Type 2 diabetes in Indigenous and non-Indigenous children and adolescents in New South Wales

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ABSTRACT

Objective: To determine the incidence of type 2 diabetes mellitus (T2DM) in 2001–2006 in young people < 19 years and the characteristics of T2DM in the Indigenous group.

Design and setting: Prospective population-based incidence study, New South Wales.

Participants: Primary ascertainment was from the Australasian Paediatric Endocrine Group NSW Diabetes Register, with secondary ascertainment from the National Diabetes Register (Australian Institute of Health and Welfare).

Main outcome measures: Incidence of T2DM in young people in NSW; incidence of T1DM and T2DM in Indigenous young people; characteristics at diagnosis.

Results: There were 128 incident cases of T2DM (62 boys, 66 girls) in the study period. The median age at diagnosis was 14.5 years (interquartile range, 13.0–16.4), and 90% were overweight or obese (body mass index > 85th percentile for age). Mean annual incidence was 2.5/100 000 person-years (95% CI, 2.1–3.0) in 10–18-year-olds. Of the ethnic groups represented, white Australian comprised 29%, Indigenous 22%, Asian 22%, North African/Middle Eastern 12% and Māori/Polynesian/Melanesian 10%. The incidence of T2DM was significantly higher in the Indigenous than the non-Indigenous group (incidence rate ratio, 6.1; 95% CI, 3.9–9.7; $P < 0.001$), but incidence rates of T1DM were similar (15.5 v 21.4/100 000, respectively).

Conclusions: T2DM accounts for 11% of incident cases of diabetes in 10–18-year-olds, and the majority are overweight or obese. The high rate among Indigenous Australian children supports screening for T2DM in this population.

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The recent global increase in incidence of type 2 diabetes mellitus (T2DM) in children and adolescents[1] has been attributed to environmental factors (eg, changes in lifestyle and eating habits), and parallels the increase in childhood obesity.[2-4] In the United States, from 1999 to 2004, the proportion of T2DM among new-onset diabetes in children and adolescents increased from < 3% to 45%.[1] Similar trends have been found in New Zealand[4] and Western Australia.[5]

Accompanying the increased case-load of T2DM is a greater risk of early complications — microalbuminuria, hypertension and dyslipidaemia — than with type 1 diabetes mellitus (T1DM).[6-8] Young people with T2DM may also have other significant medical conditions, global developmental delay or psychiatric disease.[5,8,9]

Although indigenous groups in other countries are reported to be at high risk of developing childhood-onset T2DM,[10,11] there are limited population-based data on T2DM among Australia's young Indigenous population.[5,12] The WA study found a higher incidence of T2DM among Indigenous compared with non-Indigenous children.[5] We aimed to determine the population-based incidence of T2DM in New South Wales, in 2001–2006, among Indigenous and non-Indigenous young people and the characteristics of T2DM at diagnosis.

METHODS

The notification method for the Australasian Paediatric Endocrine Group NSW Diabetes Register, described previously,[13,14] was adapted to ascertain incident cases of T2DM from 1 January 2001. This included wider distribution of the revised notification form, newsletters and presentations, to increase awareness of the change. Secondary ascertainment was from the National Diabetes Register (NDR) (Australian Institute of Health and Welfare), which ascertains cases of insulin-treated diabetes from the National Diabetes Supply Scheme (NDSS). Patients give consent for inclusion on the NDR at the time of registration for the NDSS (ascertainment rate, 92% in 2004[15]). Overall ascertainment for incident cases using both sources is more than 99%.[13,14]

T2DM was diagnosed according to the American Diabetes Association criteria, which include the presence of acanthosis nigricans, negative test results for diabetes-associated autoantibodies, and elevated fasting insulin or C-peptide levels.[16] Register inclusion criteria were: age, 0–18 years at diagnosis; usual place of residence, NSW; and diagnosis, 1 January 2001 to 31 December 2006. Patients with secondary diabetes (eg, cystic fibrosis or hyperinsulinism) or genetic β-cell defects ("maturity onset diabetes of the young") were excluded.

Incident cases of T2DM were reported to the register by paediatricians, physicians, paediatric endocrinologists, endocrinologists, diabetes educators, and nurses. Informed consent was obtained from parents of children and adolescents enrolled in the register. The study was approved by the ethics committees of The Children's Hospital at Westmead and participating hospitals.

Clinical details at diagnosis were obtained from medical record review and by physician questionnaire. Characteristics obtained included anthropometric data, ethnic background (Australian Bureau of Statistics [ABS] criteria),[17] family history of diabetes, investigation results (including for diabetes-associated autoantibodies), and treatment at diagnosis. Postcode of residence at diagnosis was used to distinguish between urban and rural residence using ABS data.[18]

Population estimates for children in NSW[19] and for Indigenous children were obtained from the ABS. Mean annual incidence of T2DM was calculated per 100 000 person-years for 10–18-year-olds over the 6-year period. For comparison, T1DM incidence rates in young people aged 10–18 years, and in Indigenous young people, were estimated over the same period by the same methods. Confidence intervals were calculated assuming a Poisson distribution.[20] Poisson regression models were used to analyse incidence rates and to investigate trends in incidence, with outcomes expressed as incidence rate ratios and 95% CIs. Statistical analysis was performed using SPSS, version 14.0 (SPSS Inc, Chicago, Ill, USA) and Stata, version 8.0 (StataCorp, College Station, Tex, USA).

RESULTS

There were 128 incident cases of T2DM in children and adolescents aged 7–18 years from 2001 to 2006 inclusive (62 boys, 66 girls). The mean annual incidence estimated for 10–18-year-olds (there were only seven children aged 7–9 years) was 2.5 per 100 000 person-years (95% CI, 2.1–3.0). Incidence did not change over the 6-year period (incidence rate ratio [IRR], 0.99; 95% CI, 0.89–1.09). The mean annual incidence of T1DM in 10–18-year-olds over the same period was 21.1 per 100 000 (95% CI, 19.9–22.5). Overall, 11% of incident cases aged 10–18 years had T2DM.

The median age at diagnosis of T2DM was 14.5 years (interquartile range [IQR], 13.0–16.4), and the youngest was 7.5 years. The median body mass index (BMI) was 31.1 kg/m^2 (IQR, 26.1–36.7), and the median BMI SD score was 2.2 (IQR, 1.7–2.8), with 90% of patients either overweight or obese (BMI > 85th percentile for age).

There were more urban residents among incident cases (66% were from the Sydney Statistical Division). Incidence was significantly higher in the North Western Statistical Division of NSW (8.8 per 100 000 [95% CI, 3.8–17.3]) versus urban Sydney (2.6 per 100 000 [95% CI, 2.0–3.2]); IRR, 3.5 (95% CI, 1.7–7.2; $P = 0.001$). Among patients for whom ethnicity was available ($n = 105$; 82%), 29% were white Australians, 22% Indigenous, 22% Asian, 12% North African/Middle Eastern, 10% Māori/Polynesian/Melanesian, 5% European, and the remaining were African or South American. Among those with T1DM for whom ethnicity was available ($n = 747$; 72%), 4% identified as Indigenous. The incidence of T2DM was significantly higher in Indigenous than non-Indigenous young people, while the incidence of T1DM was similar (Box 1). The characteristics of Indigenous young people with T1DM and T2DM are given in Box 2.

1 Incidence per 100 000 (95% CI) of diabetes type 1 and 2 in Indigenous and non-Indigenous 10–18-year-olds, NSW, 2001–2006

	Indigenous ($n = 180 481$)*		Non-Indigenous ($n = 4 902 872$)*		
	Cases	Incidence	Cases	Incidence	IRR†
Type 2	23	12.7 (8.1–19.1)	98	2.1 (1.7–2.5)	6.1 (3.9–9.7)
Type 1	28	15.1 (10.3–22.4)	1009	21.4 (20.1–22.7)	0.7 (0.5–1.1)

* Population at risk. † Incidence rate ratio (Indigenous v non-Indigenous). ◆

2 Characteristics of Indigenous children diagnosed with diabetes type 1 and 2, NSW, 2001–2006

	Diabetes type 1	Diabetes type 2
No. of cases (%)	28 (4%)	23 (22%)
Age at diagnosis, median (IQR)	12.7 (11.0–14.1)	13.7 (12.1–16.6)
No. of males (%)	16 (57%)	8 (50%)
No. of rural residents (%)	13 (46%)	15 (65%)
No. with family history of diabetes type 2 (%)	8/19 (58%)	12/16 (75%)
BMI SD scores, median (IQR)	0.9 (0.1–1.8)	2.3 (1.8–2.1)*

* $P < 0.01$ for difference (type 1 v type 2 diabetes). BMI = body mass index. IQR = interquartile range. ◆

DISCUSSION

Over the period 2001–2006, 11% of 10–18-year-olds with newly diagnosed diabetes in NSW had T2DM. While the caseload for T2DM was lower than for T1DM, more than half the patients were from minority groups and most were overweight or obese. The incidence of T2DM in Indigenous young people (12.7/100 000) was more than six times higher than that in the non-Indigenous group, in keeping with data from WA, where incidence ranged from about 8 to 16 per 100 000 from 1997 to 2002.[5]

These are the first population-based diabetes incidence data reported for Indigenous children and adolescents in NSW. Although T2DM incidence was higher in the Indigenous than the non-Indigenous group, characteristics such as age at diagnosis, sex and BMI SD score were similar.

That the incidence of T1DM was similar in NSW Indigenous and non-Indigenous children and adolescents is initially surprising, because there is a greater than 300-fold variation in T1DM incidence worldwide, with low rates in many indigenous populations.[21] While the background risk for T1DM in Indigenous Australians is unknown, the high incidence supports the putative role of environmental factors (diet, lifestyle and infections) in T1DM.[22]

We may have underestimated the incidence of T2DM, particularly among older adolescents or children from remote areas who may not have access to paediatric diabetes services. The NDR only collects information on insulin-treated T2DM, so there may be additional unreported cases of T2DM not requiring insulin. However, based on our experience with the NSW Diabetes Register since 1990, with more than 99% overall case ascertainment,[13,14] it is unlikely that T2DM incidence is significantly under-reported here. As ethnicity data were not available for all patients, it is possible that incident cases among Indigenous and minority groups were underestimated.

The high incidence of T2DM in Indigenous Australian children and adolescents, and those from other minority groups, supports consensus recommendations for screening high-risk groups, including overweight children (BMI > 85th percentile), those from high-risk ethnic backgrounds (Indigenous, Asian/Pacific and Hispanic), and those with signs of insulin resistance (acanthosis nigricans), or a family history of T2DM.[21] The high rate of early complications[5,6,8,23] and the more common occurrence of dyslipidaemia, hypertension and renal disease in Indigenous children make screening even more important.[24] As Indigenous and non-Indigenous children and adolescents have similar rates of T1DM, both forms of diabetes should be considered in an Indigenous child presenting with diabetes, and testing for autoantibodies should be included in the diagnostic work-up.

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COMPETING INTERESTS

None identified.

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