

Incidence of Type 1 Diabetes in Children Aged Below 18 Years During 2013-2015 in Northwest Turkey
Poyrazoğlu Ş et al. Type 1 Diabetes Incidence in Northwest Turkey

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What is already known?

Incidence of T1DM peaked in the age groups 5-9 and 10-14 years. Diagnosis of T1DM showed a seasonal pattern peaking in autumn-winter.

What this study adds?

The incidence of Type 1 diabetes (T1DM) in children and adolescents aged 0-17 years is intermediate (8.99/100.000 per year) during 2013-2015 in Northwest region of Turkey. The incidence of T1DM was similar over the course of 3 years.

Abstract

Objective: To assess the incidence of type 1 diabetes mellitus (T1DM) in children under 18 years of age in the northwest region of Turkey during 2013-2015.

Methods: All newly diagnosed T1DM cases were recorded prospectively during 2013-2015. Total as well as gender and age group specific (0-4, 5-9, 10-14 and 15-17 age) mean incidences per 100.000 per year were calculated.

Results: There were 1773 patients diagnosed during 2013-2015 (588 cases in 2013, 592 cases in 2014, 593 cases in 2015). Of these, 862 (48.6%) were girls and 911 (51.4%) were boys. The mean age at diagnosis was 9.2 ± 4.2 years and it was not significantly different between girls (9.0 ± 4.1 years) and boys (9.4 ± 4.4 years) ($p=0.052$). The crude mean incidence was 8.99/100.000 (95% CI: 8.58-9.42). Although mean incidence was similar between boys [8.98/100.000 (CI:8.40 to 9.58)] and girls [9.01/100.000 (CI:8.42 to 9.63)], there was male predominance in all groups except for 5-9 year age group. The standardized mean incidence was 9.02/100.000 according to the World Health Organization standard population. The mean incidence for the 0-4, 5-9, 10-14 and 15-17 age groups was 6.13, 11.68, 11.7 and 5.04/100.000 respectively. The incidence of T1DM was similar over the course of 3 years ($p=0.95$). A significant increase in proportion of diagnosis of cases was observed in the autumn-winter seasons.

Conclusion: Northwest region of Turkey is having an intermediate incidence of T1DM.

Keywords: Type 1 diabetes mellitus, childhood, incidence

Introduction

Type 1 diabetes mellitus (T1DM) is a common chronic disease in children and adolescents. In many populations, increase in the incidence of T1DM in children has been observed (1-3). Studies have shown that the incidence of T1DM varies widely between and within countries (1-4). Seasonal variations in the presentation and gender differences in incidence of T1DM have been reported (5-8).

Data on the incidence and incidence trends of childhood T1DM are limited in Turkey. Our aim in this study was to determine the T1DM incidence in children aged below 18 years during 2013-2015 in the northwest region of Turkey and to analyze seasonal presentation pattern in children with T1DM.

Material and Method

This prospective study was conducted in the northwest region of Turkey. Turkey is divided into seven geographical regions. Northwest region is one of these seven regions. The regions were divided in terms of the principles of geography (the topography, the climate). All children younger than 18 years diagnosed with T1DM during 2013-2015 in pediatric endocrinology units in this region (the pediatric endocrinology units of the 11 University and 15 State hospitals and 1 private hospital) were included in the study.

The diagnosis of T1DM was established by the pediatric endocrinologist who took care of the child, according to the accepted criteria of the International Society for Pediatric and Adolescent Diabetes (9). The onset of diabetes was accepted the day of the first insulin injection.

In the Turkish health care system, all children aged 0-17 years with T1DM are referred to a pediatric endocrinology department for treatment. Over the 3 year period (2013-2015), all hospitalized or referred new cases were reported on a special form containing information about the patient's personal identification number, sex, date of birth, date of diagnosis, some clinical and laboratory data of patients by pediatric endocrinologist in this region. All forms were sent monthly to one investigator (SP) for data collection and verification. We excluded children with type 2 diabetes mellitus, neonatal diabetes, and maturity onset diabetes of youth, transient hyperglycemia, and diabetes caused by other conditions (chemotherapy, cystic fibrosis, etc).

Statistically analysis

An incidence of T1DM was calculated using the number of patients overall for each year and by age (0–4, 5–9, 10–14 and 15–17 years aged) and gender groups (girls and boys). Annual populations of age groups in geographically defined area were used as denominators, and incidence is reported per 100.000 per year with 95% CIs, assuming a Poisson distribution of cases. The annual population sizes were obtained from the Turkey census data of 2013–2015 from the address-based population registration system of the Turkish Statistical Institute. For comparison with data from other countries, the incidence was standardized by the direct method according to the age distribution of the world population (10).

The percentage of patients diagnosed during each calendar month was calculated in both sexes and age groups and compared to identify any seasonal variation in onset.

In order to assess the significance of the differences between the groups, Mann-Whitney U test and chi-square test were used. Results are reported as means±SD. Two-tailed p values were calculated. Statistical significance was accepted as $p < 0.05$.

This study was approved by the local ethical committee of Istanbul Faculty of Medicine. Informed consent was obtained from the families and children.

Results

A total of 1773 cases were identified over 3 year period (588 cases in 2013, 592 cases in 2014, 593 cases in 2015). Of these, 862 (48.6%) were girls and 911 (51.4%) were boys, giving a male to female ratio of 1.05. The mean age at diagnosis was 9.2 ± 4.2 years and it was not significantly different between girls (9.0 ± 4.1 years) and boys (9.4 ± 4.4 years) ($p = 0.052$). Table 1 shows mean ages and proportion of cases according to age groups over the 3 year period. The proportion of incident cases was highest among children aged 5–9 years (35.9%), followed by the age groups 10–14 years (35.3%), 0–4 years (19.1%) and 15–17 years (9.6%).

The crude mean annual incidence in children aged 0–17 years old over this period was 8.99 per 100.000 [95% confidence interval (C.I.): 8.58 to 9.42]. The standardized mean incidence was 9.02 per 100.000 according to the WHO standard population.

There was no significant difference between the mean annual incidence of boys [8.98/100.000 (CI:8.40 to 9.58)] and girls [9.01/100.000 (CI:8.42 to 9.63)] during this 3 year period ($p = 0.95$) (Table 2). The mean annual incidence for the 0–4 year age group was 6.13/100.000. Incidence increased significantly with age, reaching a peak in the age group 5–9 and 10–14 years. It was 11.68/100.000 for the 5–9 year age group and 11.7/100.000 for the 10–14 year age group and then incidence declined at age 15–17 years. The lowest incidence was seen in the age group 15–17 year (5.04/100.000) (Table 2). The incidence for the age group 0–14 year was 9.82 /100.000 (95% CI 9.34 to 10.31). Male predominance was seen in all groups except 5–9 year age group (Table 2). The incidence of T1DM was similar over the course of 3 years (Table 2, $p = 0.95$).

A significant increase in proportion of incident cases was observed in the autumn–winter seasons (Figure 1). It was similar over 3 year period in age groups and gender.

Discussion

In our study we determined the incidence of T1DM in children aged below 18 years in northwest region of Turkey, and our results demonstrate that in our region T1DM incidence is intermediate (8.99/100.000) in this age group (4). In Turkey, there are only a few papers regarding the epidemiology of T1DM in children and most of them focused on children below 15 years of age (11–14). Our study is one of the few population-based reports presenting the incidence of T1DM among children in Turkey.

Considerable different incidences of T1DM have been observed among countries, even within the same country (1–4). Recently nationwide incidence of T1DM among Turkish children was reported and this study presented T1DM incidence in 5 geographic regions of Turkey in 2013 (14) including all West part of Turkey as one region. There are notable differences in the T1DM incidence between 5 regions. Northwest region is a developing part of Turkey and there have been big changes in the economy, urbanization and lifestyles in recent decades in this region. A slightly higher incidence (10.1/100.000 per year) in West part of Turkey in the nationwide study in 2013 compared with our data (9.01/100.000 per year) in Northwest region is likely to result from the fact that they evaluated all West part of Turkey together. The method of case ascertainment of our study is different from nationwide study. The data of diabetic patients from the universal health insurance to obtain essential medicine was used in the calculation of incidence in the nationwide study. In our study we collected prospectively T1DM patients' data from pediatric endocrinology units in northwest region.

We can not detect the incidence trends from our study due to the short period of observation and the lack of epidemiological data before our study in children younger than 18 years in Turkey. Our neighbour countries reported intermediate incidence similar to our result (2,3,15) and they demonstrated an increase in incidence of T1DM over time. Although observation period is short in our study, incidence was quite stable over 3 year period. Although the global increase in the incidence of T1DM is widely recognized in the last decades, some studies in populations with a higher incidence of T1DM have demonstrated that the increase in the incidence slowed down in the last decade (16–18). In the EuroDiab study, it was reported that between 2001 and 2009 the increase in T1DM incidence was significantly different in regions within Europe and the highest increase occurred in Central Eastern European countries however, Finland, other Nordic countries and the Czech

Republic showed a much lower increase or stabilization in the incidence of T1DM (19-23). An average relative increase of 3-4% per year has been reported worldwide (24). Environmental factors are thought as the most likely reason for the increase in incidence in this short period of time compared to genetic factors (3,20,25). For this reason, evaluation of incidence in different region is important.

In our cohort, although the mean annual incidence of boys and girls was similar, a male predominance was seen in all age groups except for 5-9 years. The female predominance in 5-9 year age group could be due to the earlier onset of puberty in girls than in boys. Gender differences in T1DM have been identified in many studies (4,6,26-29). Generally, high incidence countries tend to have a slight male predominance and a low incidence countries show female predominance however with exceptions (4,26-29). Karvonen et al. (4) found that 88% of low incidence populations were predominantly girls and those with high incidence were more likely to be predominantly boys. In Sardinia, very high incidence area, has also found a male predominance in the 0-14 year age group (28). The Danish Study Group of Diabetes in Childhood reported male predominance in their population (26). However, no significant difference in T1DM incidence between boys and girls was observed in Shanghai and Kuwait (27,29).

Age differences in T1DM incidence have also been observed in previous studies (2,15, 29,30,31). The incidence in our cohort increased with age in both sexes and was highest in the 5-14 year age group and followed by a decrease in the 15-17 year age group. Incidence was similar in children aged 5-9 and 10-14 year groups in our study. The youngest age group (0-4 years) had lower incidence as compared with older children (5-14 years). Age difference has been shown in other counties. DiaMond study showed that 5-9 year old children had a higher risk of developing T1DM compared with 0-4 year old children (2). Some counties reported high incidence in 5-9 years old, but others found the highest incidence in children aged 10-14 years (2,15,29-31).

Our cohort showed a significant seasonal variation in presentation. More cases were diagnosed during autumn and winter months, which are the cooler seasons in the northwest region. This seasonality of onset was identified in both sexes and in all age groups. Although Turkey is situated in large Mediterranean geographical location, Turkey's diverse regions have different climates because of irregular topography. To evaluate impact of weather on incidence of T1DM in Turkey, each region should be evaluated separately. Similar to our result some countries show significant seasonality in diagnosis for all age groups, higher incidences in the winter period and lower in the summer period (5,7,8). Some counties reported no seasonality in all age groups or absent in some age groups (5,8, 32-34). Different explanations have been suggested for this seasonal pattern in onset of T1DM, including physical activity, stress, viral infections, and vitamin D synthesis during different seasons (5,7,35,36). The DiaMond group reported seasonality in T1DM incidence with winter or summer peaks in 40% of all participating centers depending on the geographic position of the country (2). It was shown that in Japan there was a bimodal pattern in the onset of Type 1 diabetes, that is common in April/May and in December with no seasonal pattern of incidence among preschool children (6).

Study Limitations

Limitation of our study is that the duration of the registry, 3 years, was relatively short. It would be important to continue monitoring incidence of T1DM and evaluate trends in our region.

Conclusion

To conclude, this is the first paper that analyzes the time-related trends in the incidence of T1DM for Turkish children aged from 0 to 17 years in the northwest region of Turkey. Northwest region of Turkey is having an intermediate incidence of T1DM and mean annual incidence is similar between boys and girls. Considering the increasing incidence of T1DM worldwide, It is important to follow trend of incidence in the next years in our region to determine the possible triggering factors and to develop preventive strategies.

Authorship contribution:

Concept: Sukran Poyrazoglu, Ruveyde Bundak

Design: Sukran Poyrazoglu, Ruveyde Bundak

Data Collection and Processing: All authors

Analysis and interpretations: Sukran Poyrazoglu, Ruveyde Bundak, Halim Issever

Writing: Sukran Poyrazoglu, Ruveyde Bundak, Feyza Darendeliler

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Figure 1: Proportion of onset of tip 1 diabetes according to months of the year over 3 year period

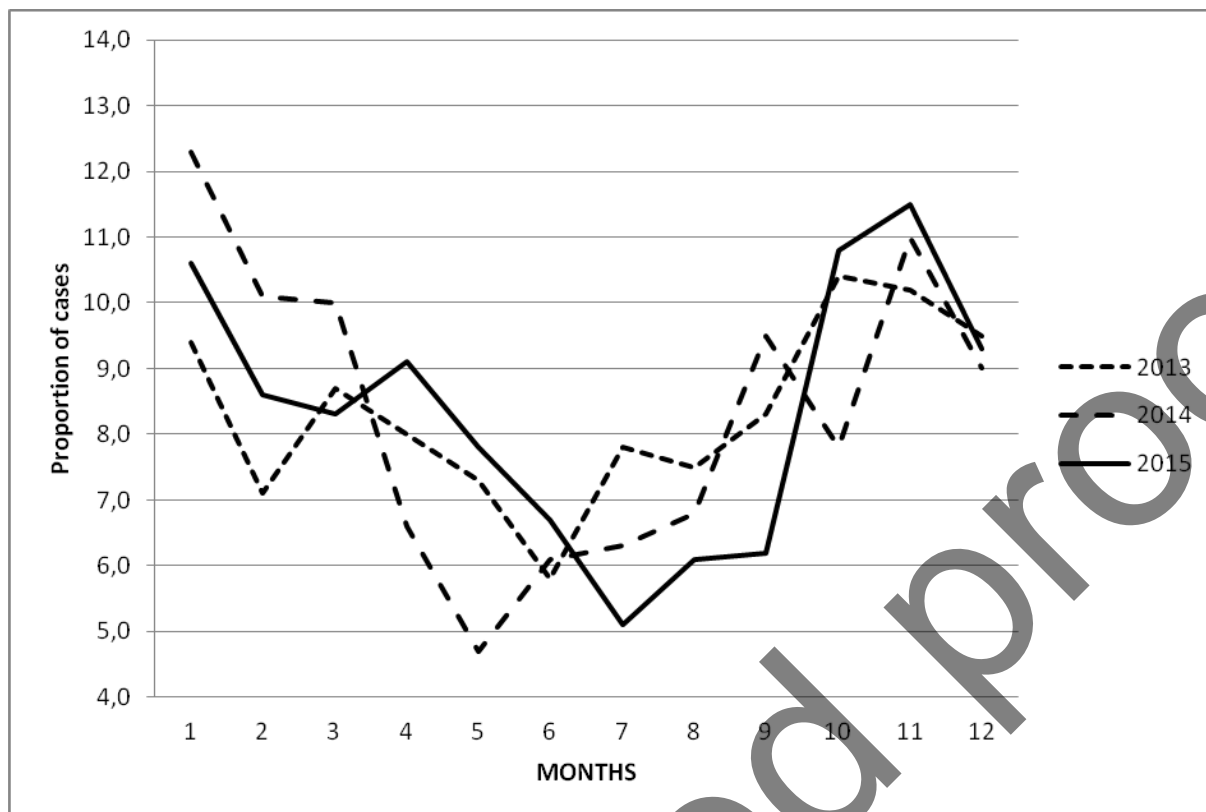


Table 1. Mean ages and proportion of age groups of newly diagnosed Type 1 diabetes mellitus cases over 3 year period.

	2013	2014	2015	2013-2015
Number	588	592	593	1773
Boys	279	309	323	911
Girls	309	283	270	862
Mean age at diagnosis (year)				
All	9.2±4.3	8.9±4.3	9.5±4.1	9.2±4.2
Boys	9.6±4.5	9.1±4.4	9.5±4.3	9.4±4.4
Girls	8.9±4.1	8.7±4.2	9.4±3.9	9.0±4.1
Proportion of age groups (%)				
0-4 years	20	20.9	16	19.1
5-9 years	32.3	38.2	37	35.9
10-14 years	39.1	31.4	35.4	35.3
15-17 years	8.3	9.5	11.1	9.6

Table 2. Incidence of Type 1 diabetes mellitus over 3 year period

Incidence (95% CI)	2013-2015	2013	2014	2015	P
All group	8.99	9.01	8.99	8.98	0.95
Boys	8.98	8.31	9.11	9.51	0.07
Girls	9.01	9.76	8.85	8.43	0.1
Age groups					
0-4 years	6.13	6.6	6.74	5.09	0.92
5-9 years	11.68	10.56	12.37	12.10	0.85
10-14 years	11.7	12.78	10.42	11.9	0.48
15-17 years	5.04	4.37	4.93	5.82	0.60
Boys					
0-4 years	6.39	6.26	6.98	5.94	0.78
5-9 years	10.26	8.43	11.08	11.25	0.06
10-14 years	12.73	12.29	12.39	13.51	0.41
15-17 years	5.19	5.01	4.26	6.31	0.32

Girls					
0-4 years	5.86	6.96	6.48	4.18	0.07
5-9 years	13.18	12.8	13.74	13.01	0.91
10-14 years	10.6	13.31	8.32	10.18	0.06
15-17 years	4.88	3.69	5.65	5.28	0.23

Uncorrected proof