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Epidemiology of type 1 diabetes mellitus in Basrah, Southern Iraq: A retrospective study



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ABSTRACT

Aims: To investigate the epidemiology of type 1 diabetes mellitus (T1DM) in Basrah city, Southern Iraq, between 2012 and 2016 among people 0–40 year old.

Methods: This was a retrospective data analysis of electronic archives for patients with T1DM registered in Faiha Specialized Diabetes, Endocrine, and Metabolism Center (FDEMC), which is a tertiary referring Center in Basrah. The data include electronic database from August 2008 to February 2016. Incidence and prevalence rates are expressed per 100,000. Population of Basrah estimates were derived from official data of The Ministry of Planning of Iraq.

Results: There were 2536 people registered at FDEMC. Of them 53.5% were males. The overall mean age at first diagnosis was 15.3 ± 9 years and it was significantly higher in males; p value 0.0005. The prevalence rate of T1DM in people 40 years old and younger in 2016 was 87 per 100,000. Between 1 January 2012 and 31 December 2016, there were 818 identified new cases of T1DM. Of these, 417 (50%) were males. The average annual incidence rate of T1DM was 7.4 per 100,000 (95% CI, 7.1–8.1).

Conclusions: The incidence of T1DM in Basrah lies in the “intermediate group” according to DIAMOND project group classification. The incidence was increasing over the last three years. The data produced by this study provide a baseline for assessing future changes in the epidemiology of T1DM in Iraq.

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1. Introduction

Type 1 diabetes mellitus, previously known as insulin-dependent diabetes, is a heterogeneous disorder that usually develops during childhood and adolescence. The disease is characterized by a deficit of insulin production secondary to destruction of pancreatic β -cells and requires lifelong administration of insulin for survival [1]. The epidemiology of type 1

diabetes mellitus has been the subject of interest of a number of international study groups and systematic reviews such as Diabetes Epidemiology Research International (DERI), Euro-diab Aetiology of Childhood Diabetes on an Epidemiological Basis (ACE), the World Health Organization's Diabete Mondial (WHO DIAMOND), International Diabetes federation (IDF) Atlas, Search For Diabetes in youth (SEARCH) and the Australian Diabetes Data Network [2–7]. These studies have

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contributed enormously to the medical knowledge and understanding of the multifactorial etiology of type 1 diabetes mellitus. These studies have shown that the incidence of type 1 diabetes mellitus varies significantly between countries with the highest incidence been reported in Northern Europe (52.8 per 100,000 in Finland) and the lowest in China and Venezuela (0.1 per 100,000) [1,5,8]. The annual worldwide incidence of type 1 diabetes mellitus is estimated to be 79,000 and the prevalence to be 500,000 among children younger than 15 year of age [5]. The first study from the middle East region described the incidence of type 1 diabetes mellitus was published in 1983 in Kuwait [9]. Since then, several studies from almost every country in that region were published. Some countries have more than one study in this regard [1,10–12]. Majority of these studies showed a relatively high incidence of type 1 diabetes mellitus with an increasing trend. However, there is dearth of data from Iraq. Furthermore, studies on the incidence of type 1 diabetes mellitus among young adults are scarce confronted by a huge number of studies on children [3–5,7,13–15]. To the best of our knowledge, there has been no published study describing the incidence and prevalence of type 1 diabetes mellitus in Iraq. Iraq population is estimated to be 36,000,000 in 2016 [16]. Iraq consists of 18 provinces; Basrah is the second largest province located in the southern part of Iraq with an estimated population of 2,900,000 in 2016, 80% of them were younger than 40 years old, according to data from the Iraqi Ministry of Planning. The Faihaa Specialized Diabetes, Endocrine, and Metabolism Center (FDEMC) is a tertiary center in Basrah established in 2004. Since then all people with type 1 diabetes mellitus were referred to be registered in the center. The number of ascertained cases of type 1 diabetes that are registered in the Center reached 2536 in February 2017. All age groups are equally treated in the center, both type 1 and 2 diabetes mellitus. Furthermore, FDEMC is the only tertiary center that specializes in treating people with diabetes in Basrah. This study aims to investigate the epidemiology of type 1 diabetes mellitus (prevalence, incidence and trends) in Basrah city between 2012 and 2016 among people 0–40 year old. It also aims to establish a baseline data for future studies and healthcare planning.

2. Subjects, materials and methods

2.1. Study design

The FDEMC is a tertiary center in Basrah established in 2004. Since then all people with type 1 diabetes mellitus were referred to be registered in the center from both public and private hospitals as well as Pediatrician private clinics. Patients satisfying standard WHO criteria for diagnosis of type 1 diabetes mellitus were recorded prospectively [17]. This represented the primary source of ascertainment. Prospective notification of newly diagnosed patients with type 1 diabetes mellitus from public and private clinics and from admission records in all Hospitals in Basra represented the secondary source of ascertainties. Furthermore, deaths due to type 1 diabetes mellitus were recorded from reviewing death certificates issued by Basra death Registry. In Iraq, every patient with type 1 diabetes mellitus is offered treatment free of

charge subsidized by the government after being registered in one of the public clinics. There are 13 specialist doctors at FDEMC, a consultant Endocrinologist, three adult Endocrinologists, three Pediatric Endocrinologists and six Endocrinology Trainees. The diagnosis of type 1 diabetes mellitus was made by at least one Endocrinologist. Data on all newly diagnosed cases of type 1 diabetes mellitus was retrieved from FDEMC electronic database which includes demographic variables, family history of diabetes mellitus, anthropometric measurements, C-peptide and pancreatic antibodies. The latter two tests were used to ascertain the diagnosis and classification of type of diabetes in borderline cases. The date of starting insulin therapy was taken as the date of diagnosis of type 1 diabetes mellitus. Basrah population estimates were derived from official data of the Central Organization of Statistics and information Technology (COSIT) of the Ministry of Planning of Iraq in 2014 [16]. The estimated population for the preceding and following years was calculated based on the national population growth rate.

2.2. Statistical analysis

Descriptive data are presented as mean and standard deviation (SD) after testing for normal distribution. The average annual incidence rates were calculated by dividing the newly diagnosed cases of type 1 diabetes mellitus in a specific year by population at risk who reside in Basrah in that year and expressed per 100,000 person per year. The 95% confidence intervals (CI) of the annual incidence rates were calculated based on Poisson distribution. The prevalence rate was calculated by dividing the total number of registered cases in the center up to 2016 by population at risk who reside in Basrah in the same year and expressed per 100,000 person. Those who are 40 years old or younger were considered as the risk group (denominator). Chi squared test was used to compare the rates between sexes and expressed as p value. A p value of <0.05 was considered significant. Statistical Package for the Social Sciences (SPSS) 22.0 for Windows (SPSS Inc., Chicago, IL, USA) was used in the analysis.

2.3. Ethics approval

The study was approved by the Research and Ethics Committee of the University of Basrah.

3. Results

The total number of ascertained cases of type 1 diabetes mellitus that were registered in FDEMC until February 2017 was 2536. Of them, 53.5% were men with a male to female ratio of 1.2:1. The mean age of registered cases was 28.4 ± 18.5 year. The overall mean age at first diagnosis was 15.3 ± 9 years. The mean age at first diagnosis was significantly higher in men than women, 16.4 ± 9 and 14.0 ± 8.7 year respectively; p value = 0.0005. The prevalence rate of type 1 diabetes mellitus in people 40 years old and younger in 2016 was 87 per 100,000. Between 1 January 2012 and 31 December 2016, there were 818 identified new cases of type 1 diabetes mellitus. Of these, 417 (50%) were men. The distribution of cases by year of diagnosis,

Table 1 – Annual incidence rates of type 1 diabetes mellitus per 100,000 among people <40 years of age, 2012–2016.

Year	Denominator (population at risk)	No. of incident cases	Women	Men	Annual incidence rate	95% CI
2012	2,066,400	182	82	100	8.8	7.6–10.2
2013	2,130,421	160	75	85	7.5	6.4–8.8
2014	2,196,325	117	49	68	5.3	4.4–6.4
2015	2,261,613	171	90	81	7.5	6.5–8.8
2016	2,329,624	188	105	83	8	7.0–9.3
Total		818	401	417	7.4 ^a	7.1–8.1

^a Average annual incidence.

gender with incidence rates is presented in Table 1. The average annual incidence rate of type 1 diabetes mellitus in people 40 years old and younger was 7.4 per 100,000 (95% CI, 7.1–8.1). The incidence rates in 2012, 2013, 2014, 2015 and 2016 were (8.8, 7.5, 5.3, 7.5 and 8)/10⁵ respectively with no difference between men and women; *p* value = 0.8. The trend in annual incidence rates from 2012 to 2016 demonstrated two peaks in 2012 and 2016 with a nadir in 2014 as shown in Fig. 1.

4. Discussion

The total number of ascertained cases of type 1 diabetes mellitus that were registered in FDEMC until February 2017 was 2536. Therefore, this is considered as the largest and the first of its kind study looking into the epidemiology of type 1 diabetes mellitus in Iraq.

In general, there is no sex predilection in the prevalence of type 1 diabetes mellitus [5]. However, some regional studies reported a higher frequency in one sex over another as shown in Table 2. The current study showed a slightly higher reported cases in men in comparison to women which is similar to studies from Kuwait and Tunisia [15,18] and may could reflect a gender difference in exposure to certain environmental triggers for type 1 diabetes mellitus. In Basrah, boys are less restricted in term of going outside homes and hence, more prone to exposure to environmental factors.

The mean age of first diagnosis of type 1 diabetes mellitus in this study was 15.3 ± 9 years which was much higher than that of Turkey and Saudi Arabia (8.1 and 6.9 year respectively) [11,19]. This can be attributed mainly to the pubertal rise of

growth hormone and sex steroids, which antagonize insulin action, as well as the emotional stress accompanying this period. Furthermore, late exposure to environmental factors that destruct β -cells of the pancreas and the slow onset of the disease might be attributable factors. According to our results, men tend to be diagnosed at older age than women which may be related to the earlier onset of puberty in girls than boys. These findings imply that more efforts should be directed toward early detection by screening and education of teens at secondary schools about the symptoms of the disease.

Unfortunately, most of the epidemiological studies of type 1 diabetes mellitus have investigated the disease incidence, few dealt with its prevalence, and most data sources do not distinguish between type 1 diabetes and type 2 diabetes mellitus in reporting prevalence [15]. The prevalence of type 1 diabetes mellitus in this study was 87 per 100,000 in 2016 which is lower than that of Egypt (112/10⁵) [20].

The average age-adjusted annual incidence of type 1 diabetes mellitus for the 0–40 year age group in Iraq during 2012–2016 was 7.4 per 100,000 (95% CI 7.1–8.1). The incidence of type 1 diabetes mellitus is widely variable across the globe, ranging from 0.1 per 100,000 in China and Venezuela to 57 per 100,000 in Finland [4,8]. Compared to some recent reports from the Middle East and North African region (MENA) [9,11,12,15,21], our incidence figure lies in the “intermediate category” of the WHO Diabetes Mondiale (WHO DiaMond) project classification approaching those quoted from France and Italy [4]. In general, our incidence was similar to that of Turkey [19], Libya [22], Tunisia and Algeria [4,13], higher than

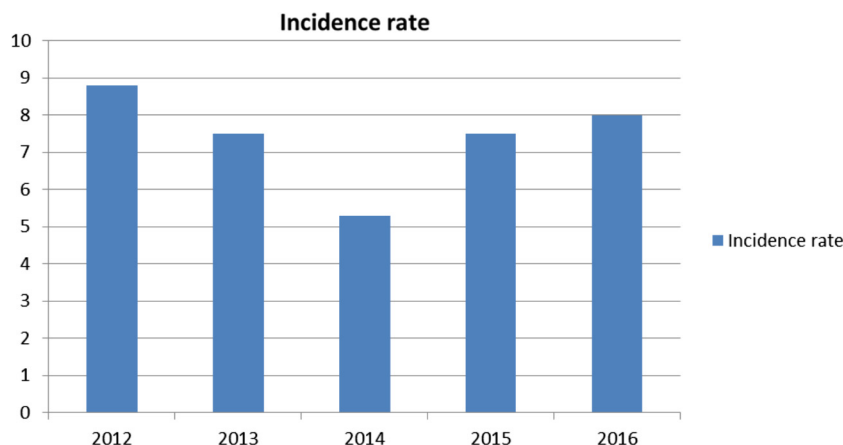
**Fig. 1 – Trend in annual incidence rates of type 1 diabetes mellitus per 100,000 among people 0–40 years of age, 2012–2016.**

Table 2 – Epidemiology of type 1 diabetes mellitus in the neighboring countries.

Country	Study period	Study age group	Incidence (n per 10 ⁵)	Gender difference	Mean age at diagnosis (y)
Saudi Arabia [11]	2004–2009	0–12	29	Significant female preponderance	6.9
Kuwait [18]	1992–1997	0–14	20.1	Slight male predominance	NA
Turkey [19]	2011	0–14	7.2	Significant female preponderance	8.1
Iran [23]	1991–1996	0–30	4.2	Significant female preponderance	NA
Jordan [2]	1992–1996	0–14	3.6	No difference	NA

NA: not available.

Jordan [2], Iran [23] and Egypt [20], and lower than Kuwait [18], Saudi Arabia [11,12], Qatar [15,24], Israel [25] and Sudan [26]. Majority of the studies reported the incidence in 0–14 year age group. There are scarce data on the incidence of type 1 diabetes mellitus in 0–40 year age group. We decided to calculate the incidence in 0–40 year age group as this study was aiming at describing the epidemiology of type 1 diabetes mellitus in the people at risk of the disease and it was not directed toward children only. The lower incidence in our study ($7.4/10^5$) compared to reports from Saudi Arabia ($29/10^5$) [12], Qatar ($23/10^5$) [15] and Kuwait ($20/10^5$) [18] may be explained by the fact that these countries have a higher gross domestic product (GDP) and hence wealthier than Iraq. It is well established that high socioeconomic status is considered as a risk factor for the development of type 1 diabetes mellitus [5]. Obviously, data on genetic and environmental risk factors for type 1 diabetes mellitus are needed to provide a better explanation for the difference in incidence between these neighboring countries which might share a common genetic and ethnic background.

The genetic variations per se cannot explain the wide difference in the incidence rate seen in neighboring countries of similar ethnicity (see Table 2) despite the fact that it is well established that genetic factors, notably the HLA system, influence the susceptibility to type 1 diabetes mellitus. There must be other factors, environmental and socioeconomic, that can explain this variation alongside with genetics. A supporting evidence is the increasing trend in the incidence observed in many regions over the last years. In an ecological analysis on the incidence of type 1 diabetes mellitus in Europe, it was shown that the incidence was positively correlated with national indicators of prosperity, such as GDP and low infant mortality [5]. The national GDP in Iraq generally and in Basrah specifically has increased over the last decade after the release of economic sanction. As a result, the prevalence of childhood obesity has increased. According to the accelerator hypothesis, obesity and resistance to insulin stimulate the autoimmune destruction of β -cells of the pancreas [27]. Furthermore, consanguineous and endogamous marriages are highly prevalent in Basrah which in turn increase the likelihood of gene-based disorders such as type 1 diabetes mellitus encounter. All of these factors may have contributed to the increasing incidence of type 1 diabetes mellitus in Basrah.

The strength of this study lies in the fact that it was based on the largest registry of type 1 diabetes mellitus in Iraq and it encompasses a high representative sample. Also, it is the first study of its type in Iraq.

This study has some limitations. First, it was based on data from a single center only and hence, there is no second source for data to apply the capture-recapture method for case ascertainment. Second, case ascertainment was based on retrospective data from center records. Third, there might be under-reporting of the incidence of type 1 diabetes mellitus in FDEMC registry which is stemming from the fact that some cases were managed in the community, whether in private or public sectors, without being referred to the center routinely especially for mild cases. In addition, under-estimation is probably inherent in all registration systems.

In conclusion, the incidence of type 1 diabetes mellitus in Basrah which is the second largest city in Iraq lies in the “intermediate group” according to DIAMOND project group classification. Although there was no specific trend in the incidence, it is obvious that the incidence was increasing over the last three years. The data produced by this study provide a baseline for assessing future changes in the epidemiology of type 1 diabetes mellitus in Iraq. Further local incidence studies as well as large scale studies covering the whole country need to be conducted to accurately define the nationwide type 1 diabetes mellitus incidence and prevalence in Iraq.

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Conflict of interest

None declared.

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