

## THE PROBLEM OF DIABETES MELLITUS IN SCHOOL MEDICAL ADMINISTRATION

BY H. SAINSBURY

(With 1 Figure in the Text)

The recent inclusion of the diabetic child in the list of children for whom special provision is required to be made by Local Authorities confronts the School Medical Officer with the following questions:

- (1) To what extent does the disease exist in a school population?
- (2) Is it increasing, and if so, to what extent?
- (3) What is its significance in terms of morbidity?
- (4) What is its significance as a source of loss of child life?
- (5) To what extent is the disease subject to control?

### (1) THE INCIDENCE OF JUVENILE DIABETES

No figures for the incidence of the disease have so far been recorded in the case of children, although an attempt by the London County Council to compile a register of child diabetics before the outbreak of hostilities in 1939 has been described by Stewart (1943). Moreover, the Ministry of Education has recently instituted a survey in certain areas in order to determine the number of children who are diabetics, and, in particular, the number of such children for whom hostel accommodation may be required, the results of which have so far not been published. The agents approached were the School Health Authorities and Local Hospitals. It is probable that School Medical Officers will find it difficult to secure sufficient information to yield reliable results, for whilst routine inspections number 'thousands' per year, the disease seems to occur in only one or two children per 'ten thousand' of the child population. Thus, in a review of the defects discovered during the course of 2500 routine inspections, Gordon (1947) noted one case of diabetes.

Recently a morbidity survey was commenced in Birmingham, but it was ascertained from the medical officer in charge of the work that the sample of the school population examined amounted to only 4000 children and included only one case of diabetes.

Hanssen (1946) noted that in Bergen the food rationing authority was a reliable source of information. In this country diabetic children have a distinctive ration book but the information available does not extend beyond the number of such books in use.

In Birmingham five hospitals had to be approached, not all of which responded to inquiry with equal readiness. The information required consisted of the name, address, age and sex of all children treated for diabetes mellitus during the year. The name was essential to avoid duplication arising out of patients transferring from one hospital to another. The address was passed to the School Attendance Department to determine which children came within the Authority's responsibility. In practice, nearly half of the names submitted by the hospitals were excluded.

The term 'diabetic child' or 'juvenile diabetic' requires definition. White's (1947) definition, the only one so far attempted, includes any person in whom the disease occurred before the age of fifteen, and is clearly unsuitable for the present purpose. 'Diabetic pupils' are defined by the Minister of Education (1946) as 'pupils suffering from diabetes who cannot obtain the treatment they need while living at home and require residential care'. The writer would suggest that the term should include all children under school-leaving age who require treatment for diabetes mellitus, or who require to be kept under observation lest they subsequently develop the disease.

The degree of precision with which diagnosis can be made is important. It may be assumed that all children over the age of 2 years who become affected sooner or later (and generally sooner) reach one of the hospitals, where an accurate diagnosis can be made. Under 2 years of age Lassale (1923) and Devine (1938) have shown that cases may be missed. The incidence of the disease in Birmingham in 1947 was as follows: child population, 257,242; number of children treated in hospital for diabetes, 38; therefore number of children affected per 100,000, 14.7.

## (2) THE INCREASE IN THE INCIDENCE

The earliest information which we have relative to the incidence of diabetes is to be found in 'crude deaths' which for practical purposes go back to 1911 when the city boundary took its present form. Fig. 1 shows the trend of these deaths.

Between 1911 and 1921 these figures may be interpreted as the numbers of children affected by the disease each year, since no child so affected survived the year following the onset of the disease. The figures show that on an average 3.6 children became affected each year. The figure given above for 1947 therefore shows a tenfold increase, the numbers of children at risk having remained substantially unaltered.

up for varying periods up to 10 years from 1936 onwards which yielded figures which are significant up to the end of the fifth year.

Table 1. Showing the expectation of life of diabetic children for periods 1-5 years after the onset of the disease

Period survived (years)	No. of cases at risk	No. survived	Probability of survival
1	56	48	0.857
2	52	41	0.788
3	44	32	0.727
4	38	25	0.658
5	36	23	0.637

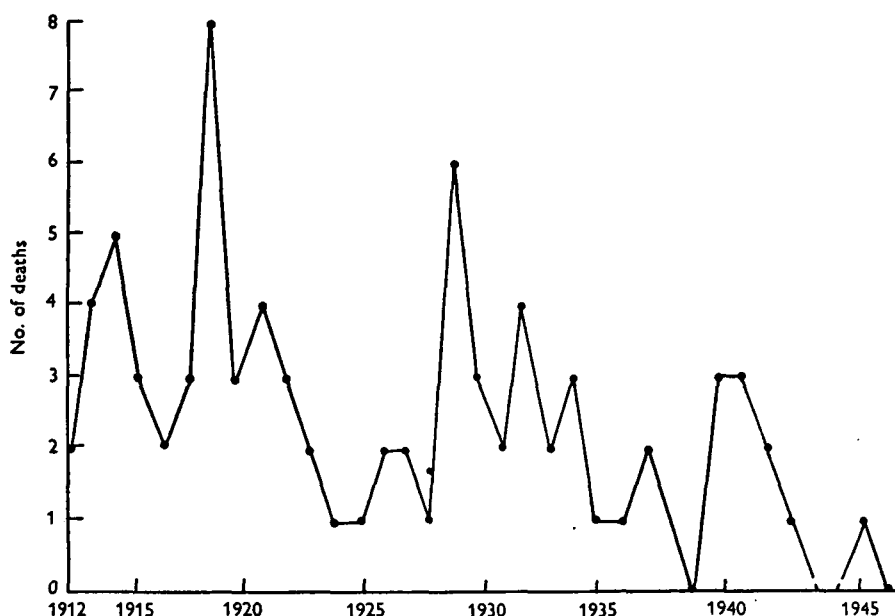


Fig. 1. Crude deaths from diabetes in age Groups 0-15 years, Birmingham 1912-46.

This assumption, however, requires some qualification. The figures for the period 1911-21 represent 'new cases', that for 1947 includes, in addition, cases under treatment during the preceding years. It was possible to arrive at an estimate of the numbers of new cases which occurred each year during the period 1936-46, the average per year being 7.2; thus it appears that the disease is occurring twice as frequently now as formerly.

The balance of the increase is made up of children who survive from year to year under more efficient medical treatment. In this connexion it seemed useful to inquire to what extent children do so survive. A series of fifty-seven cases were followed

## (3) MORTALITY

The trends in the mortality figures shown in Fig. 1 are summarized in Table 2.

Figures for crude deaths subsequent to 1928 are based on different criteria to those of years prior to that date. They are now 'Classed to Diabetes according to the Rules' which are described by the Registrar General (1938-9), who, however, states that these figures are comparable in the case of children. A paper by Garrod (1912), together with subsequent literature in the medical journals, suggests that the disease was a well-recognized clinical entity and kept well in the forefront of clinical consciousness

during the earliest years of the period under review. It may thus be assumed that coincident with the increase in the prevalence of the disease previously noted the number of deaths has fallen. How then does diabetes compare with other causes of death

Table 2. *Showing comparative mortality figures for quinquennial periods 1911-46 (Birmingham)*

Period	Population	Av. no. of deaths from diabetes per annum	Deviation ( $\pm$ )	Av. no. of deaths from diabetes per 100,000 population
1911-16	270,374	3.3	1.5	1.23
1916-21	271,911	3.8	6.5	1.4
1921-26	260,709	2.2	1.4	0.8
1926-31	249,885	2.1	1.9	0.8
1931-36	244,555	2.1	1.2	0.9
1936-41	232,616	1.8	3.2	0.7
1941-46	225,835	0.8	1.2	0.4

among children to-day? In 1946 there were 1143 deaths among children in the age periods 0-15 in Birmingham; yet in the 3 years 1944-46 there was but a single death classed as diabetes mellitus among children of the same age range.

#### (4) MORBIDITY

No estimates of the morbidity of the disease are at present available in England. Perusal of the case records of the fifty-seven children previously referred to suggested that whilst the amount of in-patient treatment varied considerably with the age of the child and the ease with which it was stabilized; taking the group as a whole, perhaps as much as a quarter of the entire school life was lost in illness. It was hoped at the beginning of the Haggerdorn period that the introduction of the long-acting insulin preparations would facilitate stabilization, but this has so far not proved to be the case.

When the early years of the disease have been successfully negotiated most cases become stabilized, and the general health of the adolescent appears well maintained with perhaps an increased liability to pulmonary tuberculosis (of the fifty-seven cases followed up two were subsequently admitted to a sanatorium).

#### (5) THE CONTROL OF THE DISEASE

Control of the disease entails limitation of: (1) the incidence of the disease; (2) the amount of sickness associated with it; (3) the mortality.

An apparent increase in the prevalence of diabetes has given rise to serious speculation in many countries and the subject of control is one which will

no doubt engage the attention of Medical Officers of Health in the future. The control of the disease is at present largely in the hands of the attending physician, who should see that all young people in his care are properly advised about the eugenics of the disease. Best, Campbell & Haist (1940) envisaged the prophylactic use of insulin which, however, does not seem to have been developed. Until the environmental factors underlying the condition are more fully known a large amount of sickness associated with the disease cannot be prevented, although clinical acumen and effective management in the home are important mitigating factors. Since the introduction of insulin it has been stated that no child should die of diabetes; yet crude deaths show at best a marked decline during the 25 years following its use. Subsequent advances in therapy have been followed by less well-defined results, and further improvement in mortality rates could be effected in other ways. Payne (1947) states that coma is the commonest cause of death in this condition and gives the following causes: (a) improper treatment, (b) failure to obey instructions, and (c) as a sequel to infectious conditions. Marquand & Tozer, (1942) give the mortality in diabetes from coma as 43%. In Birmingham out of thirty-five cases admitted to hospital in coma ten died, yet White (1933) claimed one death only in seventy cases. In ten fatal cases in which a detailed record was available of the circumstances in which death occurred, together with post-mortem findings, the following factors (Table 3) were extracted and point their own moral.

*Administration.* The Education Act 1944 provides for free treatment for all children of school age, and Local Education Authorities were empowered to make such arrangements as were convenient to provide this treatment. The National Health Service Act placed medical treatment in the hands of the Regional Hospital Boards. The Minister of Education in circular 170, dated 4 August 1948, advises School Medical Officers to outline the specialist services which the Local Education Authorities will require the Regional Hospital Boards to provide. These services should include a consultant to take charge of children suffering from diabetes. If possible they should attend the local diabetic clinic. The consultant will be responsible to the Regional Hospital Board. Mention is made of the interchange of confidential medical information, but no specific duty attaches to the consultant to inform the School Medical Officer of any diabetic children who come to light in the clinic. Thus the School Health Service may miss the opportunity to co-operate by providing supervision outside the hospital. In this connexion the School Attendance Officers with their intimate day-to-day knowledge of family circumstances have much to contribute.

Under §§ 3 and 5, pt. 2, of the Handicapped Pupils and School Health Regulations, 1945, Local Education Authorities are required to provide hostel accommodation for those diabetic children whose home conditions do not permit the receiving of the treatment and care which they require. Since it is anticipated that the majority of children who suffer from diabetes can be looked after adequately in their own homes the number of hostels required will not

possible to trace five cases only which have been admitted to this school during the past 10 years. They were selected for the following reasons:

(1) The clinical condition was difficult to stabilize.

(2) Parental anxiety about the child going a distance to school in traffic. This boy had been tried at a day school for physically handicapped children to which special transport was provided, but dietetic

Table 3. *Summarizing the factors which contributed to death in ten cases of diabetes*

Terminal cause of death	Circumstances contributing to fatal issue	
	Preventable or not	Nature of circumstances
Coma (seven cases)	Preventable (four cases)	(i) Delay in effecting treatment (two cases): (a) delay in transit to hospital; (b) delay after admission to hospital (ii) Failure to detect and treat an acute infective process, namely acute mastoiditis (two cases)
	Unpreventable (three cases)	(i) Complex pathology determined the issue (two cases) as follows: (a) an haemorrhagic colitis and T.B. pleurisy; (b) miliary T.B. acute mastoiditis and diphtheria (ii) Sudden breakdown in long-standing hitherto well-stabilized case. Rapid unexplained decline and death (one case)
Cardiac failure (three cases)	All cases were secondary to acute pulmonary oedema and death could not have been avoided on account of the severity of the condition, but the following circumstances were noted: (a) general practitioner slow in sending child into hospital; (b) mother panicked and withheld insulin	

be great and authorities are advised to utilize such accommodation as is already available. No special modification in education is advised. But opportunity should be taken to give special health instruction as it relates to diabetes to children living in the hostels.

The advantages of hostel accommodation were first pointed out by Lawrence (1935), who observed a disturbing discrepancy between the mortalities in his private and hospital patients. In Birmingham, for some years past, accommodation has been reserved for suitable cases in one of the residential schools but admissions have been few. It has been

difficulties were experienced in connexion with the midday meal.

(3) Housing difficulties resulting from the family being 'bombed out' in one of the air raids.

(4) Broken home: the parents being separated.

(5) Child beyond parental control and stealing food. The parent was elderly and deaf.

The control of infectious disease in a school population pays a particularly high dividend in the case of the diabetic child. This was emphasized in a series of seventeen consecutive readmissions to hospital in coma in which the following causative factors were recorded:

	Children admitted to hospital
Acute infections: Upper respiratory	5
Bronchitis	3
Colitis	1
Measles	3
Diphtheria	2
Tuberculosis	2
Social: Mother ill and daily routine disturbed	1
Other factors: Banti's disease	1
Henoch's purpura	1
Unstable diabetic state	1

## CONCLUSION

The domains of clinical and social medicine are rapidly closing upon each other and many clinical conditions have now acquired a mutual interest for the Hospital and Social Medical Services. An indication of the probable variations in the incidence and mortality of diabetes mellitus among children in an urban area has been given, extending over a period of 35 years. The practical difficulties in collecting and interpreting information are discussed. The

measures by means of which the disease may be controlled are outlined, and in particular those which have a bearing on School Medical Administration and practice.

I beg to acknowledge my indebtedness to the various departments of the Public Health and Education Departments of the city and to the voluntary hospitals, as they then were, in Birmingham for information and help with this paper.

## REFERENCES

- BEST, C., CAMPBELL, J. & HAIST, R. E. (1940). *New Engl. J. Med.* **223**, 607.
- DEVINE, J. (1938). *Arch. Dis. Childh.* p. 189.
- GARROD, A. E. (1912). *Lancet*, **1**, 483.
- GORDON, I. (1947). *Brit. J. Soc. Med.* **1**, 238.
- HANSEN, P. (1946). *Acta Med. Scand.* (Suppl. 178), p. 4.
- LASSALE, M. (1923). *Arch. Méd. Enf.*, **26**, 423.
- LAWRENCE, R. D. (1935). *Prognosis*, vol. 1 (Lancet series), p. 201.
- MARQUAND, H. S. & TOZER, F. H. (1942). *Endocrine Disorders in Childhood and Adolescence*, p. 246. London.
- MINISTER OF EDUCATION (1946). *Special Educational Treatment*, p. 6. H.M.S.O.
- PAYNE, W. (1947). *Diseases of Children*, ed. 4, vol. 1, p. 383. London: Garrod Batten and Thursfield.
- REGISTRAR GENERAL (1938-9). *Statistical Review for England and Wales* (text vol.), p. 97.
- STEWART, M., CAIRNEY, H. & SMITH, H. (1943). *Med. Officer*, 20 Feb., p. 61.
- WHITE, P. (1933). *Diabetes in Childhood and Adolescence*, p. 152. London.
- WHITE, P. (1947). *The Treatment of Diabetes Mellitus*, 8th ed., p. 741. Joslin.

(MS. received for publication 28. x. 48.—Ed.)