A Prevalence Survey of Diabetes in Mauritania

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OBJECTIVE — To perform an epidemiological study of the prevalence of diabetes in Mauritania, West Africa, with little data available on diabetes in West Africa.

RESEARCH DESIGN AND METHODS — The study was performed with a representative sample of the Mauritanian population. A random selection of the study population (n = 744) was drawn by a cluster sampling method. Screening for diabetes was made by capillary blood glucose (CBG) measurement, using strips analyzed by reflectance meter. Criteria for the diagnosis of diabetes were those of the World Health Organization (WHO).

RESULTS — The survey performed a screening of 744 subjects whose sex distribution was 307 men and 437 women. Their mean age was 34.6 ± 15.2 years, and their mean BMI was 22.7 ± 5.1 kg/m^2, with a significant difference for BMI between men (20.0 ± 2.9 kg/m^2) and women (24.3 ± 5.5 kg/m^2). According to the study criteria, we found 14 diabetic patients (4 men, 10 women). The crude prevalence of diabetes was 1.88% (95% CI 0.90–2.86). The difference in prevalence by sex was 1.30% (95% CI 0.00–2.60) for men and 2.29% (95% CI 0.89–3.43) for women. For the truncated 30- to 64-year-old age-group, the crude prevalence was 2.84%; the age-adjusted prevalence for the same 30- to 64-year-old age-group, using the standardized age distribution of Segi (10), was 2.61%.

CONCLUSIONS — With a crude prevalence of diabetes of 1.88% and an age-adjusted prevalence of 2.61%, Mauritania may be classified among the countries with a low prevalence of diabetes, a finding which is not surprising, considering the low level of development of this region of Africa.

Diabetes is a real problem in public health all over the world, and it is now well-known that Africa is not free from diabetes. Aspects of diabetes in Africa are presented in an important review by McLarty et al. (1) that underscores the few data that are known and available about the prevalence of diabetes in Africa. Another review (2) of the global prevalence of diabetes identified only three studies in black Africans (3–5) and one in North Africans (6). One study was performed in West Africa (5). This lack of information is a consequence of the huge difficulties and costs of realizing a large scale survey in an underdeveloped country. The aim of this study was to screen a representative sample of the Mauritanian population.

RESEARCH DESIGN AND METHODS

The study was performed from May 1984 to April 1985. A sample of 744 subjects among adult Mauritanians >17 years of age was studied.

Sample

To improve the representativeness of the sample, the survey was conducted at four different locations in Mauritania: Nouakchott (n = 353), Atar (n = 89), Bareina (n = 124), and Kaédi (n = 178). The main subsample was drawn in Nouakchott, the Mauritanian capital, where the population increased dramatically from 90,000 in 1979 to 380,000 in 1982. With 400,000 inhabitants in 1984, Nouakchott represented 25% of the total Mauritanian population. The reason for this sudden population growth was a prolonged and severe dry period that incited a rural exodus toward the capital. This explains why the residents of Nouakchott were not strictly urban in their way of life and why most of them should be considered rural. Atar is a Saharan town in northern Mauritania. Bareina is a small village in the center of the country. And Kaédi is a town in southern Mauritania, near the Senegal river, where the population is predominantly black.

A random selection of the study population was attained by a cluster sampling method with three different patterns. In Nouakchott, where the whole population was listed by an authoritative governmental structure, we were able to draw districts, quarters, and streets at random. Then, on the streets chosen, we decided to visit every second family and screen all adults present. In Atar and Bareina, we had no list of residents, but the towns were not as big, allowing us to use a geographic cluster sampling. We chose a position in the center of the village and then started walking north and, successively, in the other seven directions of the compass (northeast, east, southeast, south, southwest, west, northwest) from the center to the periphery of the village, visiting every third house. In Kaédi, we were unable to use either of these two methods, but we decided to check every adult visiting the local hospital at the gate.

Survey data

Each subject was recorded by age, sex, ethnic group, and personal and familial history of diabetes and was measured for height (in meters) with a wooden measuring stick and for weight (in kilograms) on a bathroom scale (while clothed). Obesity was determined by BMI. All subjects were checked for diabetes by a casual capillary blood glucose (CBG) measure, using Ames Dextrostix strips analyzed by a reflectance meter. When the first casual CBG was ≥110 mg/dl, the patient was

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CBG, capillary blood glucose; WHO, World Health Organization.

asked to come to the hospital the next morning to have a fasting CBG measurement. The reliability of this blood glucose measurement technique has been previously established (4,5,7). We have also assessed this technique for reliability in tropical conditions (8). The survey quality control procedures were limited to double action. Before starting the study, the precision of the reflectance meter used was checked by comparison with laboratory blood glucose oxidase results showing a mean deviation of <10% of reference glycemia. Otherwise, the meter was calibrated after every 100th measurement using calibration strips provided by manufacturer.

Criteria for diabetes

Criteria for diagnosis of diabetes were those recommended by the World Health Organization (WHO) (9): casual CBG value ≥200 mg/dl or fasting CBG value ≥120 mg/dl. No attempts were made to classify diabetes as either IDDM or NIDDM.

Statistical analysis

Statistical analysis was performed using χ^2 test and a comparison of means by the Student's *t* test or an analysis of variance. The 95% CIs were calculated assuming a normal distribution. A two-tailed *P* value of ≤0.05 indicated statistical significance.

The crude prevalence of diabetes was calculated for the whole sample and for people 30–64 years old for comparison to the age-adjusted prevalence estimated using the standard world population of Segi (10) as the reference. Results are given as means ± SD.

RESULTS

Sample characteristics

At the end of the survey, a total of 744 subjects had been screened. The sex distribution was 307 men and 437 women, giving a sex ratio (M:F) of 0.70. Their mean age was 34.6 ± 15.2 years (range 17–85), with no significant difference between men and women (35.7 ± 14.8 vs. 33.9 ± 15.5 years, respectively). Mean BMI was 22.7 ± 5.1 kg/m² for the total sample and was significantly different ($P < 0.001$) between men (20 ± 2.9 kg/m²) and women (24.3 ± 5.5 kg/m²). The overall mean CBG was 94 mg/dl, with a significant sex difference (86 ± 29 vs. 99 ± 29 mg/dl, for men and women, respectively; $P < 0.001$). The distribution of mean casual CBG with age and sex stratification is given in Table 1.

Table 1—*Distribution of CBG with age and sex stratification of population sample: diabetes prevalence survey in Mauritania*

Age (years)	Diabetic subjects (n)	Men		Women	
		n	CBG (mg/dl)	*n*	CBG (mg/dl)
<20	0	22	83 ± 26 (73)	58	97 ± 22 (91)
20–24	0	47	81 ± 21 (78)	72	95 ± 22 (97)
25–29	1	28	83 ± 27 (74)	52	99 ± 20 (96)
30–34	3	25	82 ± 17 (77)	45	101 ± 25 (99)
35–39	1	27	90 ± 28 (82)	36	105 ± 27 (101)
40–44	0	20	89 ± 28 (82)	18	93 ± 20 (93)
45–49	1	17	112 ± 67 (94)	16	95 ± 16 (93)
50–54	0	12	85 ± 21 (83)	17	96 ± 19 (97)
55–59	1	6	94 ± 18 (94)	18	114 ± 57 (105)
60–64	1	11	93 ± 25 (92)	14	101 ± 31 (95)
65–69	1	7	116 ± 42 (103)	10	123 ± 99 (86)
≥70	3	6	116 ± 57 (95)	16	104 ± 33 (94)
Unknown	2	79	78 ± 17 (77)	65	93 ± 21 (90)
All	14	307	86 ± 29 (79)	437	99 ± 29 (94)

Data are *n* or means ± SD (medians). For the total sample, *n* = 744.

Prevalence of diabetes

We found 14 subjects who met the criteria for diabetes. The crude prevalence of diabetes for the study was 1.88% (95% CI 0.90–2.86). The prevalence was lower in men than in women. We found 4 men with diabetes out of 307, giving a prevalence of 1.30% (95% CI 0.0–2.6), and 10 women with diabetes out of 437, giving a prevalence of 2.29% (95% CI 0.89–3.43), but the difference was not statistically significant. The 14 diabetic patients found for the study had the following characteristics: mean age, 49.1 ± 19.4 years (men, 61.0 ± 4.7 years vs. women, 44.3 ± 18.4 years); mean CBG, 205 ± 87 mg/dl; and mean BMI, 26.5 ± 5.0 kg/m² (men, 24.0 ± 4.7 kg/m² vs. women, 27.1 ± 5.1 kg/m²).

Among the 14 subjects discovered to have diabetes, only 4 knew of their condition, 3 of them with casual CBG levels of ≥200 mg/dl and 1 with a CBG reading of 126 mg/dl. The other 10 subjects were previously undiagnosed (71%): 1 had a casual CBG of 286 mg/dl, and 9 met the criterion of a fasting CBG level of ≥120 mg/dl.

In the subsample of 282 30- to 64-year-old subjects, the crude prevalence of diabetes was 2.84% (95% CI 0.90–4.78). For this same group, the age-adjusted prevalence using the standardized age distribution of Segi (10) for the 30- to 64-year-old population was 2.61% (95% CI 1.48–3.74).

CONCLUSIONS — This epidemiological study found an overall prevalence of diabetes of 1.88%, which leads us to classify Mauritania as a region of low prevalence (<3%) (2). In Africa, such low prevalence rates were previously reported in Mali (5) and in rural Bantu in Tanzania (3). No other data on West Africa are known. These low prevalences of diabetes are similar to those described in the least developed countries of the world (2).

As suggested by the WHO Ad Hoc Diabetes Reporting Group (2), the age-adjusted rate was calculated on a truncated age range of 30–64 years to provide a standardized result for comparison with other populations, and here it was found to be 2.61%. This adjusted prevalence is slightly lower than the crude prevalence of 2.84% for the truncated age group but is obviously higher than the crude prevalence of 1.88% for the total 17- to 85-year-old sample. In any case, it remains a low prevalence under 3%.

Considering the characteristics of the survey sample, we have compared the four subsamples by analysis of variance. There appears to be a significant difference between Bareina and the other areas for distribution by sex and age. In Bareina, the sex ratio was 0.36 and mean age, 41.2

years, the latter higher than in the other locations. For BMI and casual CBG, no significant difference was found between the four subsamples.

It is clear that a sex ratio of 0.70 indicates that women were overrepresented, which is probably due to the fact that the study was mainly conducted in homes without requiring that all inhabitants be present. Sex comparison shows comparable mean ages, but mean CBG and BMI were significantly higher in women ($P < 0.001$). The higher prevalence in women was not statistically significant because of the small number of diabetic subjects found. Moreover, we found 37.1% of women to have BMI >25 kg/m^2 versus 6.1% of men, a difference that was highly statistically significant ($P < 10^{-6}$). Considering the increased BMI and prevalence of diabetes in women, it appears that the excess of women in the sample could have produced a slight overestimation of global prevalence. However, this error did not have a strong effect on the result. Actually, we found a calculated sex-adjusted diabetes prevalence rate of 1.79%, which is very near the crude prevalence of 1.88% that was described.

To understand the frequency of female obesity, it is necessary to know that in Mauritania, obesity is a cultural determinant of female beauty, particularly for the Moorish ethnic group. Obesity is traditionally obtained by force-feeding girls with camel milk and dates, and 47.3% of adult Moorish women are clinically obese (11). Nevertheless, such female obesity is not distinctly Moorish because it has been pointed out in Mali (5), where customs could be very similar, and also in Vietnam (12), a culture quite removed from Mauritania but where the prevalence of diabetes was also found to be low. The high prevalence of diabetes among women compared with men has also been reported in Malaysia (2), Vietnam (12), Mauritius (13), the U.S. (African-Americans) (14), and South Africa (15).

Regarding other physical characteristics of the diabetic subjects, it appears that the men were older (61 vs. 44.3 years) and leaner (mean BMI, 24 vs. 27.1 kg/m^2) than the women.

The choice to evaluate the prevalence of diabetes using only casual CBG results and fasting CBG results may have underestimated the prevalence because it has been established that a fasting CBG level of 120 mg/dl, according to the WHO criteria, is slightly higher than it should be. Although it is impossible to assess how much this causes the results to deviate, it is presumably tiny because very few untreated and unknown diabetic subjects have fasting CBG levels <120 mg/dl. This possible underestimation may compensate for the possible overestimation of female predominance in the sample previously mentioned.

Despite the difficulties that we encountered at the Saharan field sites in conducting a rigorous survey, we hope to have drawn an acceptably representative sample. The crude prevalence of 1.88% and the age-adjusted prevalence (30–64 years) of 2.61% allow us to classify Mauritania among the countries with a low prevalence of diabetes. However, the low prevalence in men (1.30%) contrasts with the higher prevalence in women (2.29%) in a country where female obesity is peculiarly frequent for cultural reasons, in spite of the low standard of living.

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