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Evidence for increasing prevalence of diabetes mellitus in childhood

SARAH STEWART-BROWN, MARY HASLUM, NEVILLE BUTLER

Abstract

The prevalence of diabetes mellitus among the cohort of children in the Child Health and Education Study studied at age 10 was 1.3/1000. Comparison with prevalences found in the two previous British birth cohort studies suggested that the prevalence of diabetes is doubling roughly every decade. The data suggested that childhood diabetics are a socially advantaged group.

These findings have important implications and should be taken into account by health service planners if the needs of these children are to be met in the future.

Introduction

Recent reports from the United States,¹ Israel,² Finland,³ and other areas of Europe⁴⁻⁵ suggest that the prevalence of diabetes mellitus in childhood is increasing. Comparison between prevalences in the 1946⁶ and 1958⁷ British national birth cohorts suggested that an increase was also occurring in the United Kingdom. In addition, admissions to hospital and consultations by general practitioners for childhood diabetes in the United Kingdom have increased since 1957.⁸ We report data on the number and characteristics of diabetic children in the third British national birth cohort study and relate the prevalence in this cohort to that found in the previous cohort studies.

Subjects and methods

The Child Health and Education Study originated like the two previous national birth cohort studies in a perinatal survey of one week's births throughout the United Kingdom. The week selected for this particular cohort was 5-11 April 1970, and the initial study

was conducted under the name British Births Survey 1970. Data were collected on 16 015 births in England, Wales, and Scotland and a further 990 in Northern Ireland. The total (17 005) was estimated to represent 98% of all births during that week.⁹ In 1975 and again in 1980 a substantial proportion of the children born during that week and currently living in England, Wales, and Scotland were traced and contacted. Children in the original survey who had emigrated (roughly 0.6%) were excluded and new immigrants included, so that both data sweeps represented a national sample of children who were currently living within the survey boundaries.

In the most recent data sweep, when the children were 10, a health visitor interviewed the child's parent(s) at home, collecting a wide range of health, family, and social data. In addition, a clinical medical officer performed a medical examination on each child specifically for the survey. Information on all serious illnesses was gathered from both sources together with details of current medication from the parents. The social data included the father's most recent occupation, which was classified according to the Registrar General's classification of occupations.¹⁰ Children who might be suffering from diabetes mellitus were identified from all available information. The hospitals attended by these children for control of their disease were contacted and the relevant medical records sent to us for inspection.

Of the two earlier birth cohort studies, the National Child Development Study used a methodology similar to that of the Child Health and Education Survey; the other cohort study, the National Study of Health and Development, which had its origins in the era before computers, used a different methodology. The National Child Development Study began as a survey of all births (about 16 000) occurring throughout the country in one week in March 1958. Follow up studies attempted to survey all the children and were carried out when the children were 7, 11, and 16. Details of the methodology of this cohort study have been published elsewhere.¹¹ The National Study of Health and Development began as a survey of maternity services. Data were collected on all 13 687 births during the week 3-9 March 1946. Follow up studies, however, were limited to roughly a one third sample of the original cohort. The sample comprised all children born to non-manual and agricultural workers and a randomly selected one in four sample of children of manual workers. Illegitimate and multiple births were excluded. Prevalences applicable to the general population may be calculated from data collected in this study if statistical weighting is used to take account of the social class bias inherent in the sampling procedure. No such weighting, however, can compensate for the exclusion of illegitimate and multiple births. Further details of methodology in this study have also been published elsewhere.¹²

In both the National Child Development Study and the National Study of Health and Development a wide range of social, educational, and health data were gathered at various ages. Neither of the cohorts

Department of Child Health, University of Bristol, Bristol BS2 8DZ

SARAH STEWART-BROWN, MA, MRCP, research associate

MARY HASLUM, BSC, PHD, research associate

NEVILLE BUTLER, MD, FRCP, professor

Correspondence to: Dr S Stewart-Brown.

were surveyed at age 10, but in both studies data were obtained on the children at age 11. We compared data on the cohort in the Child Health and Education Study at age 10 with data on the 1958 and 1946 cohorts at age 11. The diabetic children in the early cohorts were identified in a manner similar to that described for the cohort in the Child Health and Education Study; in all cases the diagnosis of acute onset insulin dependent diabetes was confirmed by independent medical sources.

Results

In the data sweep on the cohort in the Child Health and Education Study at age 10 interviews were completed for 13 823 children during the 18 months after April 1980. Eighteen of these children were reported by either their parents or the examining medical officer to be suffering from diabetes mellitus. Hospital records confirmed the diagnosis of acute onset, insulin dependent diabetes mellitus in all cases, giving a disease prevalence of 18 in 13 823 (1.3/1000 children). In the data sweep on the 1958 cohort⁷ at age 11 years 10 diabetics were identified in a total population of 15 500 children, yielding a prevalence of 0.6/1000. In the equivalent sweep on the 1946 cohort only one child was found to have the disease in a sample of 5382.⁸ (This child's father had a non-manual occupation.) The prevalence for this cohort weighted to compensate for the social class bias of the sample was 0.1/1000. Table I presents these prevalences together with the 95% confidence limits on each sample.

Table II shows the age at diagnosis of the diabetics in the cohort in the Child Health and Education Study. Numbers were small, but the distribution was consistent with that reported by the National Register of Newly Diagnosed Diabetics,¹⁹ which found two peaks, one at 5 years and the other at 11, in a much larger series. The sex ratio among the diabetics in the cohort was 3.5 male to one female; this is significantly different from the ratio of 1.06:1 observed in the remainder of the cohort ($\chi^2 = 4.89$, $p < 0.05$). The reported sex ratio for the 10 diabetics in the National Child Development Study was 1.5:1.⁷

Table III shows the distribution of father's social class among the 18 diabetics in the Child Health and Education Study and the calculated prevalence of the disease in each class. It is notable that none of the diabetics were children of men in semi-skilled or unskilled manual labouring jobs; all were living with both their natural parents, and none of the fathers were unemployed. With this small number of children, however, the χ^2 test comparing rates in manual and non-manual classes did not reach significance.

TABLE I—Prevalence of diabetes mellitus in mid childhood over past 24 years

Birth cohort	Age of children (years)	Proportion of diabetic children	Prevalence/1000	95% confidence interval
1946 cohort (NSHD)	11	1/5 362	0.1*	–0.3, 0.5
1958 cohort (NCDS)	11	10/15 500	0.6	0.2, 1.0
1970 cohort (CHES)	10	18/13 823	1.3	0.7, 1.9

NSHD = National Study of Health and Development. NCDS = National Child Development Study. CHES = Child Health and Education Study.
*Weighted to take account of sampling procedure.

TABLE II—Sex of children and age at diagnosis of diabetes in cohort in Child Health and Education Study

Age (years)	Girls	Boys	Total
9		4	4
8		2	2
7		2	2
6	1		1
5	1	3	4
4	1	2	3
3	1	1	2
Total	4	14	18

TABLE III—Father's social class

	I	II	IIIN	IIIM	IV	V
No of diabetics	2	6	1	9		
Prevalence of diabetes mellitus/1000 children	2.5	2.1	0.9	1.6		

Discussion

The difference between prevalences in the three cohorts is striking, but the 95% confidence intervals (table I) show that with the small numbers of cases available considerable variation in prevalence is to be expected by chance. Thus the prevalence calculated for the 1958 cohort was not significantly different from that calculated for the 1946 cohort and was only just outside the 95% confidence limits for the 1970 cohort. Considering the three cohorts together, however, yielded a significant difference ($\chi^2 = 6.98$, $p < 0.05$), which was almost entirely accounted for by a linear trend across the three time periods.

These statistical tests show only that the differences observed between the cohorts are unlikely to have arisen by chance. It remains necessary to consider whether any biasing factors might have caused these differences. For example, we drew comparisons between 10 year old children in 1970 and 11 year old children in 1958 and 1946, and thus it might be argued that we were not comparing like with like. Previous reports,¹³ however, have suggested that the yearly prevalence of diabetes mellitus reaches two peaks in childhood, the second occurring at 11 years of age. Therefore, when the cohort in the Child Health and Education Study has reached age 11 an even greater prevalence of the disease may be expected. Although such an increase may reduce the linearity of the trend in prevalence, it can only increase the significance of the difference we observed between the 1970 cohort and the two earlier cohorts.

A changing pattern of mortality from a disease may produce an apparent change in the prevalence of that disease: children who have died of a disease in early childhood do not contribute to an estimate of prevalence at 10 or 11 years of age. As detailed studies of all deaths in children in each of the three cohorts have not revealed any due to diabetes mellitus (C Peckham and K Morgan, personal communications), this theoretical source of bias may be dismissed. The prevalence of a disease may also appear to change if diagnostic criteria change. Because acute onset insulin dependent diabetes mellitus is a well defined clinical entity that is fatal if not treated, and because the diagnosis must be made and communicated to the parents before appropriate treatment can be instituted, this explanation also cannot account for our findings.

We considered the suggestion that the time of year in which a child is born may alter his susceptibility to diabetes mellitus,¹⁴ but as variation in prevalence by month of birth has not been shown in this country and as the time of birth in all three cohorts differed by only one month, we concluded that this explanation was also unlikely.

A difference such as we found might possibly be documented without a true change in the prevalence of diabetes having occurred if the population samples in the different studies were not comparable. The methodologies of the 1958 and 1970 cohort studies, however, were very similar. Both studies followed up all children whose parents agreed to cooperate and both achieved between 80 and 90% follow up at the age of 10 or 11. Any biases due to incomplete coverage of the entire national sample are likely to have been similar in the two studies and any differences between the two are therefore likely to reflect changing patterns of the disease.

None of the alternative explanations we considered appeared to account for our findings, and we therefore concluded that the prevalence of diabetes mellitus in mid childhood had doubled over the past decade, and that this effect was probably part of a linear trend extending back over the past 25 years.

The finding of a zero prevalence of diabetes mellitus among the socially disadvantaged groups in the Child Health and Education Study is interesting. In the two earlier cohorts there were insufficient diabetics in mid childhood for a social class analysis to be useful. An analysis of diabetics in the 1946 cohort at 26 years of age,⁶ however, found a significant association with social class. A highly significant positive association between income and the prevalence of childhood diabetes was also found in

Montreal,¹⁵ but a recent review of evidence for the United Kingdom¹⁶ found no consistent relation. The group of diabetics in this study was small and does not provide unequivocal evidence for a relation between the disease and social class. Because the aetiological implications of such an association are great, however, the data suggest the need for larger studies to define unequivocally any relations that may exist. Meanwhile, the likelihood that childhood diabetics are a socially advantaged group should be taken into account in interpreting other studies on these children, particularly those based on outcomes such as growth, on which social class differences have an effect.¹⁷

The aetiological implications of a rising prevalence of diabetes are consistent with those of a positive association with social class. The rapid and consistent increase in prevalence implies the influence of environmental rather than purely genetic factors. One of these factors might well be the dietary changes associated with a rising per caput income in the Western world, which would manifest itself first in the higher social classes. From the point of view of health service planners there are other serious implications. In the absence of radical advances in treatment the juvenile diabetics of today are bound to become major consumers of ophthalmological and renal services in the future; planners will need to take these changes into account if the needs of these diabetic children are to be met.

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Decline in mortality from coronary heart disease in Finland from 1969 to 1979

JUKKA T SALONEN, PEKKA PUSKA, THOMAS E KOTTKE, JAAKKO TUOMILEHTO, AULIKKI NISSINEN

Abstract

The trends in mortality from coronary heart disease in the 1970s and the differences in trends between counties within Finland were calculated from official mortality statistics among the population aged 35 to 64 years. During this period coronary mortality declined by a mean of 1.1% for men and 2.3% for women annually in the whole of Finland. A community based cardiovascular

control programme was started in 1972 in North Karelia, a county in the east of Finland. The decline in coronary mortality in this county between 1969 and 1979 was 24% in men and 51% in women. The decline in the rest of Finland over the same period was 12% in men and 24% in women. The decline in North Karelia was greater than that in other counties of Finland for both men and women and that difference exceeded random variation, with over 95% likelihood for both sexes. Even with adjustment for rates before 1974 with cross-county multiple regression analyses the difference persisted.

Although further studies are needed, the changes in coronary mortality in North Karelia suggest that the preventive programme has been effective.

Introduction

Trends in mortality from coronary heart disease have varied during the past two decades in different countries of the world. Declining trends have been observed in some industrialised countries in the 1970s.¹⁻¹¹ Preliminary evidence suggests that coronary mortality has decreased in Finland in middle aged men and women.¹²⁻¹⁵ Regional differences in coronary mortality

University of Kuopio, Kuopio, Finland

JUKKA T SALONEN, MD, principal of research institute of public health
JAAKKO TUOMILEHTO, MD, acting professor of community health

Department of Epidemiology, National Public Health Institute, Helsinki, Finland

PEKKA PUSKA, MD, director
AULIKKI NISSINEN, MD, special research investigator

Department of Medicine and Laboratory of Physiological Hygiene, University of Minnesota, Minneapolis, USA

THOMAS E KOTTKE, MD, assistant professor

Correspondence to: Professor Jukka T Salonen, Research Institute of Public Health, Box 40, 70101 Kuopio 10, Finland.