TABLE 2—Ethnic Groups, Immunization Coverage of Children, and Sociocultural Variables

Ethnic Group	N	% of Children Not Vaccinated	% Lower Socioeconomic Group	% No Educational Level
Wolof-Lebu	249	34.5	16.9	71.5
Serer	56	37.5	21.1	70.2
Tukulor-Fula	141	39.0	17.6	73.2
Bambara-Soninke	13	15.4	53.8	38.5
Diola-Manjak	26	23.1	11.5	53.9
Others	13	38.5	38.5	84.6
Total	498	35.1	18.8	70.4

behavior.[12] Nevertheless, in African cities, it has been shown that it is modified by other social factors: for example, unionism in the Cooperbelt area in South Africa is independent on the ethnic group of mine workers, but is correlated to the length of residence in an urban area;[13] an African townsman thus seems to be a townsman before being a member of his ethnic group.[14] In Senegal, Wolofs and Lebus represent the dominant group (43 per cent of total population) as well as the oldest one in the Dakar area. Tukulors and Fulas, on the other hand, have recently arrived in the capital from the Sahelian region. Serers are mainly peasants from the central part of Senegal. Other groups are minorities from Eastern (Soninkes, Bambaras) and Southern Senegal (Diolas, Manjaks). There is no difference in immunization coverage between Wolofs-Lebus and Tukulors-Fulas who have very similar socioeconomic levels, although their culture, history, and urbanization are quite different. And when all groups are considered in the same analysis, ethnicity does not appear to differentiate immunization coverage; the same findings were obtained for access to curative care.[10]

Determinants of health behavior in urban Africa are often described as "cultural." In the pluralistic medical system of cities, people would search for a therapy according to their ethnic and geographical origins. In the particular case of vaccinations which can be considered as an example of preventive health behavior, and in the specific context of the underpriviledged suburbs of Dakar, we have shown that educational level and socioeconomic conditions are correlated with immunization coverage, while ethnic distinctions are not a factor when determining risk groups in urban populations.

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Prevalence of Diabetes in a Navajo Indian Community

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Abstract: The age- and sex-adjusted prevalence of non-insulin-dependent diabetes mellitus (NIDDM) of 494 (76 per cent) Navajo adults living in a reservation community was 10.2 per cent, approximately 60 per cent greater than the estimated prevalence (6.4 per cent) in the general US population. The screening protocol utilized likely underestimates the prevalence of NIDDM in this population. A high proportion of Navajo people were overweight when compared to the general US population. (*Am J Public Health* 1989; 78:511–513.)

Introduction

Diabetes mellitus is a public health problem of increasing importance for Native Americans. Diabetes in Southwest Indian tribes is almost exclusively non-insulin-dependent diabetes mellitus (NIDDM).[1] Most data regarding the prevalence of NIDDM in Navajo Indians, the largest Indian tribe in the United States, have been based on hospital chart reviews or on limited population surveys.[2] We therefore conducted a community-based screening program for NIDDM in adults in a representative sample of Navajo Indians.

Methods

The study was carried out from April 1, 1986 to March 31, 1987 in the Teec Nos Pos (TNP) Chapter, Shiprock Service Unit, on the 25,000 square mile Navajo Indian Reservation in northeastern Arizona. The 360 square mile area is inhabited almost exclusively by Navajo Indians.

Study Subjects

The 1986 population of the TNP Chapter was estimated to be 1,540.* By extrapolation from the Shiprock Service

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Unit population, where an estimated 42 per cent of the population are 20 years of age or greater,** we estimated that 647 individuals in the TNP chapter were in this age group. The analyses were restricted to data for persons residing within the boundaries of the Chapter who were 20 to 74 years of age.

Approval to conduct the study was obtained from the local elected Health Board and the Navajo Area Indian Health Service institutional review board. Approximately 35 per cent of the subjects were screened at home and 13 per cent were screened at a local clinic. The remaining 52 per cent were screened in public places.

Screening was performed using capillary blood analyzed with a portable blood glucose monitoring system (Accu-Chek II Blood Glucose Monitors and Chemstrip bG Reagent Strips, Boehringer Mannheim, Indianapolis, IN). Fingersticks to obtain capillary blood were performed by nurses or other health care providers who were specially trained in the use of the instrument.

Individuals whose random blood glucose (RBG) levels were 7.8 mmol/l (140 mg/dl) or greater were referred to a clinical laboratory for fasting venous blood glucose (FBG) determination by a hexokinase method. Subjects whose FBG was greater than 7.8 mmol/l (140 mg/dl) were referred to Indian Health Service clinical providers for further evaluation and therapy.

The diagnosis of diabetes mellitus was made in persons with FBGs after an overnight fast of 7.8 mmol/l (140 mg/dl) or greater on two occasions, or with an RBG of 11.1 mmol/l (200 mg/dl) or greater plus classic signs and symptoms of diabetes mellitus.[3] Circumstances did not allow us to perform a formal glucose tolerance test. Blood glucose levels of subjects claiming to be diabetic at the time of screening were not always tested, although all diagnoses were subsequently confirmed by chart review according to the above criteria.

Weight and height were measured in subjects when possible. Weight-height index (W/H^P) was calculated in kg/m^P using p=2 for males and p=1.5 for females. Percentage of persons overweight at selected percentiles based on the weight-height index in the study population were compared to the United States rates.[4]

Age- and sex-adjusted prevalence rates were calculated using the 1980 US population as the reference population.[5] The US prevalence rates for diabetes were calculated for the above population using estimates of the numbers of diabetics aged 20–74 years.[6] Rates were age-adjusted to the 1980 US population by the direct method.

**Personal communication, Office of Program Planning, Navajo Area Indian Health Service.

Results

Screening was performed on 76 per cent (494 individuals) of the estimated population age 20 years or older. Follow-up glucose testing was performed on 94 per cent (15/16) of those with RBG of 10.0 mmol/l (180 mg/dl) or greater, and 86 per cent (44/51) of those with RBG of 7.8 mmol/l (140 mg/dl) or greater who were not previously known to be diabetic. (A 72 year old male with a RBG of 21.2 mmol/l (382 mg/dl) who refused any follow-up testing or clinical interview was not counted as a diabetic in the prevalence calculations.)

The age and sex distributions of those screened were similar to those estimated for the TNP population, except that the screened group had a disproportionately low number of subjects under age 30 years, and males were slightly under-represented in the study population. The age- and sex-specific prevalence rates of diabetes mellitus in the Teec Nos Pos chapter and the general US population are shown in Table 1. Twelve new cases (7 women, 5 men) of diabetes were diagnosed, and 36 previously known diabetics (23 women, 13 men) were identified. The crude prevalence rate of NIDDM in adults age 20–74 years was 9.9 per cent. The age- and sex-adjusted prevalence rate of diabetes in the TNP population ages 20–74 years was 10.2 per cent compared to the 1980 US rate of 6.4 per cent.

Data adequate to compute a weight-height index were available for 236 females and 164 males. A higher percentage of individuals in both sexes and all age groups (except males ages 20–24) were overweight in the study population than in the US population (Table 2).

Discussion

While the burden of infectious diseases in American Indian communities has decreased substantially over the past three decades, chronic illnesses such as NIDDM have become increasingly prevalent.[7] Diabetes mellitus was thought to be almost nonexistent among Navajo Indians before the 1940s, but subsequent surveys have shown large increases in the disease prevalence.[2]

No post-load glucose tolerance tests were performed in the present study. In addition, the screening procedure did not require an FBG. Thus, the prevalence rates of diabetes in the TNP Chapter are not directly comparable to those estimated from National Health and Nutrition Examination

TABLE 1—Age-Specific Prevalence Rates of Diabetes Mellitus (per 100 population) in a Navajo Community, 1987, and in the 1976–1980 US Population

AGE (years)	20–74	20–44	45–54	55–64	65–74
US all races					
Both	6.6	2.0	8.5	12.8	17.7
Men	5.7	1.4	7.9	9.6	19.2
Women	7.4	2.5	9.0	15.5	16.5
Teec Nos Pos					
Both (%)	9.9	3.4	15.9	23.1	21.0
(N)	(44/444)	(7/254)	(13/82)	(15/65)	(9/43)
Men (%)	9.1	2.2	10	30.8	11.8
(N)	(16/176)	(2/93)	(4/40)	(8/26)	(2/17)
Women (%)	10.5	3.1	21.4	18.0	26.9
(N)	(28/268)	(5/161)	(9/42)	(7/39)	(7/26)

SOURCE: NHANES II

TABLE 2—Percent of Persons Overweight at Selected Percentiles, Teec Nos Pos Chapter, Compared to US All Races (NHANES I) by Sex and Age, Based on the Weight-Height Index*

Age (years)	TNP, >85 Percentile	US, >85 Percentile	TNP, >95 Percentile	US, >95 Percentile
Male				
20–24	9.1	11.5	0	3.4
25–34	36.4	21.8	21.2	6.6
35–44	41.2	28.2	20.6	5.1
45–54	64.9	26.9	29.7	6.8
55–64	39.1	23.8	8.7	7.4
65–74	53	21.9	6.7	4.4
20–74	42.1	22.8	17.1	5.8
Female				
20–24	23.7	12.7	5.3	3.8
25–34	50	20.8	15.5	7.0
35–44	58.2	30.3	14.5	10.5
45–54	69.4	35.8	27.8	9.1
55–64	60	41.3	26.7	10.5
65–74	84.2	39.9	31.6	9.1
20–74	54.7	29.5	18.2	8.3

*Weight-height in kg/m^p where p = 2 for males and p = 1.5 for females. Overweight criteria based on sex specific 85th and 95th percentile for persons age 20–29 years in NHANES I.[4]

Survey (NHANES II) data, which required that subjects meet the National Diabetes Data Group (NDDG) criteria after a 75 gram oral glucose load. Although our FBG 7.8 mmol/l (140 mg/dl) or greater is diagnostic of diabetes by NDDG diagnostic criteria, those criteria also allow the diagnosis of diabetes with a lower FBG plus elevated midtest and two-hour plasma glucose levels. Because only about one-fourth of the undiagnosed diabetics in the NHANES II study could be classified as diabetic solely on the basis of our FBG value, it is likely that the administration of a glucose tolerance test would have identified a higher prevalence of diabetes. In addition, because Type I (insulin-dependent) diabetes mellitus has rarely been described in full heritage southwestern American Indians,[1,8] the 1.6 ratio of the prevalence of NIDDM in the study population compared to that in the general US population, which includes persons with Type I diabetes, is underestimated.

The prevalence of NIDDM between the ages of 20 and 74 in the population of Navajo Indians studied exceeded that in the same age groups in the US population by approximately 60 per cent. The duration-specific prevalence rates of microvascular complications of NIDDM in Navajo Indians have been reported to be similar to those in other populations.[9] Thus, the high rates of NIDDM identified in the present study have significant clinical and economic implications for the health status and health care of Navajo Indians.

The large percentage of overweight individuals found in the population studied may contribute to the high prevalence of NIDDM. Because exercise programs for diabetes control have been successful in other Indian communities,[10] efforts at primary and secondary prevention by weight control and exercise are currently under way on the Navajo Reservation.

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