Seasonal incidence of type I diabetes mellitus in the north of Iran

Short Communication

Mohsen Mohammadi (MD) [1, 2]
Morteza Alijanpour (MD) [2, 3*]
Molood Ajdari (BSc) [4]

1.Assistant Professor of Pediatric Infectious Disease, Non-Communicable Pediatric Diseases Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, IR Iran.
ORCID: 0000-0002-7907-3418.
2.The Clinical Research Development Unit of Amirkola Children's Hospital, Babol University of Medical Sciences, Babol, IR Iran.
3.Assistant Professor of Pediatric Endocrinology, Non-Communicable Pediatric Diseases Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, IR Iran.
ORCID: 0000-0002-0031-4718.
4.Bachelor of Nursing, Non-Communicable Pediatric Diseases Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, IR Iran.

* Correspondence:

Morteza Alijanpour Aghamaleki (MD), Non-Communicable Pediatric Diseases Research Center, No 19, Amirkola Children's Hospital, Amirkola, Babol, Mazandaran Province, 47317-41151, IR Iran.
E-mail: m.alijanpour@yahoo.com
Tel: +98 1132346963
Fax: +98 1132346963

Received: 26 June 2018
Revised: 28 July 2018
Accepted: 24 Aug 2018

Abstract

Background: Type I diabetes mellitus (T1DM) with growing frequency which is considered as a world health threatening problem is an autoimmune disease with insulinupenia. Considering the relationship between the incidence of T1DM and environmental factors, the aim of this study was to assess seasonal incidence of T1DM and its association with birth season.

Methods: This cross-sectional study was conducted on 112 diabetic patients (66 males, 46 females) less than 18 years, referred to Pediatric Endocrine Clinic (Amirkola Children's Hospital) during 2011-2017. All the needed information was extracted from the patient's files and asking questions of their parents. Data were collected in a checklist. Comparison between different seasons and age groups was done by Pearson's chi-square test. Data were analyzed using SPSS 19 and $p \leq 0.05$ was considered significant level.

Results: The mean age of the patients during diagnosis of T1DM was 7.34±3.70 years. The incidence of T1DM was significantly increased in the cold seasons (especially winter) ($P<0.008$). A more increased incidence was seen in cold seasons in the aged group of 5-9 years old compared to other groups. However, no significant difference was found in all groups in terms of birth season.

Conclusions: The results of this study suggest the effects of season as an environmental factor on diabetes incidence. This seasonal diversity is more prominent in the age less than 10 years. So, attention to maintaining the public health and to preventing from viral infections in cold seasons is recommended.

Keywords: Birth Date, Seasonal Presentation, Seasons, Type 1 Diabetes Mellitus

Citation:
Mohammadi M, Alijanpour M, Ajdari M. Seasonal incidence of type I diabetes mellitus in the north of Iran. Caspian J Pediatr Sep 2018; 4(2): 317-20.

Introduction

Type 1 diabetes mellitus (T1DM) related to environmental factors is an autoimmune disease with insulinupenia, [1] and considered as a world health threatening problem. In addition, the incidence of diabetes mellitus was estimated 422 million in 2014, indicating significant increase in T1DM [2]. T1DM is increasing about 3% annually and has been converted to one of the important etiologies of mortality in children. Therefore, understanding the diabetes causes including environmental factors is very important. Seasonal presentation and birth season are environmental factors which should be considered [3]. T1DM increases in seasons of viral infections with various mechanisms, while this result has not been clearly confirmed [4]. The incidence of T1DM was significantly increased in cold months due to the elevation of blood glucose in the current infections [5]. Of course, the results of the mentioned studies are controversial. Although the investigations and studies in supporting of these etiologies showed specific seasonal correlation and model in the past, they indicated diverse

[Downloaded from caspianjp.ir on 2026-11-12]
[DOR: 20.1001.1.24234729.2018.4.2.5.1]
[DOI: 10.22088/CJP.BUMS.4.2.317]

results in each geographic area and specific race [6].

Considering that the diabetes mellitus as one of the most common metabolic disorders in children is associated with early and late complications [7] and that the correlation between seasonal factors and diabetic incidence has not been surveyed in Iran; therefore, the aim of the present study was to investigate the seasonal incidence of diabetes and its relation with birth season of diabetic children.

Methods

This cross- sectional study was conducted on 112 diabetic patients less than 18 years using census method. All patients who were at least 6 months after diagnosis were referred to Pediatric Endocrine Clinic in Amirkola Children's Hospital (North of Iran) during 2011-2017. Patients with type 2 diabetes mellitus, lung or heart disease, immunodeficiency, neuromuscular disorders and cystic fibrosis were excluded from the current study. Needed information was collected through patient's files, records documented in Endocrine Clinic of Children's Hospital and asking questions of their parents. Data were collected in a checklist. According to the age, the patients were divided into four examined groups: 0-4, 5-9, 10-14 and 15-18 years old. Overall, autumn and winter were considered as cold seasons as well as spring and summer as warm seasons.

Comparison between different seasons and age groups was done by Pearson's chi-square test. Dates were analyzed using SPSS 19.

Results

Out of 112 patients with T1DM and mean age of 10.7±2.6, 66 (58.92%) and 46 (41.07%) persons were male and female, respectively (the oldest was 18 years old and the youngest was 12 months). Their mean age during diagnosis of diabetes was 7.34±3.70 years old. The number of males with T1DM was more than that of females in this study, which was not statistically significant (P=0.73) (table 1). Considering the birth season, the majority of the patients were born in cold seasons (55.44%) including autmn and winter with dominance in males (37.5%=males, 16.07%=females), but the difference was not significant (P=0.37)). A significant relationship was observed between the season of diabetes presentation and cold seasons (P= 0.009) (table 1).

Regarding the birth season, diabetes had more incidence in 5-10-year-old group without statistical significance (P= 0.071). In terms of seasonal presentation of diabetes, there was a significant increase in 5-10-year-old group (P= 0.008) (table 2).

Table 1. Relationship seasons (birth and incidence of disease) and sex in diabetic children of study

Seasons		Male, N (%)	Female, N (%)	Total, N (%)
Season of birth	Spring	9 (8)	10 (8.9)	19 (16.96)
	Summer	15 (13.3)	17 (15)	32 (28.57)
	Autumn	28 (25)	12 (10.7)	41 (36.60)
	Winter	14 (12.4)	6 (5.36)	20 (17.85)
	Total	66 (58)	46 (41)	112 (100)
Incidence of disease	Spring	3 (2.6)	7 (6.25)	10 (8.92)
	Summer	12 (10.7)	3 (2.6)	15 (13.39)
	Autumn	12 (10.7)	5 (4.46)	17 (15.17)
	Winter	39 (34.8)	31 (27)	70 (62.5)
	Total	66 (58.9)	46 (41)	112 (100)

Table 2. Relationship seasons (birth and incidence of disease) and age in diabetic children of study

Seasons		Age of incidence of disease (years old)				Total
		0-4	5-9	10-14	15-18	
Season of birth	Spring	5 (4.46)	20 (17.8)	6 (5.3)	2 (1.7)	33 (29.46)
	Summer	1 (0.89)	22 (19.6)	6 (5.3)	--	29 (25.89)
	Autumn	2 (1.7)	18 (16)	4 (3.5)	2 (1.7)	26 (23.21)
	Winter	2 (1.7)	12 (10.7)	6 (5.3)	4 (3.5)	24 (21.42)
	Total, N (%)	10 (8.92)	72 (64.28)	22 (19.64)	8 (7.14)	112 (100)
Incidence of disease	Spring	2 (1.7)	22 (19.6)	1 (0.86)	--	25 (22.32)
	Summer	3 (2.6)	16 (14.2)	--	3 (2.6)	22 (19.64)
	Autumn	2 (1.7)	30 (26.6)	4 (3.5)	--	36 (32.14)
	Winter	4 (3.5)	18 (16)	5 (4.4)	2 (1.7)	29 (25.89)
	Total, N (%)	11 (9.82)	86 (76.87)	10 (8.92)	5 (4.4)	112 (100)

[Downloaded from caspianjp.ir on 2026-11-12]
[DOR: 20.1001.1.24234729.2018.4.2.5.1]
[DOI: 10.22088/CJP.BUMS.4.2.317]

Discussion

In the present study, the diabetes presentation was more in cold seasons than warm seasons. In a European study, the seasonal diversity of diabetes presentation had obvious increase in all age groups, especially in girls, in cold months [4], which is similar to our study.

Like the current study, the frequency of diabetes mellitus was more in males than females in another study without statistical significance (P=0.73) [8].

The other study like ours suggested that there was no relationship between diabetes mellitus and birth date, which was due to the low population [9]. Of course, multicentric studies are necessary because of low prevalence of T1DM in general population [9].

In 2009, Molthanova et al.'s study indicated that the diabetes might have seasonal model and believed that the geographic area affected diabetes incidence in cold seasons [4], but in the present study, the geographic diversity was not considered due to the regional propinquity and similarity of near cities in geographic status.

In contrary to the current study, an investigation in Netherland found a noticeable peak of disease in warm season based on birth date, while in parallel to the present study, diabetes presentation increased significantly in winter [10].

In another study, the seasonal and geographic diversity obviously correlates with birth season, which is in agreement with the current study [10].

In a study, different causes for T1DM and increased incidence of diabetes in autumn and winter were described [8].

Explanation of this matter that "why diabetes incidence is higher in cold seasons" is very difficult and requires more and vast studies [11].

Another study on type 2 DM was done to determine the effective factors on seasonal incidence of disease and revealed that the incidence peak of type 2 DM was in warm seasons, in contrary to the present study [12].

This discordant result may be due to the difference in pathophysiologic fields and effect of genetic factors in types 1 and 2 diabetes mellitus.

In conclusion, the current study shows the seasonal superiority of diabetes incidence with the highest incidence in cold seasons and the lowest incidence in hot seasons. These results may indicate the impact of environmental factors on the incidence of diabetes in children, which, of course, requires a further study with more and even more multi-center samples. So, attention to maintaining public health and to preventing from viral infections in cold seasons is recommended.

Acknowledgement

The authors are grateful to the Clinical Research Development Committee of Amirkola Children's Hospital and Non-Communicable Pediatric Diseases Research Center of Babol University of Medical Sciences for their contribution to this study.

Funding: None.

Conflict of interest: The authors declare that we have no conflict of interest.

References

1. Dabelea D, Mayer-Davis EJ, Saydah S, et al. Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. Jama 2014; 311(17): 1778-86.
2. Islam ST, Srinivasan S, Craig ME. Environmental determinants of type 1 diabetes: a role for overweight and insulin resistance. J Pediatrs Child Health 2014; 50(11): 874-9.
3. Zipris D. Epidemiology of type 1 diabetes and what animal models teach us about the role of viruses in disease mechanisms. Clin Immunol 2009; 131(1): 11-23.
4. Moltchanova EV, Schreier N, Lammi N, Karvonen M. Seasonal variation of diagnosis of type 1 diabetes mellitus in children worldwide. Diabetic Medicine 2009; 26(7): 673-8.
5. McKinney PA. Seasonality of birth in patients with childhood type I diabetes in 19 European regions. Diabetologia 2001; 44(3): 67-74.
6. Davalli AM, Perego C, Folli FB. The potential role of glutamate in the current diabetes epidemic. Acta diabetologica 2012; 49(3): 167-83.
7. Ursic-Bratina N, Battelino T, Kržišnik C, et al. Seasonality of birth in children (0-14 years) with type 1 diabetes mellitus in Slovenia. J Pediatr Endocrinol Metabol 2001; 14(1): 47-52.
8. Willis JA, Scott RS, Darlow BA, et al. Seasonality of birth and onset of clinical disease in children and adolescents (0-19 years) with type 1 diabetes mellitus in Canterbury, New Zealand. J Pediatr Endocrinol Metabol 2002; 15(5): 645-8.
9. Kalliora MI, Vazeou A, Delis D, et al. Seasonal variation of type 1 diabetes mellitus diagnosis in Greek children. Hormones 2011; 10(1): 67-71.
10. LÚvy-Marchal C, Patterson C, Green A, et al. Variation by age group and seasonally at diagnosis of childhood IDDM in Europe. Diabetologia 1995; 38(7): 823-30.

[Downloaded from caspianjp.ir on 2026-11-12]

[DOR: 20.1001.1.24234729.2018.4.2.5.1]
[DOI: 10.22088/CJP.BUMS.4.2.317]

11. Scott RS, Brown LJ, Darlow BA, et al. Temporal variation in incidence of IDDM in Canterbury, New Zealand. Diabetes care 1992; 15(7):895-9.

12. Gray RS, Duncan LJ, Clarke BF. Seasonal onset of insulin dependent diabetes in relation to sex and age at onset. Diabetologia 1979; 17(1): 29-32.

[Downloaded from caspianjp.ir on 2026-11-12]

[DOR: 20.1001.1.24234729.2018.4.2.5.1]

[DOI: 10.22088/CJP.BUMS.4.2.317]