

# LOWER FREQUENCY OF DIABETES AMONG HOSPITALIZED NEGRO THAN WHITE CHILDREN: THEORETICAL IMPLICATIONS \*

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*A review of the case histories of 471 diabetic children admitted to a children's hospital during the decade 1960 to 1970 showed that the proportion of diabetics among hospitalized Negro children was significantly lower than that among white children (3.8 Negro vs. 10.7 white per 1000 admissions same ethnic group,  $P < 0.005$ ). However, the proportion of mild diabetes, characterized by absence of ketosis and no insulin requirement, was higher among Negro (18%) than among white diabetic children (0.5%). These differences could not be explained by differences in environmental factors considered. It is suggested that genetic factors may account for a substantial part of this Negro-white difference.*

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## INTRODUCTION

The observation that diabetes is less common among Negro than among white children (Ziegra 1969) prompted this study because this information is not only of practical, but of heuristic value. If the observation is correct, it is important to determine whether the lower incidence of diabetes among Negro children is due to differences in environmental factors or to differences in the frequencies of genes which control for diabetes in the Negro and white populations.

Because differences in environmental factors between Negro and white children are not always known or are hard to quantitate, a hospital population was studied with the hope that some of the environmental differences between the two populations would be reduced in this study. The study was concerned primarily with St. Louis Children's Hospital, a hospital to which approximately 4500 patients were admitted each year during the decade 1960-1970. In addition, two St. Louis city hospitals, one of them a hospital at which the census was 100% Negro during the decade 1960-1970, were surveyed. Almost all of the patients admitted to the two city hospitals, but very few of the patients admitted to Children's Hospital, were financially indigent.

## METHODS

The medical records of the patients classified as diabetic (471 patients) who were admitted to St. Louis Children's Hospital from 1 January 1960 through 31 December 1969, were reviewed. Out of these, 420 were white and 51 Negro; 99% of the white patients' records and 98% of the Negro

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patients' records were retrieved. The patients ranged in age from 7 months to 15 years at the time of diagnosis. The mean age at diagnosis of diabetes was 8 years for each group of patients. Only hospitalized patients were included in this study. Since virtually all of the diabetics seen at Children's Hospital for the first time during the years 1960 to 1970 were hospitalized for the purpose of instructing them about the care of themselves as diabetics, or for therapeutic reasons, this group includes more than 96% of the diabetic patients seen at the hospital during the decade 1960 to 1970.

Excluded from the study were those patients in whom the diagnosis of diabetes was doubtful, who were discovered to be diabetic when they were admitted for a clinical research study, who were

TABLE 1  
DIABETES AT CHILDREN'S HOSPITAL  
(1960-1970)

	Diabetics				Nondiabetics				New diabetics (frequency per 1000, same ethnic group, 1960-70)
	New admissions (1960-1970)		New plus previously diagnosed admissions (1960-1970)		New admissions (1960-1970)		New admissions plus readmissions (1966-1970)		
	N	%	N	%	N	%	N	%	
Negro	37	12.1	48	10.9	9,827	28.1	6,331	27.4	3.7
White	270	87.9	392	89.1	25,153	71.9	22,989	72.6	10.7

New diabetics were defined as those patients who were diagnosed as diabetics within one month prior to admission to the hospital. "Previously diagnosed diabetics" refers to those diabetics who were diagnosed as diabetic before one month prior to admission. The percentage of patients was calculated by dividing each number by the sum of the two numbers in that column. The frequency of diabetes was calculated by dividing the number of new diabetics by the number of new admissions.

diagnosed as diabetic solely by a method other than an oral glucose tolerance test (e.g., a steroid provocative oral glucose tolerance test), and those who had a disease or syndrome associated with diabetes such as cystic fibrosis or Down's syndrome. By these criteria, 28 white and 3 Negro patients were eliminated from the study. To determine the frequency of diabetes in the two groups of patients it was arbitrarily decided that any patient who was diagnosed as a diabetic within one month prior to admission to Children's Hospital would be considered a newly diagnosed diabetic.

To determine the total number of nondiabetic white and Negro patients admitted for the *first time* to Children's Hospital during the decade 1960 to 1970 patients' cards in the admitting office were counted. The total number of admissions of nondiabetic white and Negro patients (first admissions and readmissions) was accessible only for the years 1966 to 1970.

The total number of diabetic children admitted for the first time to the pediatric unit of Homer G. Phillips Hospital, a city hospital, during the decade 1960 to 1970 was also recorded. This pediatric unit accepts only patients who are younger than 12 years. More than 99% of the patients admitted to this hospital are Negro. Therefore, the total number of admissions of nondiabetic patients was recorded as Negro patients.

The numbers of white and Negro diabetics who were younger than 20 years when they were diagnosed as diabetic and who were admitted to a second city hospital, Max E. Starkloff Hospital, during the years 1960 to 1970, were recorded also.

Data on the presenting signs and other characteristics of all the patients except the 28 white and 3 Negro patients eliminated from the study are presented in Table 3. Data on 11 Negro children who resembled adult-onset diabetics are presented in Table 4.

TABLE 2  
NEGRO DIABETICS ADMITTED TO HOMER G. PHILLIPS HOSPITAL  
(1960-1970)

Year	New Negro diabetics	Total admissions
1960	2	—
1961	2	—
1962	0	3017
1963	0	3113
1964	1	3197
1965	1	3353
1966	1	3311
1967	1	3226
1968	1	3068
1969	1	2849

## RESULTS

Table 1 shows that, during the decade 1960 to 1970, the incidence of the diagnosis of diabetes among children admitted to Children's Hospital was significantly greater ( $P < 0.005$ ) among white than Negro children. It is also apparent that the percentages of new admissions of Negroes and whites were essentially the same as the percentages of previous admissions in each category.

Table 2 shows the number of Negro children admitted to the pediatric unit of the city hospital at which the census is virtually 100% Negro. During the decade 1960 to 1970 only 10 patients of more than 30,000 hospital admissions of patients younger than 12 years, were discovered to be diabetic.

During the years 1960 to 1970, 17 white and 6 Negro patients, aged 4 to 17 years, were admitted to the other city hospital. The total number of white and Negro admissions to this hospital were unavailable. Three of the 16 Negro patients from the two city hospitals had been referred to Children's Hospital and are included in the group studied at that hospital.

The presenting signs and other characteristics of 61 Negro and 409 white children admitted to any of the three hospitals during the decade 1960 to 1970, are presented in Table 3. A much larger percentage of Negro than white patients were not prone to ketosis and were overweight (weight percentile 25 percentiles greater than height percentile) and thus resembled adult-onset diabetics. Fewer Negro than white patients presented with more severe signs of insulin deficiency, such as polyuria, polydipsia, vomiting, ketonuria, and low blood  $\text{CO}_2$ . More Negro than white patients presented subacutely with minor complaints such as an abscess or obesity, or were found to be diabetic incidentally. Most of these mild diabetics were female.

TABLE 3  
 SIGNS OF DIABETES AND OTHER CHARACTERISTICS IN NEGRO AND WHITE DIABETIC CHILDREN  
 (Admissions to St. Louis Hospitals, 1960-1970)

	Frequency (%)	
	Negro (N = 61)	White (N = 409)
Polyuria and polydipsia	49	95
Polyphagia	33	39
Weight loss	19	42
Anorexia or vomiting	8	18
Vulvitis (percentage of girls)	35	4
Abscess	8	0
Blood CO <sub>2</sub> greater than 20 meq/l	43	26
Ketonuria	38	70
Obese,* first admission	38	6
Persistent obesity	35	0
Adult-onset diabetes	8	0.5
Mean age	8 years	

\* Weight percentile 25 percentiles greater than height percentile.

The characteristics of 11 of 61 diabetic Negro patients admitted to any of the three hospitals are given in Table 4. These 11 patients were mild diabetics who resembled adult-onset diabetics in that they were nonketotic, often obese, and did not require insulin therapy. One of the three patients who was not obese was hyperthyroid.

#### DISCUSSION

The frequency of the diagnosis of diabetes at Children's Hospital among white and Negro children was 10.7 and 3.7 per 1000 patients, respectively. The incidence of diabetic Negro children admitted to the city hospital (1 per 3000 admissions) was much lower than the incidence of Negro diabetics admitted to Children's Hospital. This is probably because the pediatric unit at the city hospital accepts only patients younger than 12 years of age, whereas Children's Hospital accepts patients until they are 16 years old. Also, Children's Hospital is a specialty hospital and receives a larger number of referred patients than does the city hospital. Data on the two city hospitals were included in this report as corroborative evidence that the frequency of the diagnosis of diabetes is lower among Negro than among white children, and to show that it is unlikely that the low incidence of diabetes among Negroes at Children's Hospital is the result of a high rate of admissions of Negro diabetics to other hospitals and lack of referral to Children's Hospital.

It can be argued that the lower incidence of diabetes among Negro children in this study is due to differences between Negroes and whites in nutrition, medical care and education

TABLE 4  
CHARACTERISTICS OF NEGRO PATIENTS WITH MILD DIABETES  
(N = 11)

Sex	Age at diagnosis	Presenting signs	Years after diagnosis	Highest blood glucose (mg/100 ml)	Associated findings	Current therapy
F	9	polydipsia	2	380	obese nonketotic	diet
F	12	vulvitis	2	360	obese nonketotic	tolbutamide
F	12	vulvitis	3	337	obese nonketotic	tolbutamide
F	9	asymptomatic glucosuria	3	184	nonketotic	tolbutamide
F	12	asymptomatic glucosuria	4	290	nonketotic	diet
F	11	hyperthyroidism	2	351	nonketotic not obese	diet
F	13	upper respiratory infection	3	232	obese nonketotic	chlorpropamide
F	9	obesity	2	207	obese nonketotic	diet
F	10	abscess	10	348	obese nonketotic	tolbutamide
M	17	weight gain polyuria	4	256	obese nonketotic	insulin
F	10	vulvitis	3	270	obese nonketotic	tolbutamide

which were operative before the patients were seen at the hospital. However, it is unlikely that the florid symptoms of juvenile diabetes allow delayed detection, that nutrition has any influence on the incidence of true juvenile diabetes, and that an individual's educational level correlates with his "threshold" for consulting a physician when he thinks his child is ill. Furthermore, the diagnosis of juvenile diabetes is not an esoteric diagnosis. Any physician is able to make it.

It has been shown that Negro and white children in the United States do not differ significantly in height and weight (Verghese et al. 1969), onset of puberty (Michelson 1944), and bone age (Garn et al. 1972). Therefore, differences in these factors, or anything which influences these factors, such as caloric intake, are probably not great enough to account for the lower incidence of diabetes among Negro children. As for the patients in this study, a significantly

higher percentage of diabetic Negro children (38%) were obese than were diabetic white children (6%). Of course, this is not what one would expect if caloric intake accounted for the higher incidence of diabetes among white children.

Eleven of the 64 Negro children, but only 2 of the 409 white children admitted to the three hospitals in this study were mild diabetics. They resembled adult onset diabetics in that most of them were obese and none of them was prone to become ketotic. These 13 children were not chemical diabetics, but were overtly diabetic with fasting blood glucose levels higher than 200 mg/100 ml. It is unlikely that the 11 Negro patients were true juvenile diabetics in remission or were evolving into ketosis-prone diabetics because all but two of them have remained obese for 2 to 10 years without insulin therapy. The fact that there are reports that the obese, nonketotic type of diabetic is more common among black adolescent diabetics in Africa than among white diabetic children on other continents (Sankale and Wade 1966, Jackson 1970), indicates that this finding is not fortuitous.

There is very little data in the medical literature on the incidence of diabetes among American Negro children and this data must be interpreted indirectly. Rosenbaum (1967), in a review of juvenile diabetes at Charity Hospital, New Orleans, commented on the marked preponderance of diabetic white children compared to nonwhite children in that hospital population. Although ethnic differences in juvenile diabetes were not the major emphasis of his study, his data show that from 1953 to 1967, the incidence of diabetes among white children was four times the incidence of diabetes among nonwhite children admitted to Charity Hospital. The U.S. National Health Interview Survey for 1 July 1964 through 30 June 1965, showed that 4.6% of the diabetic white population was younger than 15 years at diagnosis, while only 0.3% of the diabetic Negro population was younger than 15 years at diagnosis; and that 8.3% of the diabetic white population was younger than 25 years at diagnosis, while only 3.4% of the diabetic Negro population was younger than 25 years at diagnosis (U.S. Public Health Service 1967 and 1969). Evidence that the findings of the present study, the study of Rosenbaum (1967), and the U.S. National Health Interview Survey are not incidental, is provided by reports that true juvenile diabetes is rare among black children in Africa (Dodu 1958, Dodu and de Heer 1964, Seftel 1964, Jackson and Huskisson 1965, Dodu and Hathorn 1966, Goldberg et al. 1969, Marine et al. 1969, Osuntokun et al. 1971). Case-finding procedures seemed adequate in these studies. If, as seems probable, American Negroes experience dietary and other environmental conditions more similar to those of American whites than to those of African Negroes, the similar frequencies and patterns of childhood diabetes in the two Negro groups suggests a genetic etiology for the different characteristics of diabetes in Negro children compared to white children.

If juvenile diabetes and adult-onset diabetes result from the effects of genes at the same loci, the incidence of juvenile diabetes cannot be lower in one of two populations in which the frequencies of adult-onset diabetes are equal (Harvold 1967)<sup>1</sup>. This study shows that there is a significant difference in the frequencies of diabetes in childhood between hospitalized Negro and white children. It was pointed out that this difference cannot be adequately explained by known environmental differences between the two groups of children. The results of this study then, are evidence that the genetic control for juvenile diabetes is independent

The incidence of diabetes diagnosed after age 45 in the American general population is actually higher among Negro females than among white females, but it is equal among Negro and white males (U.S. Public Health Service 1967 and 1969).

from that for adult-onset diabetes. It is also possible that the genes which control for juvenile or adult-onset diabetes among Negroes are different than those which control for these diseases among whites.

It is known from studies of blood groups that 20 to 30% of the American Negro genome is composed of genes received from white ancestors through racial admixture over the 400 years in which whites and Negroes have co-existed on this continent (Glass and Li 1953, Reed 1969). Therefore, it is interesting to speculate that the rate of juvenile diabetes among American Negroes would be even lower, if it had not been for significant racial admixture.

#### Note Added in Proof

Findings of another study on childhood diabetes, conducted in Buffalo, N.Y., and not directed at ethnic differences in diabetes, confirmed the findings of the present study. The frequency of true juvenile diabetes was lower among hospitalized Negro children compared to white children. However, the frequency of mild diabetes, characterized by obesity and absence of ketosis, was higher among Negro diabetics than among white diabetics (*Diabetologia* 1974, 10: 767).

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## RIASSUNTO

### *Minore Frequenza di Diabete in Bambini Ricoverati Negri rispetto ai Bianchi: Implicazioni Teoriche*

Una rassegna di 471 bambini diabetici ricoverati dal 1960 al 1970 dimostra che la frequenza di diagnosi di diabete nei bambini negri (3,7‰) è significativamente inferiore ( $P < 0,005$ ) a quella dei bambini bianchi (10,7‰). Tuttavia, la proporzione di diabete leggero, caratterizzato dall'assenza di chetosi e fabbisogno insulinico, è risultata più elevata nei bambini diabetici negri (18%) che in quelli bianchi (0,5%). Viene suggerito che tale differenza possa essere spiegata in termini di eredità più che di ambiente.

## RÉSUMÉ

### *Fréquence Mineure de Diabète chez des Enfants Hospitalisés Noirs par rapport aux Blancs: Implications Théoriques*

Une revue de 471 enfants diabétiques hospitalisés de 1960 à 1970 démontre que la fréquence de diagnostic de diabète chez les enfants noirs (3,7‰) est significativement inférieure ( $P < 0,005$ ) à celle des enfants blancs (10,7‰). Toutefois, la proportion de diabète léger, caractérisé par l'absence de kétose et de demande insulinique, est plus élevée chez les enfants diabétiques nègres (18%) par rapport aux blancs (0,5%). On suggère que cette différence puisse s'expliquer en termes d'hérédité plus que de milieu.

## ZUSAMMENFASSUNG

### *Geringere Diabeteshäufigkeit bei schwarzen als bei weissen stationär behandelten Kindern: Theoretische Schlussfolgerungen*

Ein Ueberblick über 471 Kinder, die zwischen 1960 und 1970 wegen Diabetes stationär behandelt wurden, zeigt, daß die Diagnose Diabetes bei schwarzen Kindern (3,7‰) bedeutend seltener ( $P < 0,005$ ) ist als bei weissen (10,7‰). Das Vorkommen von mildem Diabetes (ohne Ketose und ohne Insulinbedarf) war unter den Negerkindern (18%) höher als bei den weissen Kindern (0,5%). Verf. gemäß läßt sich diese Differenz eher durch Erb- als durch Umweltseinflüsse erklären.

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