

Incidence of type 1 and type 2 diabetes, between 2012-2016, among children and adolescents in Qatar

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Summary. *Introduction:* Diagnoses of type 1 DM (T1DM) and type 2 diabetes mellitus (T2DM) in youths present a substantial clinical and public health burden. The aim of this study was to determine the incidence and trend of T1DM and T2DM, among children aged 0–14 years, in Qatar. *Methods:* This prospective cohort study was performed to ascertain all new cases of T1DM and T2DM in Qatar as per the registry of the National Paediatric Diabetes Centre (the only tertiary care center treating children with DM in Qatar). Age-standardized and age-specific annual incidence rates for age groups 0.5–14 years were calculated. *Results:* A total of 440 youths with T1DM (0.5 to 14 years of age) and 45 with T2DM (5 to 14 years of age) were identified in Qatar. The inclusive unadjusted estimated incidence rates of T1DM in this population over the period between 2012–2016 was 28.39/100,000 with a 95% CI of 31.82–40.03. This was significantly higher compared to the unadjusted estimated incidence registered between 2006–2011 (23.15/100,000). No case of T2DM were registered before 2008. In the following years the incidence of T2DM increased from 1.82 per 100,000 in 2012 to 2.7 per 100,000 in 2016, with an incidence of T2DM equal to 2.9/100,000 per year. *Conclusions:* A relatively higher incidence of T1DM compared to incidence reported worldwide have been documented in Qatar. The incidence rate increased in the period 2012–2016 compared to 2006–2011. Further studies are required to determine the causes of these increases. (www.actabiomedica.it)

Key words: incidence, diabetes mellitus type 1 (T1DM), diabetes mellitus type 2 (T2DM), Qatar

Introduction

Providing an accurate estimate of the number of children with type 1 diabetes (T1DM) is a vital component of developing health strategies, evaluating the quality of care and driving research. The DiaMond and the Europe and Diabetes study (EURODIAB) and the American Search for Diabetes in Youth study monitored the trends of incidence in different countries through setting-up of population-based regional or national registries. Worldwide data indicate that the incidence of T1D has increased by 2% to 5% worldwide mainly in children and adolescents under the age of 15 years. Genetic, socioeconomic, geographic and

environmental factors are thought to contribute to the increased incidence of T1DM. The overall annual increased incidence is estimated to be around 3%. Of the estimated 490,000 children living with T1DM, 24% come from the European Region and 23% from the South-East Asia Region (1–5).

Moreover, there is evidence that type 2 diabetes (T2DM) in children and adolescents is increasing in some countries, however reliable data are sparse (1, 2, 6).

The aim of this study was to determine the incidence and trends of T1DM and T2DM among children and adolescents, aged 6 months–14 years, living in Qatar.

Patients and Methods

This prospective cohort study reports the incidence of new cases of T1DM and T2DM in children and adolescents (aged 6 months – 14 years) between January 2012 to December 2016 in Qatar. Identified case subjects during this time were ascertained from two sources and verified using the capture-recapture technique. Data were obtained from the Pediatric Diabetes Center of Hamad Medical Center (HMC), Qatar.

General population data were obtained from the planning and statistics of the Ministry of Development in Qatar (7, 8).

Trends in incidence were tested with the use of a generalized autoregressive moving average (GARMA) to account for serial correlation (9).

The study was approved by the Institutional Review Board (IRB) of Hamad Medical Center, Doha (Qatar).

Results

Over study period (2012–2016), 440 children aged 0.5–14 years were diagnosed with type 1 DM and 45 with type 2 DM. The incidence was equal to 28.39/100,000 (95% CI of 31.82–40.03), with an increased incidence rate for T1DM of 5.2% compared to the previous years (23.15/100,000) (10), and an annual increased incidence of 1.05 % per year (Table 1).

In the same period the incidence of T2DM increased from 1.16 per 100,000 in 2012 to 2.72 per 100,000 in 2016, with a incidence rate for T2DM of 2.9/100,000 per year, and an annual increased incidence of 3.12% (10).

The age at presentation differed significantly between T1DM and T2DM (Table 2).

Table 1. Incidence rates/100,000 for T1DM and T2DM in children and adolescents in Qatar

Year	T1DM	T2DM	Total
2012	25.91	1.82	27.74
2013	26.05	4.40	30.45
2014	24.65	3.48	28.12
2015	33.49	2.07	35.57
2016	31.83	2.72	34.55

Table 2. Age at presentation of children and adolescents with T1DM and T2DM living in Qatar

Age at presentation (years)	T1DM	T2DM
0.5–4.99	19.9%	0%
5–9.99	40.3%*	24.1%
10–14	39.8%	76.9%*

Most of T1DM cases occurred in winter and autumn seasons (75%). The male to female ratio in T1DM was 1:1.1 and for T2DM was 1:1.4.

All children and adolescents with T2DM were obese or overweight, and had a positive family history of T2DM.

Discussion

In our study the incidence of T1DM in children and adolescents (0.5–14 years) was considerably high compared to many European countries, and increased from 28.34 per 100,000 in 2012 to 33.2 in 2015 (95% CI of 31.2–40.0). The highest incidence for T1DM in children and adolescents has been reported in Finland (40.9/100,000). Other European countries tend to have lower incidence rates than the Scandinavian countries (United Kingdom 29.8/100,000; Czech Republic 17.2/100,000; Germany 18.3/100,000). Even lower rates have been reported in Slovenia (11.1/100,000), Slovakia (13.6/100,000), and Eastern European countries, such as Greece (9.9/100,000), Croatia (8.9/100,000), Bulgaria (9.4/100,000), Albania (3.9/100,000), Bosnia Herzegovina (3.5/100,000) and Turkey (8.7/100,000 in females and 5.7/100,000 in males) (11–19) (Figure 1).

It appears that the incidence of T1DM in children and adolescents living in Qatar is lower compared to Finland and other Scandinavian countries, higher compared to European countries and similar or to some extent lower to the incidence reported from neighbouring countries like Saudi Arabia (Figure 1), and Kuwait (39.3 /100,000 in boys and 44.1/100,000 in girls) (20–22). In addition, the incidence in Qatar is higher than the overall estimated incidence reported in the USA (19.5 cases per 100,000, in 2002–2003, and 21.7 cases per 100,000 in 2011–2012) (23).

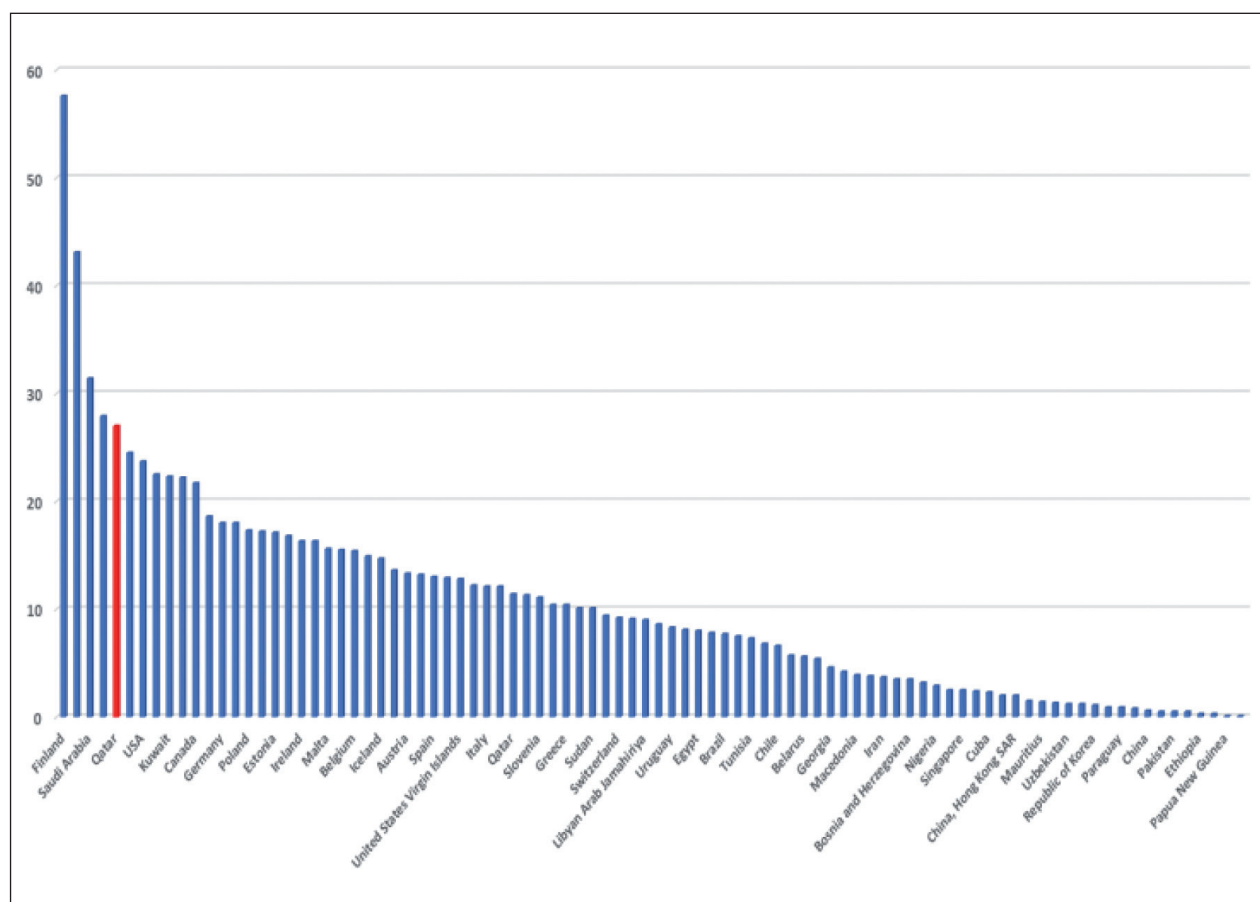


Figure 1. Incidence of T1DM in children and adolescents living in Qatar (bar in red) and other different countries

In summary, the incidence rate of T1DM in Qatar is considerably higher compared to other countries all over the world, being the 4th highest rate among 89 countries, published in the International Diabetes Federation's Diabetes Atlas in 2011 (1) (Figure 1). Furthermore, the incidence of T1DM between 2012-2016 (28.39/100,000) was significantly higher compared to the incidence rate reported between 2006-2011 (23.15/100,000).

Before 2008, there were not registered cases of T2DM in children and adolescents living in Qatar. The reported incidence rate, in children and adolescents, increased thereafter, from 1.16 per 100,000 in 2012 to 2.72 per 100,000 in 2016, with the inclusive incidence rate of T2DM of 2.75/100,000 per year. This increase is lower compared to USA where the overall unadjusted incidence rates of T2DM increased from

9.0 cases per 100,000 per year in 2002-2003 to 12.5 cases per 100,000 per year in 2011-2012, $P < 0.001$). The high prevalence of obesity and overweight in children and adolescents in Qatar has been found to be strongly correlated with metabolic syndrome and was identified as a risk factor for adverse cardiovascular outcomes in later life (24, 25).

Conclusions

The incidence rates of both T1DM and T2DM among children and adolescents living in Qatar is considerably higher compared to other countries. A significant trend increase was registered in the 2012-2016 period compared to previous years. Further studies are required to determine the causes of these increases.

References

1. International Diabetes Federation. Diabetes Atlas, 5th ed. IDF. Brussels, 2011. Available from: http://www.idf.org/sites/default/files/EN_6E_Atlas_Full_0.pdf.
2. D.I.A.M.O.N.D. Project Group. Incidence and trends of childhood Type 1 diabetes worldwide 1990-1999. *Diabet Med* 2006; 23: 857-66.
3. Patterson CC, Dahlquist GG, Gyürüs E, Green A, Soltesz G; EURODIAB Study Group. Incidence trends for childhood type 1 diabetes in Europe during 1989-2003 and predicted new cases 2005-20: a multicenter prospective registration study. *Lancet* 2009; 373: 2027-33.
4. SEARCH for Diabetes in Youth Study Group, Liese AD, D'Agostino RB Jr, Hamman RF, Kilgo PD, Lawrence JM, Liu LL, Loots B, Linder B, Marcovina S, Rodriguez B, Standiford D, Williams DE. The burden of diabetes mellitus among US youth: prevalence estimates from the SEARCH for Diabetes in Youth Study. *Pediatrics* 2006; 118: 1510-8.
5. Maahs DM, West NA, Lawrence JM, Mayer-Davis EJ. Epidemiology of type 1 diabetes. *Endocrinol Metab Clin North Am* 2010; 39: 481-97.
6. Reinehr T. Clinical presentation of type 2 diabetes mellitus in children and adolescents. *Int J Obes (Lond)* 2005; 29 (Suppl 2): S105-10.
7. <https://www.mdps.gov.qa/en/statistics1/pages/default.aspx>
8. <https://www.mdps.gov.qa/en/knowledge/Publications/Other/QIF-30-2015-En.pdf>
9. Benjamin MA, Rigby RA, Stasinopoulos DM. Generalized autoregressive moving average models. *J Am Stat Assoc* 2003; 98: 214-23.
10. Soliman A, Alali M, Elawwa A, Elsayed N. High Incidence of Childhood Type 1 Diabetes in Qatar between 2006 and 2011. *Arch Dis Child* 2012; 97(Suppl 2): A1-A539. Abs 639.
11. DIAMOND Project Group. Incidence and trends of childhood Type 1 diabetes worldwide 1990-1999. *Diab Med* 2006; 23: 857-66.
12. Borchers AT, Uibo R, Gershwin ME. The geoepidemiology of type 1 diabetes. *Autoimmunity Rev* 2010; 9: 355-365.
13. Cardwell CR, Carson DJ, Patterson CC. Higher incidence of childhood-onset type 1 diabetes mellitus in remote areas: a UK regional small-area analysis. *Diabetologia* 2006; 49: 2074-7.
14. Scottish Diabetes Survey Monitoring Group. Scottish Diabetes Survey 2016. <http://www.diabetesinscotland.org.uk/Publications/Scottish%20Diabetes%20Survey%202016.pdf>
15. Dahlquist GG, Nyström L, Patterson CC, the Swedish Childhood Diabetes Study Group, the Diabetes Incidence in Sweden Study Group. Incidence of Type 1 Diabetes in Sweden Among Individuals Aged 0-34 Years, 1983-2007: An analysis of time trends. *Diabetes Care* 2011; 34: 1754-9.
16. Craig ME, Hattersley A, Donaghue KC. Definition, epidemiology and classification of diabetes in children and adolescents. *Pediatr Diabetes* 2009; 10 (Suppl 12): 3-12.
17. Harjutsalo V, Sjöberg L, Tuomilehto J. Time trends in the incidence of type 1 diabetes in Finnish children: a cohort study. *Lancet* 2008; 371: 1777-82.
18. Patterson CC, Dahlquist GG, Gyurus E, Green A, Soltesz G EURODIAB Study Group. Incidence trends for childhood type 1 diabetes in Europe during 1989-2003 and predicted new cases 2005-20: a multicentre prospective registration study. *Lancet* 2009; 373: 2027-33.
19. Demirebilek H, Özbek MN, Baran RT. Incidence of Type 1 Diabetes Mellitus in Turkish Children from the Southeastern Region of the Country: A Regional Report. *J Clin Res Pediatr Endocrinol* 2013; 5: 98-103.
20. Abduljabbar MA, Aljubeih JM, Amalraj A, Cherian MP. Incidence trends of childhood type 1 diabetes in eastern Saudi Arabia. *Saudi Med J* 2010; 31: 413-8.
21. Habeb AM, Al-Magamsi MS, Halabi S, Eid IM, Shalaby S, Bakoush O. High incidence of childhood type 1 diabetes in Al-Madinah, North West Saudi Arabia (2004-2009). *Pediatr Diab* 2011; 12 :676-81.
22. Shaltout AA, Wake D, Thanaraj TA, Omar DM, Al-Abdul-Razzaq D, Channanath A, AlKandari H, Abdulrasoul M, Miller S, Conway N, Tuomilehto J, Davidsson L; Steering Group for the Study of Childhood Diabetes in Kuwait. Incidence of type 1 diabetes has doubled in Kuwaiti children 0-14 years over the last 20 years. *Pediatr Diabetes* 2017; 18: 761-6.
23. Mayer-Davis EJ, Lawrence JM1, Dabelea D, Divers J, Isom S, Dolan L, Imperatore G, Linder B, Marcovina S, Pettitt DJ, Pihoker C, Saydah S, Wagenknecht L; SEARCH for Diabetes in Youth Study. Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002-2012. *N Engl J Med* 2017; 376: 1419-29.
24. Mandeya J, Kridli SAO. Childhood overweight and obesity in Qatar: A literature review, *Avicenna* 2014;2 <http://dx.doi.org/10.5339/avi.2014.2>
25. Al Khalaf FA, Darwish EA, Katab M, Soliman A. Prevalence of Underweight, Overweight and Obesity Among Primary School Children in Qatar. *Qatar Med J* 2012; 21: 1.

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