

Disturbed eating behavior in Iranian adolescent and young females with type-1 diabetes compared to non diabetic peers: A cross-sectional study

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ABSTRACT

Background: An association of eating disorder with diabetes mellitus may lead to a serious lack of metabolic control, higher mortality and morbidity. There is no recent study conducted in the Iranian population about eating disorder and its variants. The aim of the present study is investigation of frequency of disturbed eating behaviors in adolescent girls with type 1 diabetes mellitus (T1DM) compared to non-diabetics.

Materials and Methods: In this cross-sectional study, disturbed eating behavior were evaluated and compared in two groups of 12–22 year old adolescent and young females (126 with diabetes and 325 without diabetes). A self-report questionnaire including demographic data, Children's Depression Inventory (CDI), and Eating Attitude Test (EAT-26) was used for data gathering. Independent *t*-test, Chi-square test, and logistic regression [odds ratio (OR)] were used for data analyses in SPSS 15.

Results: Findings revealed that higher percentage of diabetic girls are likely to have eating disturbances (67.9% vs. 53.8%, $P = 0.01$). Diabetic group obtained higher scores in both dieting (14.95 ± 6.28 vs. 11.79 ± 5.62 , $P < 0.001$) and bulimia scales (4.9 ± 3.13 vs. 4.12 ± 2.89 , $P = 0.017$), which supports a role for T1DM in inducing the symptoms. Diabetic girls were at more than double the risk of developing eating disturbance.

Conclusions: The results indicate that a significantly higher percentage of diabetic girls are likely to have eating disturbances. Also, diabetic subjects had an increased probability of getting higher scores in all three EAT-26 subscales. Therefore, healthcare professionals, especially diabetic nurses, should be aware of the potential effects of the subclinical and clinical eating behaviors on adolescents with T1DM and evaluate them for these disturbances.

Key words: Adolescent, behavior, diabetes mellitus, eating disorder, eating disturbance, Iran, nurse, type 1, type 1 diabetes mellitus

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INTRODUCTION

Type 1 diabetes mellitus (T1DM) is the most common endocrine–metabolic disorder of childhood and adolescence that has important consequences for physical and emotional development.^[1] Appropriate management of the disease and maintenance of blood glucose level in the normal range could reduce the rate of complications.^[1,2] Factors that impair blood glucose level could lead to poor metabolic control and increased rate of

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complications.^[3] In recent years, eating disorder (ED) has been found to be one of these factors.^[4]

An association of ED with diabetes mellitus may be more hazardous than each one alone and could lead to a serious lack of metabolic control, higher mortality rate, and higher rate of complications, in particular, retinopathy.^[1,5-8] In the adolescent period, increased rate of physical growth and major changes in emotional and psychomotor aspects occur. In addition, there is growing independence from parents in this period. Adolescents are worried about their body shape, which in girls is followed by an ED.^[9] It is estimated that 10% of adolescent girls suffer from some types of EDs; half of these are bulimia behaviors.^[10] Adolescent girls with type 1 diabetes are at higher risk for disturbed eating behaviors than their non-diabetic peers.^[11] Effects of chronic disease on body image,^[8] low self-esteem due to chronic disease,^[4] limited dieting, and gaining weight due to insulin injections are probably the mechanisms for occurrence of EDs in young women with type 1 diabetes.^[8] Young women with EDs accompanying T1DM are confronted with specific and hard conditions. First, they must cope with their specific lifestyle and, on the other hand, ED could lead to other disorders.^[6,9] So, combination of EDs and diabetes mellitus leads to increased mortality and morbidity. With regard to the importance of early diagnosis and treatment of these disorders and complexity of both, and because there is no information about the frequency of disturbed eating behaviors in Iranian population with T1DM, the present study was conducted to evaluate disturbed eating behaviors in adolescent girls with T1DM and compare its frequency with that of non-diabetic peers.

MATERIALS AND METHODS

Participants

In this cross-sectional comparative study, 126 adolescents and young females with T1DM aged between 12 and 22 years and 325 healthy peers were enrolled. Diabetic cases were selected using the convenience sampling method from the patients' databases of the outpatient clinic of diabetes mellitus in Isfahan Endocrine and Metabolism Research Center and Isfahan Social Security Organization from October to November 2010. Both centers are main referral diabetes clinics in the area. Having diabetes mellitus type 1 (DMT1) for at least 1 year without any history of other chronic mental or physical disorders was our main eligibility criterion. Recruited patients had received diet and physical activity education and were under metabolic control by using insulin twice to thrice daily.

Three hundred and twenty-five healthy, 12- to 22-year-old females were chosen as the control subjects by random two-stage cluster sampling method, with probability

proportional to the size of each cluster. The clusters were middle and high schools, and faculties of local universities in Isfahan City whose list was obtained from the local Department of Education. The cases were interviewed individually, but the control girls were approached as a group during a class.

Study protocol

After enrollment in the study, all participants were handed a self-report structural questionnaire including demographic data, the Eating Attitudes Test (EAT-26),^[12,13] and Children's Depression Inventory (CDI).^[14] Original versions of the aforementioned standardized inventories were translated into Persian language and then retranslated into English, and incoherencies were discussed and rectified. Data for laboratory tests were retrieved from each patient's records. In order to corroborate the diagnosis of T1DM, all of the eligible cases were visited by a collaborating endocrinologist.

Screening measures

A broadly used standardized measure, EAT-26, has been designed to serve as an economical first step for the screening of EDs. This questionnaire includes three subscales with the following items: (a) Dieting scale including 13 items, (b) bulimia and food preoccupation scale including 6 items, and (c) oral control subscale including 7 items. EAT-26 questions are scored according to the frequency of a behavior or concern. In items 1–25, “always,” “usually,” and “often” are given scores of 3, 2, and 1, respectively; while the answers “sometimes,” “rarely,” or “never” are assigned a zero score. Item 26 is scored on an inverse scale. Summing all the items in each subscale yields the total subscale score. A total score of 20 or above is indicative of the presence of problematic eating behaviors and/or concerns, whereas a score below 20 does not rule out the probability of having EDs. Body mass index (BMI) was calculated using the metric height and weight measurements and the standard equation (kg/m^2).

CDI is a reliable and valid clinical research instrument for school-aged children and adolescents. As a self-report instrument, it evaluates the presence and severity of depressive symptoms. It includes 27 items; each of them is assigned a numerical value from 0 to 2, with the higher values corresponding to clinically more severe behavior. Total score is calculated by the summation of separate item scores (54) with a cut point of > 15.

Statistical analysis

Data are reported as number (%) and mean (SD) where appropriate. Comparisons between groups were made using independent *t*-test for continuous variables and Chi-square

test for discrete variables. The univariate relations between diabetes status and EAT-26 and CDI scores were examined by logistic regression and presented as odds ratio (OR) with 95% confidence intervals (95% CIs). Adjustment for age was then made for crude ORs. Data were entered using Epi Info, version 6 (Centers for Disease Control, Atlanta, GA, USA) and analyzed by means of SPSS software, version 15 (SPSS Inc., Chicago, IL, USA). A 2-tailed *P* value of ≤ 0.05 is considered statistically significant in all the analyses.

Ethical considerations

Ethical approval for conducting this study was obtained from the ethics committee of the Isfahan University of Medical Sciences, Isfahan, Iran, and an informed written consent was obtained from each participant or her parent (in under-aged individuals).

RESULTS

During the recruitment period, 114 out of 126 eligible selected diabetic individuals returned signed consent forms and were enrolled in the study. Due to incompleteness of the questionnaires, four enrolled participants had to be excluded from the final analyses.

As illustrated in Table 1, although our diabetic cases were older than the control group (17.24 ± 3.53 vs. 15.59 ± 2.62 years, $P < 0.001$), they had no significant differences in weight and BMI from controls. Parents' education level and occupation status differed significantly between the groups. In comparison to controls, diabetic subjects were less probable to have fathers (13.9% vs. 30.2%) and mothers (8.3% vs. 25.9%) with academic qualifications. Their fathers were more likely to be unemployed, retired, or deceased ($P < 0.001$), while their mothers were mostly housewives (91.7% vs. 80.2%, $P = 0.049$).

Overall CDI score was averagely high in both the groups, with a significantly higher value in diabetic girls ($P = 0.006$). Also, 81.6% of girls with T1DM passed the CDI threshold and were classified as having potential depression in contrast to 70.5% of non-diabetic participants ($P = 0.03$). Analysis of data from EAT-26 questionnaires revealed that a significantly higher percentage of diabetic girls are likely to have eating disturbances ($P = 0.01$). Cases acquired higher scores in both dieting and bulimia scales, which supports a role for T1DM in inducing the symptoms [Table 1].

ORs of depression and eating disturbances with T1DM in our sample are presented in Table 2. As shown in the table, compared to unaffected individuals, diabetic girls were at a 78% increased risk of having depressive symptoms (OR = 1.78, 95% CI: 1.08–2.12). Regarding the eating

Table 1: Characteristics of the study sample

| | Diabetic (n=110) | Non-diabetic (n=325) | P |
|-----------------------------|---------------------|-------------------------|--------|
| Demographic characteristics | | | |
| Age (mean, SD) | 17.24 (3.53) | 15.59 (2.62) | <0.001 |
| Body weight (mean, SD) | 54.46 (8.66) | 48.56 (7.21) | 0.21 |
| Body mass index (mean, SD) | 21.45 (3.00) | 20.68 (2.45) | 0.67 |
| Educational level (n, %) | | | |
| 6-8 years | 31 (29.2%) | 118 (36.3%) | 0.12 |
| 9-12 years | 56 (52.8%) | 181 (55.7%) | |
| >12 years | 19 (17.9%) | 26 (8.0%) | |
| Father's educational level | | | |
| 0-5 years | 23 (21.3%) | 49 (15.1%) | 0.001 |
| 6-12 years | 70 (64.8%) | 178 (54.8%) | |
| >12 years | 15 (13.9%) | 98 (30.2%) | |
| Mother's educational level | | | |
| Primary school | 33 (30.6%) | 55 (17.0%) | <0.001 |
| High school | 66 (61.1%) | 185 (57.1%) | |
| University | 9 (8.3%) | 84 (25.9%) | |
| Father's occupation | | | |
| Salary-employed | 37 (34.6%) | 111 (34.2%) | <0.001 |
| Self-employed | 37 (34.6%) | 163 (50.3%) | |
| Retired | 22 (20.6%) | 39 (12.0%) | |
| Unemployed | 8 (7.4%) | 10 (3.1%) | |
| Deceased | 3 (2.8%) | 1 (0.3%) | |
| Mother's occupation | | | |
| Salary-employed | 5 (4.6%) | 45 (13.9%) | 0.049 |
| Self-employed | 4 (3.7%) | 9 (2.8%) | |
| Retired | 0 (0.0%) | 10 (3.1%) | |
| Housewife | 100 (91.7%) | 260 (80.2%) | |
| Disease characteristics | | | |
| Depression score | 26.63±12.85 | 22.83±11.73 | 0.006 |
| Depressed | 80 (81.6%) | 227 (70.5%) | 0.03 |
| Eating disturbance | 74 (67.9%) | 175 (53.8%) | 0.01 |
| Eating attitude test | | | |
| Dieting scale | 14.95±6.28 | 11.79±5.62 | <0.001 |
| Bulimia scale | 4.9±3.13 | 4.12±2.89 | 0.017 |
| Oral control scale | 6.53±4.18 | 5.98±3.56 | 0.18 |

SD: Standard deviation

Table 2: Crude and adjusted odds ratio of depression and eating disturbance with diabetes type 1

| | Crude | Age adjusted |
|----------------------|------------------|------------------|
| Depression | 1.85 (1.05-3.23) | 1.78 (1.08-2.12) |
| Eating disturbance | 1.81 (1.15-2.82) | 2.17 (1.35-3.57) |
| Eating attitude test | | |
| Dieting scale | 1.09 (1.05-1.16) | 1.05 (1.01-1.11) |
| Bulimia scale | 1.00 (0.91-1.10) | 1.15 (1.04-1.28) |
| Oral control scale | 1.02 (0.97-1.09) | 1.23 (1.14-1.34) |

disturbance symptoms, our findings have shown that having T1DM can increase the risk more than double. Although significant in the crude model, the risk of eating disturbance was intensified after adjustment for age (OR = 2.17, 95% CI: 1.35–3.57). Moreover, according to the adjusted model, diabetic girls had an increased probability of getting higher scores in all three EAT-26 subscales.

DISCUSSION

In the present study, the frequencies of disturbed eating behaviors in adolescent girls with and without T1DM were evaluated by EAT-26 questionnaire, and the results indicated that with a cutoff score, a significantly higher percentage of diabetic girls are likely to have eating disturbances. Also, diabetic subjects obtained significantly higher scores in both dieting and bulimia scales, and had an increased probability of getting higher scores in all three EAT-26 subscales.

Alice *et al.*, in a cross-sectional study on 71 adolescents with T1DM (aged 10–22 years; 41 females and 29 males) who were matched to a group of non-diabetic adolescents, found that adolescent females with T1DM scored significantly higher in bulimia subscale than adolescent Taiwanese females without T1DM. In their study, however, there were no group differences among adolescent females dieting subscale, oral control subscale, and EAT-26 total scores.^[11] Our results are not consistent with those of Alice *et al.* in dieting subscale and EAT-26 total scores and do not support their findings. This difference may be due to difference in the cost of sugar-free foods in Iran compared to Taiwan or because Iranian population may include more diabetic substitutes in their meal plan than Taiwanese.

In the present study, diabetic girls had more than double the risk of eating disturbance symptoms compared to unaffected individuals. Pinar found that disordered eating meeting the EAT cutoff criterion is approximately four times as common in diabetic adolescents as in their non-diabetic peers,^[4] which is higher than our results. This difference may be due to the cross-cultural differences in the prevalence of EDs between Turkish population and Iranian population.

Philippi *et al.*, in their investigation about the frequency of risk behaviors for ED in patients with type 1 diabetes, found that patients with diabetes are at the risk of having ED.^[8] These findings are presented in several other previous studies^[2,3,5-7,15,16] and support a role for T1DM in inducing the ED symptoms.

Analyses of data from CDI revealed that diabetic girls had significantly higher mean score of depression than non-diabetics. According to the adjusted model, they had

a 78% increased risk of having depressive symptoms (OR = 1.78, 95% CI: 1.08–2.12).

Depression may be a cause of susceptibility for developing disturbed eating behavior.^[7] In a study among girls with T1DM who were interviewed for symptoms of depression and disturbed eating behavior, Eating Disorder Examination scores were significantly higher in girls with depression.^[17] Therefore, it is important to pay attention to the signs and symptoms of depression in diabetic girls and treat depression as a means of treating EDs.

Increased body weight is a known risk factor in diabetic patients to develop ED.^[15] It has been documented that weight gain is related to intensive insulin therapy.^[11,18] Our findings indicated that there was no significant difference in BMI between groups. This finding may be related to a low rate of intensive insulin use in our subjects (mostly two times a day). However, more studies are necessary in this field.

Limitations

In the present study, small sample size and simple convenient method of sampling for diabetic cases limit the generalizability of the results to other samples. In addition, data on eating disturbance and unhealthy weight control behaviors among adolescents with type 1 diabetes should be interpreted cautiously.

CONCLUSION

As far as could be ascertained, this is the first study investigating the risk of developing eating disturbance in a sample of Iranian patients with diabetes and comparing it with that of non-diabetic peers. Based on the findings, it is suggested that special attention should be directed toward adolescent girls with poor metabolic control. Finally, healthcare professionals, especially diabetic nurses, should be aware of the potential effects of subclinical and clinical eating behaviors on adolescents with T1DM. It is recommended that other studies should be done by use of diagnostic scales to evaluate the frequency of both disturbance in eating behaviors and ED criteria in patients with T1DM.

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Conflicts of interest

There are no conflicts of interest.

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