Tribal Differences in Diabetes: Prevalence Among American Indians in New Mexico

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Synopsis......................................

The prevalence of diagnosed diabetes among American Indians in New Mexico with varied genetic and cultural backgrounds is reported. Utilizing community-based registries, the prevalence in persons ages 35 years and older ranged from 9.8 percent among Jicarilla Apache Indians to 28.2 percent among Zuni Indians. All rates were significantly higher than the U.S. rate of 5.3 percent for the same age group. In addition, in three of the five tribal groups examined, the rates of diagnosed diabetes in Indians less than 35 years of age (range from 0.5 percent to 1.3 percent) were significantly higher than the U.S. rate of 0.4 percent for the same age group.

The prevalence rates of diagnosed diabetes found in this study of American Indians in New Mexico were intermediate between those for the United States as a whole and the Pima Indians of southern Arizona. Reasons for the variations and the relative contribution of obesity, fitness, or genetic risk in the development of diabetes need further study.

NON-INSULIN dependent diabetes mellitus (NIDDM) is a common disease among American Indians, presumably because of lifestyle changes superimposed on a primary genetic determinant (1). The highest reported rate of diabetes in any population has been found in the Pima Indians in southern Arizona (2). This tribe has been studied longitudinally since 1963, and the prevalence of diabetes was found to have increased 42 percent in the 10-year period between 1967 and 1977 (3). Epidemiologic studies of other American Indian tribes also showed a high prevalence of diabetes (4). Because the prevalence rates of diabetes may be increasing (3), it is difficult to use studies done at different times to compare the rates of diabetes among various tribes.

In planning and implementing a public health approach to diabetes care, several Indian Health Service (IHS) facilities in New Mexico have developed community-based registries of patients with diagnosed diabetes. Thus, an opportunity is provided to ascertain the prevalence of clinically treated diabetes in several tribes in New Mexico at the same time.

Indian tradition holds that ancestors arose from the lands on which present-day Indians live. Ethnohistorians hypothesize that Indian tribes came over the Bering land bridge in several different migrations (5). The Apache and Navajo Indians belong to the Athabascan language groups, and immunoglobulin allotyping supports the hypothesis that the Apache and Navajo are descended from the Na-Dene migration that occurred 12,000–14,000 years ago (6). Rio Grande Pueblo tribes and the Zuni, on the other hand, are descendants of the Anasazi people (5) and, along with the Pima Tribe of Arizona, are probably descendants of the Paleo-Indian migration to this continent 16,000–40,000 years ago (6). Language and cultural traditions differ between descendents of these two migrations. We examined the prevalence of diabetes among 20 New Mexico Indian tribes with varied genetic backgrounds.

Methods

All federally recognized American Indians are eligible for free health care at IHS clinics. Indians can choose to receive their health care elsewhere at their own expense. However, since health care is

New Mexico tribes for which diabetes prevalence is reported
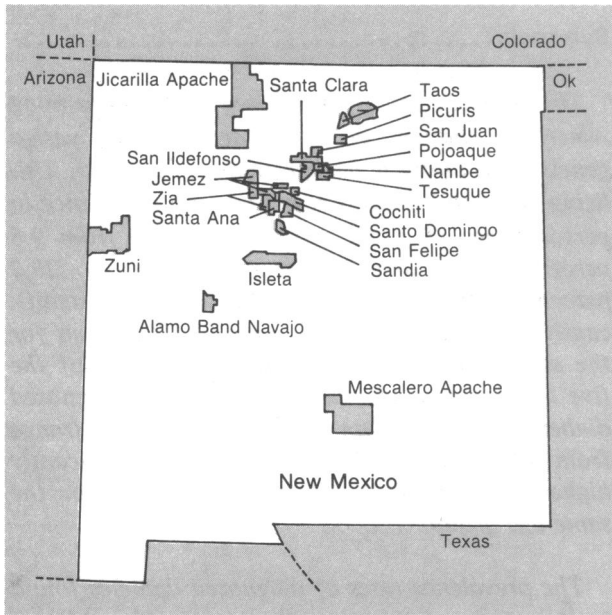
NOTE: Rio Grande Pueblos include Taos, Picuris, San Juan, Santa Clara, San Ildefonso, Pojoaque, Nambe, Tesuque, Cochiti, Santo Domingo, San Felipe, Jemez, Zia, Santa Ana, Sandia, and Isleta.

free of charge at IHS facilities, most patients interact with the IHS system at some time. The New Mexico tribes included in this study were 16 Rio Grande Pueblo Tribes, the Zuni Pueblo, the Alamo Band of Navajo, the Jicarilla Apache, and the Mescalero Apache (see map). IHS health care facilities are located in each of these communities. Additionally, there are urban clinics located in Albuquerque and Santa Fe.

In 1985, the IHS facilities at each of these locations established or updated registries of patients with diabetes for the tribes listed on the map. These registries were compiled in several steps. First, 1985 IHS outpatient computer records for New Mexico were used to generate a list of patients who had "diabetes mellitus" coded at least once during the year. These lists were then broken down by health care facility and tribal code.

Although patients from many different tribes receive care at the urban clinics in Santa Fe and Albuquerque, patients from tribes other than those on the map were excluded from analyses. All Pueblo residents of Santa Fe or Albuquerque were included in the registry of their home village. The Zuni Pueblo, the Jicarilla Apache and the Mescalero Apache, and the Alamo Band of Navajo are relatively isolated reservation communities; therefore, no adjustments were made.

The lists of patients seen in 1985 for diabetes were then given to the community health nurse and

clinic staff at each location to review and verify the diagnosis. Patients were excluded if they did not have diabetes or there was an error in tribal affiliation. Patients with gestational diabetes or previous abnormalities of glucose tolerance were also excluded from analyses. No attempt was made to distinguish patients with insulin dependent diabetes mellitus (IDDM) from those with NIDDM. Any patients known to have diabetes and who were not on the list were added. The final lists became the community-based registries that were used to calculate prevalence rates.

Current population estimates for individual communities were derived from 1980 census data (7) and projected by the Population Branch of the Division of Program Statistics, IHS, to reflect the population in 1985. According to the 1980 census, 24.9 percent of all New Mexico Indians were 35 years or older (8). We applied that percent to each tribal group to derive the age breakdown and to compute prevalence rates of diagnosed diabetes.

To examine whether differences existed between the Athabascan language groups (Apache and Navajo) and the Pueblo Tribes (Rio Grande Pueblos and the Zuni), the composite rates for these two groups were compared. Rates for each of the tribes were also compared to published rates for the Pima Indians (9) and the U.S. general population (10) with age group data provided by the National Center for Health Statistics (11). A chi-square method was used to compare all rates (12).

Results

Among the Rio Grande Pueblo communities, the prevalence of diagnosed diabetes for all age groups ranged from 3.4 percent in San Ildefonso to 8.3 percent in Santa Ana and Santa Clara (table 1). In persons ages 35 and older, the prevalence of diabetes in the Pueblo communities ranged from 13.8 percent in San Ildefonso and Jemez to 31.5 percent in Sandia. For these communities, the overall prevalence of diabetes for all age groups was 5.7 percent, a rate 2.3 times that for the general U.S. population. For persons ages 35 years and older, the overall prevalence rate was 21.3 percent, four times the comparable U.S. rate (10, 11) (table 2). In the other Pueblo group examined, the Zuni, the rate of diabetes was 8.0 percent for all ages and 28.2 percent for persons ages 35 years and older. These rates were significantly higher than the U.S. rates and also significantly higher than the rates for the Rio Grande Pueblo Tribes.

The prevalence of diabetes among the Apache

Table 1. Prevalence of diabetes among Rio Grande Pueblo Indians

Village	Total population	Percent with diabetes	Population ages 35 and older	Percent with diabetes, ages 35 and older
Cochiti	690	6.7	172	25.0
Isleta..	3,173	4.8	790	17.8
Jemez..	1,720	3.7	428	13.8
Nambe	218	4.1	54	14.7
Picuris	142	4.2	35	17.0
Pojoaque	110	3.6	27	14.6
San Felipe..	2,059	6.2	513	22.8
San Ildefonso	552	3.4	137	13.8
San Juan..	988	4.4	246	17.1
Sandia	293	8.2	73	31.5
Santa Ana.......................................	460	8.3	115	31.4
Santa Clara......................................	653	8.3	163	30.7
Santo Domingo	2,555	5.9	636	22.6
Taos	1,264	7.3	315	27.6
Tesuque...	270	8.1	67	31.2
Zia...	600	6.3	149	23.4
Rio Grande Pueblo..........................	15,747	5.7	3,921	21.3

and Navajo communities ranged from 3.0 percent to 4.6 percent for all age groups, and from 9.8 percent to 16.5 percent for persons ages 35 years and older. Except for the prevalence rate in the Jicarilla Apache for all ages, these rates were significantly higher than the comparable U.S. rates. Though not shown on the tables, all New Mexico Indians had rates of diabetes significantly lower than comparable rates for the Pima Indians.

When comparing the prevalence rates between the tribes from the Athabascan language group (the Apache and Navajo Tribes) and the Pueblo Tribes descended from the Paleo-Indian migration (Rio Grande Pueblos and the Zuni Pueblo), the Athabascan language group had significantly lower rates than the Pueblo Tribes for all age groups (relative risk (RR) 0.61; 95 percent confidence limits (CL) 0.53-0.70) and for persons ages 35 years and older (RR = 0.57, 95 percent CL 0.50-0.66). There was no significant difference in the rates of diabetes between these two groups in persons less than 35 years.

Diabetes was found in Indians under age 35, and in three of the five groups examined, significantly exceeded the prevalence of diabetes in the U.S. population for the same age group (table 3).

Discussion

Certain limitations should be noted when comparing the data presented to previous epidemiologic studies, including the ongoing Pima investigations. First, undiagnosed cases of diabetes were not identified and hence were not included in our estimates. Because health care providers in IHS are aware of the risk of diabetes, undiagnosed diabetes may be less of a problem than in other parts of the country. However, asymptomatic patients who do not interact with the health care system will not be diagnosed even by the most vigilant system.

Second, census data collected on Indian reservations may be incomplete, but these data, rather than tribal enrollment, provided the best comparative data. By assigning Santa Fe and Albuquerque Pueblo Indians to their respective Pueblo villages, we attempted to include patients who might have been counted in their villages in the 1980 census, thus minimizing the effect of patients moving between the reservation and surrounding communities. Taking all the limitations together, the rates of diagnosed diabetes for New Mexico Indians were quite possibly underestimated.

While there are no previously published data concerning diabetes among Rio Grande Pueblo Indians, a formal survey of diagnosed and undiagnosed diabetes conducted in the Zuni Pueblo in 1970 revealed that 31.3 percent of the Zuni population ages 35 and older had "carbohydrate intolerance" (13). A more comparable study of clinically treated diabetes in Zuni in 1975–76 found 24.7 percent of the population older than 45 under treatment for diabetes (14), compared to the 28.2 percent reported here for persons ages 35 years and older.

Although the number of Apache and Navajo Indians included in this study was small, the overall rate of diabetes for these tribes from the Athabascan language group was significantly lower than the rate of all Pueblo groups combined. Also, while the rates for each Athabascan language group

Table 2. Prevalence of diabetes among selected southwest Indian tribes

Tribe	Total population	Percent with diabetes	Relative risk [1]	95 percent CL [1]	Population ages 35 and older	Percent with diabetes, ages 35 and older	Relative risk [1]	95 percent CL [1]
U.S. all races [2]	219,656,000	2.5	...	...	93,161,000	5.3	...	...
Pueblo-Pima								
Rio Grande Pueblos	15,747	5.7	2.29	2.14–2.45	3,921	21.3	3.99	3.74–4.26
Zuni........................	7,057	8.0	3.24	2.98–3.52	1,757	28.2	5.29	4.89–5.73
Pima [3]	4,126	17.5	7.08	6.59–7.60	1,210	49.5	9.28	8.71–9.88
Athabascan								
Apache:								
Jicarilla..................	2,176	3.0	1.21	0.95–1.54	542	9.8	1.83	1.42–2.37
Mescalero	2,256	4.4	1.74	1.43–2.12	562	16.4	2.84	2.33–3.46
Navajo Alamo..............	1,408	4.6	1.87	1.47–2.37	351	16.5	3.10	2.45–3.93

[1] Relative risk and 95 percent confidence limits compared with U.S. rate.
[2] References 10,11.
[3] Reference 9.

Table 3. Prevalence of diabetes among persons less than 35 years old in selected southwest Indian tribes

Tribe	Population ages less than 35 years	Percent with diabetes	Relative risk [1]	95 percent confidence limits [1]
U.S. all races [2]......................................	126,495,000	0.4	...	...
Pueblo-Pima				
Rio Grande Pueblos...............................	11,826	0.5	NS	...
Zuni...	5,300	1.3	3.58	2.78–4.60
Pima [3]	2,916	4.3	11.79	9.11–14.32
Athabascan				
Apache:				
Jicarilla..	1,634	0.7	2.02	1.14–3.57
Mescalero	1,694	0.5	1.96	1.11–3.47
Navajo Alamo...	1,057	0.7	NS	

[1] Relative risk and 95 percent confidence limits compared with U.S. rates.
[2] References 10,11.
[3] Reference 9.

were, with one exception, still significantly higher than that for the United States, they were not as greatly elevated as the Pueblo groups. This finding of lower rates of diabetes among tribes of the Athabascan language group has been documented in other studies (15, 16). Athabascan Indians in Alaska were found in 1985 to have a crude prevalence of diabetes of 1.2 percent for all ages and 4.0 percent for persons ages 35 years and older (15). A screening program conducted from April 1, 1986, through March 31, 1987, in a community of Navajo in northwestern New Mexico, identified both previously diagnosed diabetes and undiagnosed diabetes. The researchers found the crude prevalence rate for those ages 20 to 74 to be 9.9 percent (16). Since it is estimated that as many as 50 percent of persons with diabetes are undiagnosed (10,17), these data from the Navajo study are comparable to the rate we report of 4.6 percent for the Alamo band of the Navajo.

We have no data on relative rates of obesity or lifestyle differences that might explain the different rates of diabetes between the Pueblo Tribes and tribes of the Athabascan language groups. The extent of Indian blood quantum has been shown to correlate with the prevalence of diabetes, but again we have no data to examine this factor (18, 19). Whether tribes of the Athabascan language group carry a genetic risk of diabetes different from that of Pima and Pueblo Indians is unknown. The data we present suggest that the question should be examined more extensively.

The rate of diabetes for Pima Indians significantly exceeds any rates of clinically treated diabetes in our communities. Case ascertainment on the Pima Reservation is very high because of the longitudinal screening study. Whether the extent of obesity or different genetic risks also account for some of the differences is unknown.

It is of special interest to note the presence of

diabetes in the Indian population under 35. A review in 1978 noted IDDM to be very rare among American Indians (20). NIDDM among the Pima Indians less than 25 years of age has been found since 1979 (21). Some of the cases in young Indians may be explained by the recent findings concerning obesity and diabetes among Pima children whose mothers had diabetes during the pregnancy. Among children whose mothers had documented diabetes during pregnancy, 45 percent developed diabetes by ages 20–24, compared to 8.6 percent of the offspring of mothers whose diabetes began after the pregnancy (22). Recent descriptions of diabetes in blacks also confirm racial variations in the age of onset of NIDDM (23). Thus, our data on diabetes in persons less than 35 years of age are compatible with other studies describing NIDDM among young persons.

In summary, the prevalence of diabetes in persons ages 35 years and older in certain New Mexico tribes ranged from 9.8 percent among the Jicarilla Apache Indians to 28.2 percent among the Zuni Indians. The rates of diabetes were intermediate between rates for the United States as a whole and the rates for Pima Indians. Whether different groups of Indians carry different genetic risks for NIDDM is unknown at this time. The relative contribution of obesity, fitness, or blood quantum is also unknown. Our data suggest that such questions should be examined further.

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