THE INCIDENCE OF GLYCOSURIA AND DIABETES IN NEW YORK CITY BETWEEN 1902 AND 1907

WITH A REPORT OF TWO CASES OF ESSENTIAL PENTOSURIA *

THEODORE B. BARRINGER, JR., M.D.

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There are no statistics that I have been able to find concerning the frequency of glycosuria, and the incidence of its not unusual sequel, diabetes, is calculated chiefly from mortality figures and hospital records. The results so obtained vary greatly. Naunyn says, in his book on diabetes, that almost any figures desired can be selected from various estimates, and that only out of courtesy to the authors does he quote any of them. Osler states, in his "Practice of Medicine," that among 99,000 patients admitted to the medical wards and medical dispensary of the Johns Hopkins Hospital, there were 226 cases of diabetes, or 228 per 100,000 of medical admissions. The last report of mortality statistics by the United States Census Bureau shows, between 1901 and 1905, a yearly average of 11.6 deaths from diabetes per 100,000 of population. These figures show how difficult it is to get any idea as to the actual frequency of diabetes, for many diabetics never enter a hospital ward and many die from other diseases.

The records of one of New York's large insurance companies were very courteously placed at my disposal by the medical director, and from them I have been able to secure reliable information on these points.

There were 71,729 adults examined medically by this company in New York City between 1902 and 1907. They belonged, naturally, to the better social class, which shows, as is generally recognized, a greater incidence of diabetes than does the poorer class of people. Probably 95 per cent. or more of them were men between the ages of 18 and 60, and, of course, they were practically all on a mixed diet (one containing carbohydrates).

The men who showed glucose on one or more examinations numbered 2,043, or 2,840 per 100,000. Of these men 681 showed between 1 and 12 per cent., and 1,362 less than 1 per cent. of sugar. In all these cases the presence of glucose was confirmed by an experienced chemist. If

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we consider the presence of 1 or more per cent. of sugar in an office specimen of urine, a criterion of the existence of diabetes, the incidence of diabetes per 100,000 of population would be 950. This criterion of diabetes is rather an arbitrary one, but I feel it is justified for the following reasons:

The diagnosis of diabetes at an early stage is a difficult matter, for very little is known about the beginning of this disease. The diagnosis of a fully-developed case with the marked glycosuria, polyuria, loss of weight, etc., is, of course, easy, but very few of those included in our large group of glycosuric cases were of such a type. We know that diabetics react to small quantities of carbohydrates in their food with a decided glycosuria. Any patient reacting to such a diet with a glycosuria as marked as 1 per cent. is, therefore, under strong suspicion, and is probably diabetic. A reaction of only a trace of sugar would leave us in doubt. In a previous paper,¹ however, Roper and I have shown that of a group of 20 patients with slight glycosuria (less than 1 per cent.) 9 had developed diabetes at the end of five years.

Admitting that the glucose percentage criterion of the existence of diabetes may have led us to include cases not diabetic among the 681 quoted above (which showed 1 per cent. or more of sugar), we have as yet left entirely out of consideration the 1,362 cases of slight glycosuria, many of which are or may become diabetic. Their inclusion would raise the incidence so markedly that our previous error would be negligible.

Just what proportion of cases of slight glycosuria become diabetic is difficult to estimate. Our former paper showed in a small series 45 per cent., which is perhaps too low, as but five years had elapsed since the initial glycosurias of these cases. If we figured that 50 per cent. of such cases became ultimately diabetic, our final figures for the incidence of diabetes in New York City would be 1,895 cases per 100,000 of population.

These figures contrast most surprisingly with all previous estimates, and oblige us to consider this disease as certainly not "rare" or "uncommon."

The lack of definite knowledge concerning the beginning of diabetes has led to a very general idea that a transitory glycosuria is in most cases the warning signal of later diabetic disease.² In our previous

1. Barringer and Roper: The prognosis of spontaneous glycosuria, etc. *Am. Jour. Med. Sc.*, 1907, cxxxiii, 842.

2. Von Noorden: Disorders of metabolism and nutrition. *Diabetes*. English transl., 1905, p. 127.

paper we showed that but 45 per cent. of a group of 20 such cases of slight transitory glycosuria had become diabetic at the end of five years. We assumed, therefore, that there were two types of transitory glycosuria: (1) a type essentially diabetic from the outset, in which sugar recurs, which shows constantly *glycosuria e saccharo*, and in which the patients at the end of five or more years become diabetic; (2) a type, quite harmless, in which sugar does not recur after the first few months, which does not show *glycosuria e saccharo*, except perhaps during the first few months, and in which the patients do not develop diabetes. This idea was quite at variance with existing views.

Our present figures show that there is a much greater incidence of slight glycosuria (1,890 cases per 100,000) than of marked glycosuria, (950 cases per 100,000), and confirm the above assumption in regard to types of transitory glycosuria.

Concerning the onset of diabetes: In our former paper the histories of 9 patients, who formed the diabetic group of glycosuria, showed a gradual change from a slight transitory glycosuria to a persistent glycosuria in five years' time, and suggested naturally that this was the usual mode of development of diabetes. In our present statistics the high incidence of slight glycosuria, about double that of marked glycosuria, leads us to believe that the great majority of diabetic cases begin in this way.

This insidious onset would correspond pathologically to a gradual destruction of the islands of Langerhans by a slowly advancing inter-acinar pancreatitis, which Cecil³ has shown accompanies 73 per cent. of all cases of diabetes.

There were sixteen men among the 71,729 examined in whose urine the insurance company found pentose. I subsequently visited eleven of these and secured twenty-four-hour specimens of urine. Nine specimens were negative, the subjects evidently having been originally affected with alimentary pentosuria. The insurance company's examinations had been made chiefly during the summer months, and had always shown an absence of pentose on the succeeding day, when a second analysis had been done. The greater consumption during the summer months of fruit, which contains pentosans, explains the origin of these cases.

Two of the men showed pentosuria on repeated examinations.

The first was a dentist, 37 years old, in excellent health. He showed generally, in the twenty-four-hour urine, about 0.5 per cent. of a re-

3. A study of the pathological anatomy of the pancreas in 90 cases of diabetes mellitus, Jour. Exper. Med., April, 1909.

ducing substance (estimated as dextrose) which was identified as a pentose by means of Bial's test, the spectroscopic reaction, and the melting point of the ozason, between 150 and 155 degrees C.

The second man, a clerk, 17 years old, in good health, showed constantly about 0.3 per cent. of a pentose. I was unable to carry out any metabolism experiments on these subjects or to investigate the members of their families.

SUMMARY

1. The incidence of diabetes in New York City reaches the surprising figure of 1,895 cases per 100,000 of population.

2. A large proportion of cases of transient glycosuria are harmless and do not develop into cases of diabetes.

3. Diabetes generally begins as a slight, intermittently appearing glycosuria which gradually becomes more frequent and more marked, until finally it is constantly present.

I am much indebted to Dr. J. C. Roper for the urine analysis of these pentose cases.

34 West Eighty-fourth Street.