DM, 9 (17.78%) had severe grade of illness while 13 (28.89%) and 4 (8.89%) exhibited moderate and mild grade symptoms respectively. In the control group, the majority belonged to mild (6.67%) and moderate (8.89%) grades of illnesses and only 2.22 % had severe grade. The difference as regard moderate and sever grade is statistically significant (p value 0.015 and 0.007 respectively) between diabetics and controls.

The most common disorder observed in the children with T1DM was depression (42.22%), followed by irritation (40%) then anxiety (35.56%). In the control group anxiety (17.78%) is the most common disorder, next depression (15.56%) then anger and irritation both (13.33%). (Table 1).

Compliance for diet prescribed found significantly affecting the prevalence and severity of psychosocial illness, as 44.44% of type 1 diabetics, having severe psychosocial illness, had poor compliance for diet as compared to 13.89% of those not suffering from these (p value 0.040). (Table2)

[Table1]:

Pattern of psychosocial illness in children with type 1 DM and control group

	Children with T1DM			**Control group**		
	Total (n=45)	**Males (n=26)**	**Females (n=19)**	**Total (n=45)**	**Males (n=23)**	**Females (n=22)**
Psychosocial illness	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**
Somatic symptoms	8 (17.78)	5 (19.23)	3 (15.79)	5 (11.11)	2 (8.7)	3 (13.64)
Sleep problems	2 (4.44)	1 (3.85)	1 (5.26)	1 (2.22)	0	1 (4.55)
Inattention	5 (11.11)	2 (7.69)	3 (15.78)	0	0	0
Depression	19 (42.22)	11 (42.30)	8 (42.11)	7 (15.56)	3 (13.04)	4 (18.18)
Anger	13 (28.89)	10 (38.46)	3 (15.79)	6 (13.33)	4 (17.39)	2 (9.1)
Irritation	18 (40.00)	9 (34.62)	9 (47.37)	6 (13.33)	3 (13.04)	3 (13.64)
Mania	0	0	0	0	0	0
Anxiety	16 (35.56)	7 (26.92)	9 (47.37)	8 (17.78)	5 (21.74)	3 (13.64)
Psychosis	0	0	0	0	0	0
Repetitive thoughts	0	0	0	0	0	0
Suicidal ideation	0	0	0	0	0	0

[Table 2]:

Association of severe psychosocial illness with compliance for advised diet

	Compliance for diet				
	Poor		**Good to fair**		
Severe psychosocial illness	**No.**	**%**	**No.**	**%**	**Total**
Present	4	44.44	5	55.56	9
Absent	5	13.89	31	86.11	36
P	0.040				

Age and gender were not found to be significantly affecting the prevalence of psychosocial illness. But it showed higher prevalence in female The prevalence was lower in those having onset of diabetes after the age of 10 years however, the difference was insignificant.The duration of diabetes was not found to affect the prevalence of psychosocial disease. but higher prevalence noticed in those with duration > 5 years.

Among the different variables, number of self-monitoring glucose level showed significant

association with occurrence of psychosocial illness (p value0.035), the percentage of psychosocially affected diabetics is higher in those with minimal monitoring of glucose (<3 times / day) and those with very high frequent monitoring (>6 times / day). Socioeconomic status and caregiver's literacy state didn't have significant effect on the prevalence of psychosocial illness, but yet it showed higher occurrence in patients with illiterate parent .

[Table3]:

Prevalence of psychosocial illness in relation to different variable among the T1DM children.

Variables	Psychosocial illness		Total	p-value
	Present	Absent		
Gender				
Male	14 (53.85%)	12 (46.15%)	26 (100%)	0.532
Female	12 (63.16%)	7 (36.84%)	19 (100%)	
Age				
6-10	9 (56.25%)	7 (43.75%)	16 (100%)	0.878
11-14	17 (58.62%)	12 (41.38%)	29 (100%)	
Residence				
Rural	14 (66.67%)	7 (33.33%)	21 (100%)	0.259
Urban	12 (50%)	12 (50%)	24 (100%)	
Duration of diabetes				
1-3	11 (57.9%)	8 (42.1%)	19 (100%)	0.871
3-5	8 (53.33%)	7 (46.67%)	15 (100%)	
>5	7 (63.64%)	4 (36.36%)	11 (100%)	
Age of onset of DM				
<5	6 (66.67%)	3 (33.33%)	9 (100%)	0.089
6-10	19 (63.33%)	11 (36.67%)	30 (100%)	
>10	1 (16.67%)	5(83.33%)	6 (100%)	
Caregiver’s literacy status				

Literate	15 (50%)	15 (50%)	30 (100%)	0.135
Illiterate	11 (73.33%)	4 (26.67%)	15 (100%)	
Socioeconomic status				
Low	15 (60%)	10 (40%)	25 (100%)	0.736
Middle	11 (55%)	9 (45%)	20 (100%)	
Suffered at least once from acute complication				
Yes	19 (59.38%)	13 (40.63%)	32 (100%)	0.734
No	7 (53.85%)	6 (46.15%)	13 (100%)	
Hospitalization at least once with acute complication				
Yes	11 (64.7%)	6 (35.3%)	17 (100%)	0.463
No	15 (53.57%)	13 (46.43%)	28 (100%)	
No. of self-monitored glucose level per day				
< 3	12 (75%)	4 (25%)	16 (100%)	**0.035**
3-6	11(42.31%)	15 (57.69%)	26 (100%)	
> 6	3 (100%)	0 (0.00%)	3 (100%)	

Statistically significant difference was found in the prevalence of psychosocial illness between diabetics with good metabolic control (HbA1c <7.5) compared to those with fair to poor control (HbA1c >7.5) being significantly lower in those with good metabolic control (p value 0.038). (Table 4)

[Table 4]:

Prevalence of psychosocial illness in relation to metabolic control among the T1DM children

Psychosocial illness	**Metabolic control**

	Good (HbA1C<7.5) n=8		**Fair to Poor (HbA1C > 7.5) n=37**	
	No.	**%**	**No.**	**%**
Present	2	25	24	64.86
Absent	6	75	13	35.14
P	**0.038**			

Children who had only mild grade of psychosocial illness, their parents/guardians were educated in detail regarding the disease, diet plan, regular monitoring of random blood sugar, importance of mental health and timely follow-up. Children, who showed moderate to severe grades of illness, were sent to psychiatrist for further work up and treatment in the form of behaviour/pharmacological therapy, as considered appropriate.

Discussion

This study reported 57.78% prevalence of psychosocial illness in type 1 diabetic children as per "DSM-5 parent/guardian-Rated Level 1 & Level 2 Cross-Cutting Symptom Measure–Child age 6-17" which was almost three times that observed in the non diabetic children (17.78%), this result is comparable to what was reported by Khandelwal S et al., 2016 that revealed 55.95% prevalence of psychosocial illness in type 1 diabetic children using the same scoring system (15). In a recent study by Chatterjee S et al., 2020 (53.85%) were found to be psychologically distressed using childhood psychopathological measurement schedule (CPMS) questionnaire (16). A quite similar prevalence (58.2%) of DSM-IV disorders was noticed by Maronian et al., 1999 in type 1 diabetics. (17). Northam et al., showed that 37% of adolescents with diabetes met the criteria for a DSM-IV psychiatric disorder (18).

So far, the association between diabetes and behavioral problems has been established using various psychiatric tools and study designs which differed in respect to the ill targeted spectrum of illness as well as their sensitivity. DSM-5 is an evidence based revision of DSM-IV and this study is the first to use DSM-5 in assessment of psychosocial problems in diabetic children in Egypt.

In the control group, 17.78% prevalence was detected which was higher than expected which could be because of over-apprehension in parents/ guardian as they were interrogated in the hospital based setting. Moreover, using DSM-5, even mild grades of a wide spectrum of

psychosocial disorders were picked up. Of note, severe psychosocial problems were noticed only in 2.22% children of the control group.

Categorisation of symptoms according to their severity was also possible using DSM-5 tool. Out of the children with type 1 DM, 8.89% were suffering from mild psychosocial illness. A total of 28.89% children showed at least one moderate grade disorder and rest 17.78% were suffering from one or combination of severe grade disorders. These result is quiet similar to what was reported by Khandelwal S et al., 2016, which came as 8.33% mild, 27.38% moderate and 20.24% sever grades of psychosocial illness(15).

After analyzing the incidence of symptoms of individual domains, Among the 12 domains, depression was found to be the most common problem affecting 42.22% children with type 1diabetes followed by irritation, anxiety, anger and somatic symptoms respectively. Other studies focusing only on depression, Naruboina B et al., 2017 showed a high prevalence (60%) among T1DM patients (19) and another one by Khater D et al., 2017 found prevalence (52.3%) in the diabetic group (20), while McGrady and Hood found almost a quarter of participants suffering from depressive symptoms (21). Similar results by Kovacs et al., who found major depression to be the most prevalent (27.5%) disorder but with lower percentage compared to our results (22), whereas the main disorders found in a retrospective study by Maronian et al., were anxiety disorders (19%) and eating disorders (18%) (17). However in recent study from Denmark reported that anxiety disorders are the most common mental comorbidities in children and adolescents with type 1 diabetes (23). Maia AC et al., also identified generalised anxiety disorder (22.7%) as the most common problem, followed by dysthymia (18.2%), panic disorder (8.2%) and social phobia (5.5%) (24). Although the disorders studied by various researchers were different as were the tools used to assess them which makes it hard to compare the pattern between these studies.

Although adolescence is a period thought to be especially prone for mental illnesses, and most researchers focused on this age group (25-27). In our study, no significantly higher prevalence was noticed in adolescence (11-14 years) as compared to middle childhood (6-10 years).This result came similar to what was found in an indian study stating that Age and gender were not found to be significantly affecting the prevalence of psychosocial illness by Khandelwal S et al., 2016 (15). While Chatterjee S et al., 2020 reported higher prevalence of psychosocial morbidity among post pubertal individuals than pre pubertal ones, it didn't demonstrate a statistically significant association between psychosocial morbidity and puberty (16).

Gender was also an insignificant factor to affect occurrence of psychosocial illness in our study, similar results reported by Khandelwal S et al, 2016 (15) and Chatterjee S et al., 2020 (16). In contrast, Lawrence JM et al., found a higher mean CES-D (Center for Epidemiologic Studies Depression Scale) score in females than males in their study (28). Another two studies found females to be more psychosocially distressed and have greater psychiatric morbidities than males by Lašaitė L et al., 2015 (29) and Cohen DM et al., 2004 (30).

A lower prevalence of psychosocial illness was observed in children with later onset of diabetes (age>10 years), although not statistically significant. No significant association of psychosocial illness was observed with type of family or duration of diabetes. A lower prevalence was noticed

in children having caregivers with higher education but the difference was insignificant. However, literacy could affect the attitude and in turn detection of psychosocial problems as well and this might act as a confounding factor in finding the relation between caregiver's literacy status and occurrence of psychosocial illness.

In our study we found statistically significant association between occurrence of psychosocial illness and poor dietary compliance. The fact was supported by Ciechenowski et al., who showed depressive symptom severity to be associated with poorer diet adherence (31). Also Khandelwal S et al, 2016 reported similar results (15). As well as the data published in recent study by Chatterjee S et al., 2020 (16).

This study also found another possible risk factor, number of self-monitoring glucose level showed significant association with occurrence of psychosocial illness, the percentage of psychosocially affected diabetics is higher in those with minimal monitoring of glucose (<3 times / day) and those with very high frequent monitoring (>6 times / day). This result is consistent with what was reported in previous study by Vesco AT et al., 2018 (32) stating that use of CGM was found to be associated with lower adolescent-perceived diabetes distress and lower HbA1c. Another study focusing on disorder eating behaviors in diabetics noticed that blood glucose was self-monitored less frequently in participants with DEB by Nip AS et al., 2019 (33). By similar mechanism, Chatterjee S et al., 2020 reported increased distress in diabetics with frequent insulin injections per day. Fear and anxiety related to insulin injection are known causes of diabetes distress and psychological comorbidity (16).

Also another significant association between psychosocial illness and metabolic control reporting lower prevalence in those with good metabolic control [25% of those with good metabolic control (HbA1c <7.5) compared to 64.86% of those with fair to poor control (HbA1c >7.5) suffering from psychosocial illness with p value 0.038). the same result was reported by Khandelwal S et al, 2016 (15). Additionally, three more studies by Northam et al., Bryden et al., and Leonard BJ et al., also emphasized the relation of behavioural problems with poor metabolic control (18,34 and 35).

Limitation

Limitation of our study was the small sample size collected from only one center. DSM 5 is just a psychological screening tool. Consequently, no specific psychiatric diagnosis can be ascertained by using this. No standardized validated questionnaire in the local vernacular was available. Further, the used questionnaire was parent/guardian rated carrying an inherited risk of subjective bias.

Conclusion

This study establishes T1DM as an important risk factor for development of psychosocial illness in children. Almost every fifth child with T1DM (20.24%) exhibited psychosocial illness of

severe grade. Severe psychosocial illness in T1DM was also found to be significantly associated with poor dietary compliance. Significant association was also observed between presence of psychosocial illness and poor metabolic control. This study emphasizes that in children with T1DM, presence psychosocial illness should be recognised and addressed therapeutically for optimal management.

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