Rising Rates of All Types of Diabetes in South Asian and Non-South Asian Children and Young People Aged 0–29 Years in West Yorkshire, U.K., 1991–2006

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OBJECTIVE—To investigate incidence trends of all diabetes types in all children and young people and in the south Asian subpopulation.

RESEARCH DESIGN AND METHODS—Annual incidence per 100,000 and time trends (1991–2006) were analyzed for 2,889 individuals aged 0–29 years diagnosed with diabetes while resident in West Yorkshire, U.K.

RESULTS—Diagnoses comprised type 1 (83%), type 2 (12%), maturity-onset diabetes of the young (0.7%), "J"-type/other (0.1%), and uncertain/unclassified (4%). There was a lower incidence of type 1 and a threefold excess of type 2 in south Asians compared with non-south Asians. Type 1 incidence leveled out and type 2 increased after the first south Asian case of type 2 was diagnosed in 1999. Type 2 and unclassified diabetes incidence rose in all population subgroups.

CONCLUSIONS—The burden of diabetes increased over time for both ethnic groups, with a significant excess of type 2 diabetes in south Asians. The rising incidence of type 1 diabetes in south Asians attenuated as type 2 diabetes increased after 1999.

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Type 1 diabetes incidence is stable in young adults (1,2), contrasting with rising rates in children (3,4). In south Asia, the incidence is low (4), but south Asian children had rates similar to the indigenous population in the U.K. up to 1999 (5). An increasing incidence of type 2 diabetes in children and young people is reported in the U.K. and worldwide (6–8), but in Asia it has emerged more quickly—and in younger age groups—than elsewhere (9). In this report we have analyzed incidence trends in all types of diabetes to assess the total burden of diabetes in children and young people.

RESEARCH DESIGN AND METHODS

—Data on individuals aged 0–29 years diagnosed with any type of diabetes (excluding gestational) from 1 January 1991 to 31 December 2006 were extracted from clinical notes by a dedicated Register Manager and entered onto the population-based Yorkshire Register of Diabetes in Children and Young People for residents of West Yorkshire, which has a 97.6% level of completeness (1).

Type of diabetes was defined in accordance with World Health Organization guidelines (10) as type 1, type 2, maturity-onset diabetes of the young (MODY), "J"-type/other, and uncertain/unclassified. Original diagnoses of uncertain/unclassified were reclassified as type 1 for 18% (n = 32) and type 2 for 11% (n = 20). Analyses are based on the final diagnosis type and first diagnosis date.

Ethnicity was assigned as south Asian (Pakistani, Indian, Bangladeshi) or non-south Asian (all other ethnicities) using the South Asian Names Analysis Program (Nam Pehchan) and the South Asian Name and Group Recognition Algorithm (SANGRA), two independent name recognition programs that are validated and sensitive tools for identifying south Asians (11,12). Where the programs disagreed (<1%), a local expert examined the names and assigned ethnicity.

Incidence was defined as the number of newly diagnosed cases per calendar year and 100,000 population at risk. Age-sex standardized rates were derived using indirect standardization. Populations for West Yorkshire were provided by the Office for National Statistics, supplemented by estimated midyear population denominators by age, sex, and ethnic group. Three-year moving average rates were calculated to assess trends in incidence.

Effects on incidence of age at diagnosis (5-year groups), sex, ethnicity (south Asian or not), and year of diagnosis on all types, type 1, type 2 and uncertain/unclassified diabetes were analyzed using Poisson regression. Average annual percentage change (AAPC) and 95% CIs were derived using the coefficient for year in the Poisson model. All analyses were done in Stata 11 software (StataCorp LP, College Station, TX).

RESULTS

—Diabetes was diagnosed in 2,889 children and young people, with 83% (n = 2,410) type 1, 12% (n = 337) type 2, 0.7% (n = 19) MODY, 0.1% (n = 1 of each) "J"-type or other, 0.1% (n = 4) not recorded, and 4% (n = 117) uncertain/unclassified.

Incidence

The incidence (95% CI) of all diabetes (aged 0–29 years) was 21.0 (20.2–21.7) per 100,000, with no statistically significant differences between south Asians and non-south Asians. The incidence of type 1 diabetes was 17.6 (16.9–18.3), with significantly higher rates in non-south

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Asians (18.3 [18.3–19.0]) than in south Asians (13.1 [11.4–14.8]). Type 2 incidence was 2.5 (2.2–2.7), which was significantly lower for non-south Asians (1.8 [1.6–2.1]) than south Asians (6.9 [5.6–8.1]). Incidence of uncertain/unclassified diabetes was 0.8 (0.67–0.98) and was lower for non-south Asians.

Time trends

AAPC was 4.0% (95% CI 3.2–4.8) overall, and significantly greater in south Asians (7.0% [4.8–9.2]) compared with non-south Asians (3.6% [2.7–4.4]) (Fig. 1) and females (5.3% [4.1–6.4]) compared with males (3.0% [1.9–4.0]). For type 1 diabetes, AAPC was 1.3% (0.4–2.2) overall, with a significant increasing trend seen in non-south Asians (1.4% [0.5–2.3]) compared with no trend in south Asians (0.0% [−2.8 to 2.8]). Annual incidence increased significantly for children (aged 0–14 years) at 2.9% (1.7–4.0), but was stable for young people aged 15–29 years (0.6% [−1.9 to 0.7]). For type 2, the incidence in those aged younger than 30 years rose from 0.1 to 4.9 per 100,000 between 1991 and 2006 and AAPC was 19.4% (16.5–22.2) overall, with incidence increasing at a similar rate for both ethnic groups. Incidence increased at a faster rate for children aged 0–14 (37.4% [21.5–53.2]) compared with those aged 15–29 (18.1% [15.3–21.0]).

The proportion of uncertain/unclassified cases per year rose from 0% in 1991 to 8% in 2006. AAPC was 26.4% (95% CI 20.7–32.1) overall, with similar increases for both ethnic groups.

CONCLUSIONS—An increasing burden of diabetes was observed in non-south Asian and south Asian children and young people, with a rising incidence of type 1 diabetes confirmed in children (3,4) and stable rates for young adults (1,2).

Although the proportion of south Asians in the diabetes population (13%) was similar to the background population, south Asians had a lower incidence of type 1 diabetes but an excess of type 2, with an apparent shift from diagnosis of type 1 to type 2 from 2000 onwards. The previously reported steep rise in incidence of type 1 diabetes in south Asian children up to 1999 (5) was not sustained, possibly as a result of a change in the recognition that type 2 and other forms of diabetes are emerging in younger age groups. All south Asian children diagnosed with type 2 diabetes between 1991 and 2006 were 10 years or older, and a fall in type 1 in those 15 to 29 years old in the second period is unlikely to be attributable to changes in diagnostic classification.

There are clinical challenges in the differential diagnosis of type 1 and type 2 diabetes (13,14). Treatment can be based on symptoms with no clear diagnosis, reflected in rising numbers of uncertain/unclassified diagnoses (two diagnoses in

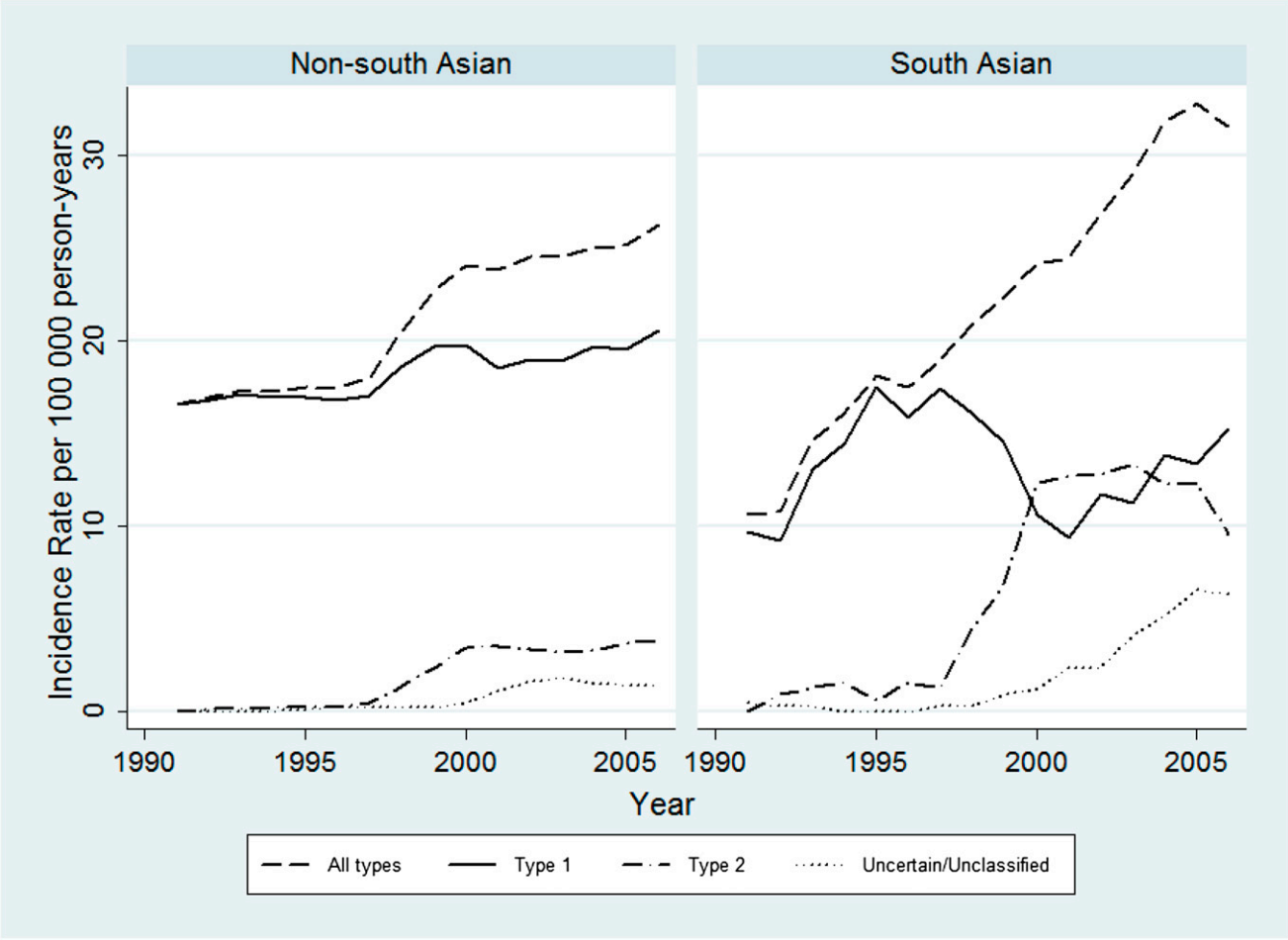

Figure 1—*Age-sex adjusted 3-year moving average incidence rates by ethnic group. (A high-quality color representation of this figure is available in the online issue.)*

the first 5 years, with 91 thereafter). We acknowledge that we may have underestimated the incidence of type 2 especially in earlier years, a problem identified in an earlier survey (15), but these observations confirm the importance of including all forms of diabetes in our analyses.

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References

1. Feltbower RG, McKinney PA, Parslow RC, Stephenson CR, Bodansky HJ. Type 1 diabetes in Yorkshire, UK: time trends in 0-14 and 15-29-year-olds, age at onset and age-period-cohort modelling. Diabet Med 2003;20:437–441
2. Ostman J, Lönnberg G, Arnqvist HJ, et al. Gender differences and temporal variation in the incidence of type 1 diabetes: results of 8012 cases in the nationwide Diabetes Incidence Study in Sweden 1983-2002. J Intern Med 2008;263:386–394
3. Patterson CC, Dahlquist GG, Gyürüs E, Green A, Soltész 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;373:2027–2033
4. DIAMOND Project Group. Incidence and trends of childhood type 1 diabetes worldwide 1990-1999. Diabet Med 2006;23:857–866
5. Feltbower RG, Bodansky HJ, McKinney PA, Houghton J, Stephenson CR, Haigh D. Trends in the incidence of childhood diabetes in south Asians and other children in Bradford, UK. Diabet Med 2002;19:162–166
6. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care 1998;21:1414–1431
7. Pinhas-Hamiel O, Zeitler P. The global spread of type 2 diabetes mellitus in children and adolescents. J Pediatr 2005;146:693–700
8. Hsia Y, Neubert AC, Rani F, Viner RM, Hindmarsh PC, Wong IC. An increase in the prevalence of type 1 and 2 diabetes in children and adolescents: results from prescription data from a UK general practice database. Br J Clin Pharmacol 2009;67:242–249
9. Yoon KH, Lee JH, Kim JW, et al. Epidemic obesity and type 2 diabetes in Asia. Lancet 2006;368:1681–1688
10. World Health Organization. Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia [article online], 2006. Available from http://wwwwhoint/diabetes/publications/en/. Accessed 1 July 2010
11. Nanchahal K, Mangtani P, Alston M, dos Santos Silva I. Development and validation of a computerized South Asian Names and Group Recognition Algorithm (SANGRA) for use in British health-related studies. J Public Health Med 2001;23:278–285
12. Cummins C, Winter H, Cheng KK, Maric R, Silcocks P, Varghese C. An assessment of the Nam Pehchan computer program for the identification of names of south Asian ethnic origin. J Public Health Med 1999;21:401–406
13. Silverstein J, Klingensmith G, Copeland K, et al.; American Diabetes Association. Care of children and adolescents with type 1 diabetes: a statement of the American Diabetes Association. Diabetes Care 2005;28:186–212
14. Ehtisham S, Barrett TG. The emergence of type 2 diabetes in childhood. Ann Clin Biochem 2004;41:10–16
15. Haines L, Wan KC, Lynn R, Barrett TG, Shield JP. Rising incidence of type 2 diabetes in children in the U.K. Diabetes Care 2007;30:1097–1101