ORGINAL ARTICLE

The First Phase Registration of Type 1 Diabetes in Yazd, Iran

Maryam Askari[1], Nasim Namiranian[1], Hassan ali Mahmoudi Kohani[1]*, Seied Mohammad Reza Aghaee- Meybody[1], Saeed hossein khalilzade[1], Zohre Mozafari[1], Mahbubeh Shariati[1]

1. Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

***Correspondence:**
Hassan ali Mahmoudi Kohani, Epidemiologist, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
Tel: (98) 353 728 0215
Email: a.mahmoodi@ssu.ac.ir
ORCID ID: (0000-0002-3073-2822)

Received: 20 April 2021

Accepted: 15 July 2021

Published in September 2021

Abstract

Objective: The aim of this study was registration of type 1 diabetes mellitus (T1DM) in Yazd (the first phase of registration).

Materials and Methods: This study was a cross-sectional study on the first phase registration of T1DM in Yazd, Iran. Participants in this study included all patients diagnosed with T1DM by an endocrinologist. Data were analyzed by SPSS20 statistical software. Non-parametric tests were used in this study. Median ± Range was used to describe the data. Stata 13 software was used to calculate the confidence interval for the prevalence.

Results: Yazd T1DM registry (YT1DMR) was conducted from June 2018 to August 2020. All new and old cases of T1DM were registered. YT1DMR was able to identify 158 T1DM and it registered the data of 128 patients. The age of the participants was between 2.5 - 57 years old. Median ± Range of age in these participants was calculated 17 ± 54.5. In terms of gender, (57.81%, CI= 48.76-66.48) of these patients were male. The prevalence of overweight and obesity in these patients was 17.32 (CI= 11.18-25.04) and 6.29% (CI= 2.75-12.03), respectively.

Conclusion: In the future, all patients with T1DM in Yazd province are expected to enroll in the YT1DMR and be followed up.

Keywords: Registration, Type 1 diabetes, Yazd

Introduction

Type 1 diabetes mellitus (T1DM) is characterized by the destruction of pancreatic cells, which occurs at a variable rate. Clinical symptoms occur when approximately 90% of pancreatic β cells are destroyed (1,2). T1DM etiology is still unknown, but genetic susceptibility, environmental factors may influence the pathogenic processes (1).

Various studies in Yazd, Iran evaluated the incidence and prevalence of type 2 diabetes. The incidence of diabetes by Namayandeh and et al. was predicted 21.4 per 1,000 person-year in a 10-year cohort study in people aged 20-74 (3). The prevalence of diabetes in the studies of Mirzaei et al. (4), Fallahzadeh et al. (5), and Lotfi et al. (6) were 14.10%, 14.67%, and

16.30%, respectively. But the epidemiology of T1DM was not studied in Yazd.

There is an association between T1DM and seasonal changes, as well as an association between the development of β cell autoimmunity and the risk of developing a person's month of birth, but these associations are unclear (7,8).

Family aggregation is reported in 10% of cases of T1DM, but when we look more broadly at family history, it reaches 20%. However, there is still no specific genetic pattern for diagnosis (9). T1DM is 2 to 3 times more common in the children of a diabetic man than in the children of a diabetic woman (1); but other studies, contrary to data from T1DM, have a similar risk of recurrence in the children of mothers and fathers with late-onset T1DM (10).

Although T1DM has serious physical and emotional complications with proper blood sugar control, many of these consequences can be prevented. Proper management of T1DM requires multiple cares, which with limited resources in most health systems must be carefully considered and selected. Reliable information and monitoring of the epidemiology of T1DM are essential for effective service planning and resource allocation. This requires a registration system with a strong database (11). The hospital-based diabetes registry is linked to a hospital or health center that it has a positive effect on diabetes care. This is the first phase report of T1DM pre-registration in Yazd which, will be completed in the registration phase.

Materials and Methods

Study design and procedures

This study was a cross-sectional study of the first-phase T1DM-registration in Yazd. Yazd province (latitude: 31.8974° N; longitude 54.3569° E) is located in central Iran (12,13) (Figure 1).

Considering the prevalence of T1DM, which is between 5-10%, and Cochran's formula, the sample size was calculated to be 100 patients. This study was conducted as the first phase of the registry at the Diabetes Research Center. Inclusion criteria included patients with T1DM diagnosed by an endocrinologist. They have lived in Yazd for more than one year or the children of their parents have lived in Yazd for more than one year.

In this study, patients were collected from one source (Diabetes Research Center). To reduce the selection bias, all endocrinologists, internal and general practitioners were asked to refer

Figure 1. Location of Yazd, Iran

their patients.

Anthropometric indices

To measure height, the participant had to stand on a flat surface while looking forward. The shoulders are on the same level and the hands are hanging and both feet are straight, the heels and the soles of the feet are on the ground. Then, in this position, a ruler was placed on the highest part of the head and the marked point was recorded on the stadiometer (centimeters). The patient's weights were measured using a scale (Omron Inc. Osaka, Japan). Body mass index (BMI) was calculated using the formula of Weight (kg)/ height2 (m2). BMI category was as follows: In patients under 18 years old, it was based on the Centers for Disease Control and Prevention (CDC) reference. Less than the 85th percentile was normal or healthy weight and 85th to less than the 95th percentile was overweight (14). BMI for participants over 18 years old was also categorized based on the World Health Organization (15).

Physical activity (PA)

Assessment of daily physical activity was performed using International Physical Activity Questionnaire (IPAQ). In this questionnaire, the type of physical activity and the number of days that the person performs physical activity are asked. The results of IPAQ were reported in categorical forms (low, moderate, and high). The validity (Cronbach's alpha coefficient= 0.7) and reliability (Spearman-Brown correlation coefficient= 0.9) of this questionnaire have been measured in the study Baghiani Moghaddam and et al. (16).

Statistics analysis

Data were analyzed by SPSS20 statistical software. After checking the normality of the data by Kolmogorov-Smirnov test, the data were not normal (P-value<0.001), so non-parametric tests were used in this study. Median ± Range was used to describe the data. Stata 13 software was used to calculate the confidence interval for the prevalence.

Ethical considerations

This study has been approved by the Research Committee of Shahid Sadoughi University of Medical Sciences in Yazd. (Ethics code: IR.SSU.REC.1397.164.)

Results

The estimated sample size for the first phase was 100, but more patients were identified during the study, and data collection is ongoing.YT1DMR data collection began in June 2018. YT1DMR has been able to identify 158 T1DM and the total number of participants was 128 patients with T1DM. In some of the studied variables, the checklist was not completed by the patient (figure 2).

The age of the participants was between 2.5 - 57 years old. Median (± range) of age in these participants was calculated 17 (± 54.5). The duration of diabetes varied from one month to

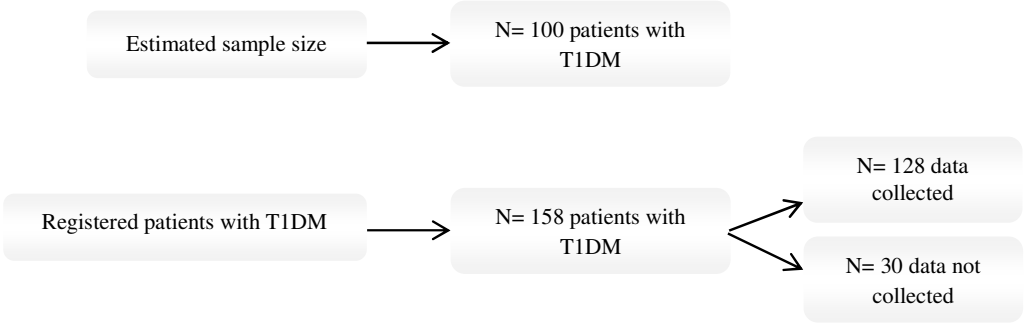

Figure 2. flow diagram of study

408 months with a median (± range) of 60 (±407). The duration of diabetes in more than 50% (54.60%, 45.65-63.50) of these patients was less than 5 years. The median age of diagnosis diabetes of participants was adolescence (11± 27 years). Most participants in this study were between 10-20 years old (46.45%, CI= 37.56-55.51). In terms of gender, (57.81%, CI= 48.76-66.48) of these patients were male. The level education of most parents (Father's education= 77.60, CI= 69.27-84.56 and Mother's education= 85.60, CI= 78.19-91.23) these patients were diploma and lower.

One hundred (79.36, CI= 71.24-86.05) of the patients had a family history of diabetes. Of these 100 patients, 61 (48.41, CI= 39.42-57.41) were second-degree relatives of patients. More than 70% (75.78, CI= 67.41-82.91) of these patients were taking Novorapid and Lantus insulin simultaneously. The prevalence of smoking or hookah in these patients was 12% (CI= 6.87-19.01). The level of low physical activity in patients over 15 years was 74.07% (CI= 60.34-85.04). The prevalence of overweight and obesity in these patients was 17.32 (CI= 11.18-25.04) and 6.29% (CI= 2.75-12.03), respectively (Table 1,2).

Conclusions

YT1DMR has been able to identify 158 T1DM and it registered the data of 128 patients.

The future plan for the YT1DM is as follows:

- Increasing the information portals of T1DM patients
- Design a questionnaire for the registry and enter it into the web-based software
- Establishment of a clinic for finding, caring, and following up patients with T1DM
- Developing a training program

Iran is one of the developing countries that need many medical services due to various sanctions against Iran. The inconsistency of patient information and the lack of protocols for data collection in developing countries have led to many duplicate data collection. The most important use of the registry is to be able to identify groups at risk for complications. So that the health care teams can better provide the necessary actions to the patients. Finally, YT1DM can maximize the cost-effectiveness of diabetes care, which is very important for developing countries.

This study is the first registration of T1DM in Yazd. This study took a long time to find patients due to the lower prevalence of T1DM than type 2 patients. But by obtaining

Table 1. Prevalence of demographic variables in the patients

Variables		Frequency (percentage)	Confidence intervals
Age (year)	<10	20 (15.74)	9.89-23.26
	10-20	59 (46.45)	37.56-55.51
	21-30	37 (29.13)	21.41-37.85
	>31	11 (8.66)	4.40-14.96
Sex	Male	74 (57.81%)	48.76-66.48
	Female	54 (42.18 %)	33.51-51.23
Marital status	Single	108 (85.03)	77.62-90.74
	Married	19 (14.96)	9.25-22.37
Father's education	Diploma and lower	97 (77.60)	69.27-84.56
	Above the diploma	28 (22.40)	15.43-0.72
Mother's education	Diploma and lower	107 (85.60)	78.19-91.23
	Above the diploma	18 (14.40)	8.76-21.80
Employment status	student	55 (42.96-)	34.25-52.01
	Non-student	73 (57.03)	47.98-65.74
Father's job	Employee	18 (14.40)	8.76-21.80
	self-employment	38 (30.40)	22.49-39.26
	Retired	65 (52.00)	42.88-61.01
	Unemployed	4 (3.20)	0.87-7.99
Mother's job	Employed	11 (8.73)	4.43-15.08
	Unemployed	115 (91.26)	84.91-95.56

Table 2. Prevalence of studied factors in the patients

Variables		Frequency (percentage)	Confidence intervals
Duration of diabetes (year)	<5	70 (54.60)	45.65-63.50
	5≥	58 (45.31)	36.49-54.34
Age of diagnosis (year)	<10	53 (41.40)	32.77-50.44
	10≥	75 (58.59)	49.55-67.22
Family history of diabetes	Yes	100 (79.36)	71.24-86.05
	No	26 (20.63)	13.94-28.75
Family history of diabetes	No	26 (20.63)	13.94-28.75
	First-degree relative	5 (3.96)	1.30-9.01
	Second-degree relative	61 (48.41)	39.42-57.41
	First & Second-degree relative	34 (26.98)	19.46-35.61
Birthday season	Spring	32 (25.80)	18.36-34.43
	Summer	30 (24.19)	16.95-32.70
	Fall	32 (25.80)	18.36-34.43
	Winter	30 (24.19)	16.95-32.70
Insulin type	Regular and NPH	7 (5.46)	22.22-10.94
	Novorapid and Lantus	97 (75.78)	67.41-82.91
	Levemir and Novorapid	6 (4.68)	1.73-9.92
	Levemir and Apidra	1 (0.78)	0.01-4.27
	Apidra and Lantus	17 (13.28)	7.93-20.41
Smoking or hookah	No	110 (88.00)	80.98-93.12
	Yes	15 (12.00)	6.87-19.01
Physical activity (Participants≥ 15 years old) (N=86)	Low	40 (74.07)	60.34-85.04
	Moderate	8 (14.81)	6.61-27.11
	High	8 (14.30)	6.61-27.11
Body Mass Index (BMI)	Normal	97 (76.37)	68.02-83.45
	Overweight	22 (17.32)	11.18-25.04
	Obese	8 (6.29)	2.75-12.03

information from other centers such as the Deputy Minister of Health of Yazd Province, a high number of patients can be registered in less time.

Acknowledgments
The authors thank the participants in this study and the staff of Diabetes Research Center for collecting data.

Funding
The funding of this study was provided by the Shahid Sadoughi University of Medical Sciences in Yazd, Iran.

Conflict of Interest
There are no conflicts of interest.

References

1. Craig ME, Jefferies C, Dabelea D, Balde N, Seth A, Donaghue KC. Definition, epidemiology, and classification of diabetes in children and adolescents. Pediatric diabetes. 2014;15(S20):4-17.
2. Hanberger L, Birkebaek N, Bjarnason R, Drivvoll AK, Johansen A, Skrivarhaug T, et al. Journal of diabetes science and technology. 2014 Jul;8(4):738-44.
3. Namayandeh SM, Karimi A, Fallahzadeh H, Rahmanian M, Bafghi SM, Soltani M, et al. The incidence rate of diabetes mellitus (type II) and its related risk factors: A 10-year longitudinal study of Yazd Healthy Heart Cohort (YHHC), Iran. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13(2):1437-41.
4. Mirzaei M, Rahmaninan M, Mirzaei M, Nadjarzadeh A. Epidemiology of diabetes mellitus, pre-diabetes, undiagnosed and uncontrolled diabetes in Central Iran: results from Yazd health study. BMC public health. 2020;20(1):166.
5. Fallahzadeh H, Ostovarfar M, Lotfi MH. Population attributable risk of risk factors for type 2 diabetes; Bayesian methods. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13(2):1365-8.
6. Lotfi MH, Saadati H, Afzali M. Prevalence of diabetes in people aged≥ 30 years: the results of

screen-ing program of Yazd Province, Iran, in 2012. Journal of research in health sciences. 2013;14(1):88-92.

7. Zhao Z, Sun C, Wang C, Li P, Wang W, Ye J, et al. Rapidly rising incidence of childhood type 1 diabetes in Chinese population: epidemiology in Shanghai during 1997–2011. Acta diabetologica. 2014;51(6):947-53.
8. Kahn HS, Morgan TM, Case LD, Dabelea D, Mayer-Davis EJ, Lawrence JM, et al. Search for diabetes in youth study group. Association of type 1 diabetes with month of birth among US youth: The search for diabetes in youth study. Diabetes care. 2009;32(11):2010-5.
9. Parkkola A, Harkonen T, Ryhanen SJ, Ilonen J, Knip M, Finnish Pediatric Diabetes register. extended family history of type 1 diabetes and phenotype and genotype of newly diagnosed children. Diabetes care. 2013;36(2):348-54.
10. Harjutsalo V, Lammi N, Karvonen M, Groop PH. Age at onset of type 1 diabetes in parents and recurrence risk in off spring. Diabetes. 2010;59(1):210-4.
11. Roche EF. The national paediatric diabetes Register and its impact on healthcare. Ir Med J. 2014;107(7):197-8.
12. Dorouzi E. Iran's position in the south east Asian Union from the point of view of international law. International Academic Journal of Humanities. 2018;5(1):147-61.
13. Dehghan H, Sadraei J, Moosa-Kazemi SH. The morphological variations of Culex pipiens larvae (Diptera: Culicidae) in Yazd Province, central Iran. Iranian journal of arthropod-borne diseases. 2010;4(2):42.
14. Dall TM, Mann SE, Zhang Y, Quick WW, Seifert RF, Martin J, et al. Distinguishing the economic costs associated with type 1 and type 2 diabetes. Population health management. 2009;12(2):103-10.
15. Tao B, Pietropaolo M, Atkinson M, Schatz D, Taylor D. Estimating the cost of type 1 diabetes in the US: a propensity score matching method. PloS one. 2010;5(7):e11501.
16. Moghaddam MB, Aghdam FB, Jafarabadi MA, Allahverdipour H, Nikookheslat SD, Safarpour S. The Iranian Version of International Physical Activity Questionnaire (IPAQ) in Iran: content and construct validity, factor structure, internal consistency and stability. World applied sciences journal. 2012;18(8):1073-80.