Diabetes Mellitus in Alaskan Yup'ik Eskimos and Athabascan Indians After 25 Yr

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OBJECTIVE — To estimate the prevalence of diabetes mellitus and overweight in two populations of Alaska Natives and to compare the results with previous data.

RESEARCH DESIGN AND METHODS — Participants' heights, weights, and random plasma glucose levels were determined. Those with a glucose of ≥6.72 mM received a follow-up glucose-tolerance test, interpreted by WHO criteria. Overweight was defined by National Center for Health Statistics criteria and also by criteria used in previous studies. The subjects were Eskimo and Athabascan residents ≥40 yr of age in 15 villages in southwestern Alaska.

RESULTS — Diabetes prevalence was 4.7% for Eskimos and 10.0% for Indians. Among Eskimo men and women, the prevalence of overweight was 34 and 56%, respectively; among Indian men and women, it was 29 and 55%, respectively. Comparisons with past data indicate that the prevalence of diabetes has increased from 1.7% in 1962 for Eskimos and 1.8% in 1969 for Indians.

CONCLUSIONS — The prevalence of diabetes appears to have increased among Eskimos and Indians in Alaska. Overweight appears to be a significant problem in both groups.

Past studies of diabetes mellitus among Alaskan Yup'ik Eskimos and Athabascan Indians indicated that the disease was rare, and documented rates of overweight (defined as >13.6 kg above the average weight for a U.S. citizen of the same age, height, and sex, 1912 actuarial tables) were 3.0 and 6.1% for Eskimo men and women, respectively, in 1962 (1–3).

This report gives the results of blood glucose testing and height and weight measurements among participating residents of the Eskimo villages screened in 1962 and of four Athabascan villages.

RESEARCH DESIGN AND METHODS

— The population for this study consisted of Alaska Native residents ≥40 yr of age from the same villages along the Kuskokwim River that were studied by Mouratoff in 1962. Four neighboring villages of Athabascan Indians also were screened. Participants were screened at village clinics from January 1987 through February 1988. Participation was voluntary. Each participant provided basic demographic information (residence, race, sex, birthdate) and was asked about any previous diagnosis of diabetes. Measurements of height and weight were made with standard balance beam scales. Random venous plasma and capillary blood samples were obtained from each participant, and analyzed for glucose. The plasma was analyzed by the hexokinase method. The capillary blood specimen was placed on a Chemstrip bG (Boehringer Mannheim, Indianapolis, IN) and analyzed by both a visual method and the Accu-Chek II (Boehringer Mannheim). (Use of brand name is for identification purposes only and does not imply endorsement by the Indian Health Service.) Computerized medical records of all village residents were searched for any ICD-9 codes indicative of glucose intolerance.

A 2-h 75-g OGTT was offered at the village clinic to participants who had a glucose level ≥6.72 mM by any method or a history of abnormal glucose tolerance by self-report or medical records review. Participants were instructed to fast for 8–10 h before the OGTT and to take nothing by mouth after the oral glucose load. The results were classified by WHO 1985 diabetes diagnostic criteria (4). Screened participants also were considered diabetic if they previously had met WHO epidemiologic criteria for diabetes, or, in the absence of laboratory

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RECEIVED FOR PUBLICATION 24 OCTOBER 1991 AND ACCEPTED IN REVISED FORM 16 APRIL 1992.

WHO, WORLD HEALTH ORGANIZATION; ICD-9, INTERNATIONAL CLASSIFICATION OF DISEASES, INJURIES, AND CAUSES OF DEATH, 9TH REVISION; OGTT, ORAL GLUCOSE-TOLERANCE TEST; BMI, BODY MASS INDEX; IGT, IMPAIRED GLUCOSE TOLERANCE; NCHS, NATIONAL CENTER FOR HEALTH STATISTICS.

Table 1—*Glucose screening results, Alaskan Yup'ik Eskimos and Athabascan Indians by race and sex, 1987, ages ≥40 yr*

	Village population			Number screened (%)			Diabetes (% of screened)			IGT (% of screened)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
Eskimo	403	363	766	253 (63)	303 (83)	556 (73)	7 (2.8)	19 (6.3)	26 (4.7)	5 (2.0)	8 (2.6)	13 (2.3)
Athabascan Indian	79	69	148	54 (68)	56 (81)	110 (74)	4 (7.4)	7 (12.5)	11 (10.0)	1 (1.9)	4 (7.1)	5 (4.5)
Total	482	432	914	307 (64)	359 (83)	666 (73)	11 (3.6)	26 (7.2)	37 (5.6)	6 (2.0)	12 (3.3)	18 (2.7)

documentation, if they were treated with oral agents or insulin at the time of the study. BMI was calculated as weight/height (kg/m^2) for both men and women. Village populations were estimated by applying rates of population increase obtained from the Indian Health Service to age-, race-, and sex-specific figures from the 1980 U.S. census for each village. Comparisons of qualitative data were made using χ^2 with Yates correction for continuity when appropriate (χ^2, df) or Mantel-Haenszel test (χ^2 MH) to adjust for age or ethnicity, as necessary (5,6). Average BMIs were compared using the Student's *t* test or linear regression (5). Evaluation of trends was by a test for linear trend in proportions (Z) (6). All probability values are reported as two-sided *P* values.

RESULTS— A total of 666 village residents were screened (73% of the 914 residents age ≥40; Table 1). The mean age for men was 57.7 yr and for women was 56.9 yr ($t = 1.96$, $P = 0.050$, df = 664). The mean age for Eskimos was 56.4 yr and for Indians was 58.6 yr ($t = 1.79$, $P = 0.074$, df = 664).

A total of 156 participants had a glucose screening value of ≥6.72 mM by at least one of the three methods, and an additional 17 had a past history of glucose intolerance; 142 of these participants (82%) completed the OGTT. The 31 participants who did not receive a follow-up OGTT included 12 with a history of diabetes by WHO criteria, and one with previous IGT by WHO criteria. A total of 37 participants (5.6% of those screened) had documented diabetes (Table 1), 21 by study OGTT results, 14 by previous diagnosis (WHO criteria), and 2 by use of oral agents. An additional 18 participants (2.7% of those screened) met WHO criteria for IGT (17 by study OGTT results, and 1 by a past OGTT result).

Twenty-six (4.7%) of the 556 Eskimos screened met the criteria for diabetes, as did 11 (10%) of the 110 Indians screened ($P = 0.070$, χ^2 MH, 1 df, adjusted for sex and 10-yr age groups). Eleven (3.6%) of the 307 men screened displayed diabetes, as did 26 (7.2%) of the 359 women ($P = 0.029$, χ^2 MH, 1 df, adjusted for age in 10-yr groups). Of the 37 cases, 10 (27%) were newly diagnosed (9 Eskimos, 1 Indian) with the study OGTT results their first evidence of DM.

Height and weight were documented for 616 participants (Table 2). In general, women tended to have higher BMIs than men ($P < 0.001$, *t*-test, df = 614). By NCHS criteria for overweight (BMI of ≥27.8 for men and ≥27.3 for women), 79 (34%) of the Eskimo men and 156 (56%) of the Eskimo women were overweight, whereas 15 (29%) of the Indian men and 31 (55%) of the Indian women were overweight (7). Women were significantly more likely to be overweight than men within each ethnic group (Indians, $P = 0.019$ χ^2 MH; Eskimos, $P < 0.001$ χ^2 MH) and with both groups combined ($P < 0.001$ χ^2 MH) adjusting for age by 10-yr groups. There was no significant difference in the rate of overweight comparing Indians with Eskimos overall ($P = 0.865$ χ^2 MH), adjusting for sex and age by 10-yr groups. Controlling for age, the participants with abnormal glucose tolerance (IGT or diabetes) were significantly more likely to be overweight by NCHS criteria than those with no evi-

Table 2—*Body mass index data, Alaskan Yup'ik Eskimos and Athabascan Indians, 1987*

	Eskimo (kg/m^2)			Indian (kg/m^2)			Combined (kg/m^2)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
N	230	279	509	51	56	107	281	335	616
Mean ± SD	26.7 ± 4.3	29.0 ± 4.9	27.9 ± 5.3	26.6 ± 4.5	27.4 ± 4.8	27.0 ± 4.7	26.6 ± 4.3	28.7 ± 5.7	27.8 ± 5.2
Median	25.7	28.3	26.7	25.8	27.4	26.5	25.8	28.0	26.7
Minimum-maximum	19.1–50.9	17.8–58.2	17.8–58.2	18.8–43.9	17.6–37.7	17.6–43.9	18.8–50.9	17.6–58.2	17.6–58.2

Complete height and weight data obtained on 616 of 666 total participants.

Table 3—*Comparison of Alaskan Eskimo populations receiving weight-for-height determinations at different times, ages ≥40 yr*

	MEN			WOMEN		
	1962 (3)	1972 (3)	1987	1962 (3)	1972 (3)	1987
NUMBER TESTED*	161	97	203	138	96	256
MEAN AGE (YR)	51.4	54.1	56.1	50.6	53.0	54.4
MEAN DIFFERENTIAL WEIGHT (KG)†	1.54	1.56	3.99	1.45	0.54	6.87
OVERWEIGHT %‡	3.0	9.4	16.3	6.1	11.7	27.0
95% CONFIDENCE LIMITS	(1.0, 7.1)	(4.3, 16.9)	(11.5, 22.1)	(2.5, 11.1)	(5.9, 19.6)	(21.6, 32.8)

*In 1987, 97 participants either had incomplete data or were too short to appear on the actuarial table.
†Difference in kg between an individual and white average (3).
‡13.6 kg above average (3).

dence of abnormality (relative odds = 2.1, $P = 0.043$ χ^2 MH).

We determined the proportion of Eskimo participants who were overweight by the criteria used in the previous studies (3). Table 3 shows our results compared with those surveys. There has been a significant increase in the proportion of the population overweight by Mouratoff's criteria for both sexes, separately and combined, over the 25-yr period ($P < 0.001$, Z, for men, women, and combined).

CONCLUSIONS— With data obtained in 1962 and 1969, we estimated that the prevalence of diabetes among Eskimos ≥40 yr old was 1.7% (5 cases, 296 tested) and among Indians was 1.8% (3 cases, 163 tested) (1,2). Compared with our data, these rates show a significant increase for both groups (Eskimos, $P < 0.001$; Indians, $P < 0.01$). Compared with National Health Survey data, our Eskimo and Indian rates are lower than rates for U.S. whites in each age group 40–74 years, except for Indians 60–69 yr old (8).

However, there are several potential limitations in the data. The current report may underestimate the number of participants with diabetes mellitus because only 73% of the eligible population was screened and because not all participants received an OGTT. On the other hand, the individuals screened may have participated because of some concern about risk and may have been more likely to have diabetes than unscreened persons. It is difficult to compare the current results with past data because of methodological differences.

While acknowledging the limitations, we believe that this study indicates that rates of diabetes may be increasing among Alaskan Yup'ik Eskimos and Athabascan Indians. Whether or not diabetes rates will become extremely high with life-style changes as in other indigenous American populations, remains to be seen.

Acknowledgments— This study was supported by Indian Health Service Research Initiative Grant 87–01.

The opinions expressed are those of the authors and do not necessarily reflect those of the Indian Health Service.

We acknowledge Debra J. Parks for data management, Anita Vogt for manuscript preparation, and Barbara Doty, Maureen Thiele, Darlene Heine, and the Yukon-Kuskokwim Health Corporation Board of Directors for logistic support.

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