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Short communication

Demographic Characteristics of Type 1 Diabetic Children and Adolescents in Hamadan, Iran

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ABSTRACT

Background: Type 1 diabetes mellitus (T1DM) is the most common endocrine disease in pediatric. We aimed to determine the demographic characteristics at presentation of childhood type 1 diabetes mellitus in Hamadan, west Province of Iran.

Methods: In this cross sectional descriptive study, demographic data of children with T1DM being followed up in Pediatric Endocrinology Clinic of Besat Hospital Hamedan Iran, during 2001 to 2012, were analyzed. A detailed record of the required information such as the age, sex, place of living, season, and BMI were collected. The data were analyzed by standard statistical package SPSS, version 15.0. Results with *P*-value less than 0.05 were defined as statistically significant.

Results: In total, 150 patients were included. The mean age at diagnosis was 8.47 ± 3.17 yr. The majority of patients were urban. The frequency of disease was higher in summer. BMI percentile of most cases was between 5th to 85th. The frequency of positive family history was 10.7%. Among the studied patients, 18.7% had parental consanguinity. The mean mother's age at delivery was 25 ± 5.3 yr. Of the studied patients, 82.7% were exclusively breastfed and 43% were the first child of family. About 13.3% had co-occurring endocrine disease.

Conclusions: Age at diagnosis and sex of our patients was similar to the world report. However, seasonal variation is different in our region. The frequency of a family history of type 1 diabetes in first and second-degree relatives was relatively high. Hypothyroidism was the most frequently observed co-occurring endocrine disease.

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Introduction

Type 1 diabetes mellitus (T1DM) is one of the most common chronic diseases of childhood and adolescence¹. The most common form of diabetes in pediatrics is T1DM². The world incidence of type 1 is increasing continuously by about 2-5% per year³⁻⁶. The majority of cases are diagnosed before the age of 18 with peaks at 3 to 6 years of age and mid-adolescence. However, the disease can present in adult life⁷. The incidence of T1DM is highly variable among different countries, even within various regions in an individual country and various ethnic groups^{5,6}. Autoimmunity is considered the major factor in the pathophysiology of T1DM. Environmental factors are able to trigger development of T1DM in predisposing genotypes⁸. In general, its incidence varies from 0.61 per 100,000 people per year in China to about 41.4 per 100,000 in Finland⁹.

The epidemiological studies are important to survey of geographic, demographic, environment and ethnic variations in patients with T1DM in order to plan or assess prevention strategies. To date limited data have been available regarding demographic characteristics of T1DM patients in our region. The aim of our study was to give an updated profile of

demographic characteristics of T1DM patients compared with the results of similar studies worldwide.

Methods

This cross-sectional study was conducted on patients with T1DM attending the Pediatric Endocrine Clinic of Besat Hospital Hamadan Iran during 2001 to 2012. The required data of enrollment (age at disease onset, sex, living in urban or rural area, body mass index (BMI), mother ages at delivery; birth order, seasonality, parental consanguinity) was collected from the subject's medical records.

The study was approved by the local Ethics Committee and Research of Hamadan University of Medical Sciences (No: p/16/70/2/2019). Studied cases gave their written informed consent for participation in the study.

The inclusion criterion was diagnosis of T1DM and presentation <18 years. T1DM was defined in accordance with the (EURODIAB criteria)¹⁰. Those without the required information of the study were excluded. Data were analyzed

using standard statistical package SPSS, version 15.0 (Chicago, IL, USA).

Results

A total of 150 patients met the study eligibility criteria among those diagnosed with T1DM. As shown in Table 1, 56.7% of cases were male ($P=0.080$). The mean age of patients at diagnosis was 8.47 yr. Age at diagnosis was not significantly different between two genders ($P=0.230$). Overall, 70% of patients (69.2% of female and 70.6% of male patients) presented within age group 5 to 14.9 yr. Eighty one point three percent of patients were urban. BMI of 114 patients (85.7%) was between the 5th and 85th percentiles (normal range). BMI at presentation was not significantly different between male and female groups ($P=0.440$). The frequency of disease presentation was higher during summer. Eighteen point seven percent of patients had parental consanguinity and their mean mother age's at delivery was 25.19 yr. Ten point seven percent of patients had a positive family history. Of those, 14 cases had a sibling with T1DM. There were no significant differences between sex and positive family history of T1DM ($P=0.370$). Majority of patients were exclusively breastfed and mostly were the first child of family. Twenty of studied patients (13.3%) had co-occurring autoimmune disease. Hypothyroidism was the most common co-occurring autoimmune disease and was significantly more common among females ($P=0.007$).

Discussion

Incidence of T1DM varies markedly among different populations^{8,11-13}. This could be attributed to the differences in ethnic background, genetic, geographical region and environmental factors including viral infections, toxins from food, cow milk feeding in infancy or vitamin D deficiency¹⁴⁻¹⁶. This, to our knowledge, is the first up-to-date profile of demographic characteristics of T1DM patients in our region.

Our results indicate that frequency and peak age presentation of diabetes was similar in both sexes (peak age range of 5-9.9 years). Our results on gender of patients at onset of diabetes confirmed the some earlier studies. Overall, the majority of patients were within the age range of 5-14.9 yr (38%). These findings are, to some degree, consistent with the results of the many others, but smaller, works addressing gender distribution in similar groups of patients¹⁷. For example, in southern Iran, frequency of diabetes was higher in males than females¹⁸. Both types of diabetes were more common in girls¹⁹, in contrast, in Diyarbakir, Turkey, T1DM was at age 5-9 yr in the girls and 10-14 yr in the boys¹⁵. Our study showed that frequency of T1DM was higher in urban areas. We hypothesized this is duo to population distribution in our region (Urban population is more than rural). We also concur with other authors suppose that higher socioeconomic status and urbanized life style can be involved in the development of T1DM^{8,20}.

Looking at BMI, our study showed that 85.73% of patients present in normal range of BMI distribution and 3% were overweight. We found no case with obesity. Our results confirmed that children with T1DM are not obese. In study by Kaminski Et al, the median BMI percentile of children with T1DM was lower than that of the general population and 11% of cases were overweight (BMI $\geq 85^{\text{th}}$), 8% obese (BMI

$\geq 95^{\text{th}}$) and 2% severely obese (BMI $\geq 99^{\text{th}}$ percentile)²¹. In another study, 44% of T1DM were overweight or obese¹⁷.

Table 1: Demographics and Characteristics of the subjects at onset of diabetes

Characteristic	Results
Mean age at diagnosis (yr), mean (SD)	8.47 \pm 3.17
Mother's age at delivery (yr), mean (SD)	25 \pm 5.3
Gender, n (%)	
Female	65 (43.3)
Male	85 (56.7)
Age distribution at diagnosis (yr), n (%)	
1-4	31 (20.6)
5-9	54 (36.0)
10-14	51 (34.0)
15-18	14 (9.3)
Living location, n (%)	
Urban	122 (81.3)
Rural	28 (18.7)
Body mass index (kg/m ²)	
<5 th percentile	17 (11.3)
5 th - 85 th percentiles	128 (85)
85 th - 95 th percentile	5 (3.3)
>95 th	0 (0.0)
Season at presentation	
Spring	39 (26.0)
Summer	51 (34.0)
Autumn	29 (19.3)
Winter	31 (20.7)
parental consanguinity	
No	122 (81.3)
Yes	28 (18.7)
Family history of T1DM ^a	
No	134 (89.3)
Yes	16 (10.7)
Birth order	
First child	63 (43.0)
Next children	87 (57.0)
Feeding during the first 6 months of life	
Exclusively breastfed	124 (82.7)
Formula	18 (12.0)
Mix	8 (5.3)
Co-occurring autoimmune disease	
Hypothyroidism	16 (10.7)
Hyperthyroidism (Graves' disease)	2 (0.01)
Juvenile rheumatoid arthritis	1 (0.01)
Vitiligo	1 (0.01)

^a Type 1 diabetes mellitus in the 1st or 2nd degree relatives

One new and intriguing finding in this study was a different seasonality at onset of T1D. Higher frequency was observed in summer following winter. This may suggest different triggers and specific environmental factor of T1DM in our region. In contrast, previous epidemiological studies have revealed that the majority of T1DM children were diagnosed during the cold months (Winter-spring) as opposed to the warm months^{2, 3, 4, 22}. In the present study, the rate of first cousin parental consanguinity was relatively high. However, since no genetic factors have been attributed to T1DM, the findings were not considered significant. It may also be due to the high rate of consanguineous marriages in this area.

Similar to in earlier studies^{23, 24}, 10.7% (16 cases) of patients in our study, had a first-degree relative with T1DM. A significant positive family history of T1DM in current work can be explained by the fact that in addition to genetic factors, the same environmental and health insurance contribute to the increased risk of disease in first-degree

relatives of patients with T1DM. In Australia, 9% of patients had a prior history of diabetes in first-degree relatives²⁴.

Although, it has been showed that the risk of childhood diabetes increased by 5% for each 5-year increases in maternal age^{14,25,26}. The majority of mothers was young at delivery (25.19 years, ranged from 14 to 47 yr).

Regarding of birth order, most patients (42%) were first children of the family. Similarly, in Tehran, most patients were first children of the family (44.6%)²⁷. Our data support the proposal have found lower risk of T1DM with increasing birth order due to protective effect of exposure to infections in early life, in later born children²⁸.

Exposure to cow milk antigens in early infancy may increase the risk of T1DM, because of its associated harmful antibodies^{29,30}. Data of this work dose not confirm this theory, because the most of our patients (82.7%) were exclusively breastfed for the first 6 months of life.

Look at the other autoimmune diseases in our patients; hypothyroidism was the most common co-occurring autoimmune disease. Hypothyroidism was significantly more common among females than males. This finding is in line with previous studies that have shown the most common autoimmune disease in diabetes is hypothyroidism^{31,32}.

The major limitation of the study is that we did not have the T1DM prevalence and incidence rates in our region. A prospective national or regional register should be attempted to establish the incidence and prevalence of T1DM in this region.

Conclusions

Conclusion of our study adds to previous research by providing data on age and sex distribution of T1 DM. However, the season distribution of disease onset was different. In addition, hypothyroidism was the most common concurrent autoimmune disease.

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Conflict of interest statement

None declared.

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