

Diabetes among Bedouins in the Negev: The Transition from a Rare to a Highly Prevalent Condition

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Abstract

Background: Previous studies have shown a low prevalence of diabetes and other cardiovascular risk factors among Bedouins living in the Negev desert. New evidence suggests that diabetes is becoming highly prevalent.

Objectives: To estimate the prevalence of diabetes in the town of Rahat, describe the cardiovascular risk factor profile and therapeutic modalities for diabetes and related conditions in this population, and compare these findings with those in the Jewish population.

Methods: A complete record review of all known diabetic individuals aged 35 and older registered at the Rahat Clinic (Clalit Health Services) was carried out by a trained nurse and a research assistant. Information on demographic, anthropometric and clinical characteristics was abstracted. Data on prescribed hypoglycemic agents and other medications were also obtained.

Results: Of the 316 known diabetic patients in the clinic, complete data were available for 271 (85.8 %). The prevalence of known diabetes was 7.3% in males and 9.9% in females. Females had a significantly higher body mass index than males (30.9 vs. 29, $P < 0.002$), but lower levels of HBA1c and microalbuminuria. Oral hypoglycemic medications were taken by 69% of women and 76% of men, and insulin by 19% of women and 15% of men.

Conclusions: Compared with data on Jewish diabetic patients in the Negev and Israel, the overall prevalence of diabetes in the population of Rahat is higher, but their cardiovascular risk profile is better, except for obesity. These findings support the hypothesis that diabetes and obesity have become major public health problems among Bedouins.

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Studies in Israel and other countries have shown that populations going through these changes have experienced significant increases in diabetes prevalence [4,5]. A recent survey indicated a higher prevalence of reported diabetes in Israeli Arabs than in Jews in all studied age groups [6], but it did not include information on the Bedouin population. The objectives of the present study were to estimate the prevalence of known diabetes in the Bedouin township of Rahat, to describe levels of cardiovascular risk factors and therapeutic modalities for diabetes and related conditions in this population, and to compare these with data in the Jewish population.

Methods

Medical records of all known diabetic patients aged 35 years and older registered in the Rahat Clinic by 31 July 2000 were reviewed by a trained nurse and a research assistant. Diabetes was defined if there was evidence of a recorded diagnosis and hypoglycemic treatment including diet. Data abstracted included age, gender, date of diabetes diagnosis, anthropometric data (weight and height), clinical data (systolic and diastolic blood pressure, diabetes treatment), and laboratory measurements. No specific laboratory tests were performed for determining the type of diabetes in diabetic patients receiving insulin. Body mass index was calculated as $\text{weight}/\text{height}^2$, and microalbuminuria was defined for levels ≥ 30 mg/L in a single urine sample. Ischemic heart disease was defined as any evidence of history of acute myocardial infarction, coronary artery bypass grafting, or percutaneous transluminal coronary angioplasty. All laboratory tests of the Rahat and other primary care clinics belonging to Clalit Health Services are performed in the central laboratory of the Soroka University Medical Center, which uses an automated method (SMA). For the estimates of prevalence, the number of insured individuals in the Rahat clinic, in the various age-gender groups, was obtained from the regional Clalit Health Services roster. Data on the total population of Rahat in each age and gender group were obtained from the Central Bureau of Statistics report [1]. Student's *t*-test, the chi-square test and Fisher's exact test were used for statistical analysis. *P* values < 0.05 were considered to be statistically significant.

Results

Complete data were available for 271 of the 316 known diabetic individuals (85.8%), therefore only these individuals were included

For Editorial see page 720

The Bedouin population of the Negev desert comprises about 120,000 people. Half of this population lives in permanent settlements, of which Rahat is the largest with about 27,000 inhabitants in 1998 [1]. Previous studies have shown a low prevalence of diabetes and other cardiovascular risk factors among Bedouins of the Negev. Ben Assa [2], the physician who treated the Bedouins in the Negev in the 1950s and 1960s, reported that among 2,000 Bedouins examined in 1962 less than 10 were diabetics. Moreover, after an extensive review of all primary care and hospital sources, 18 diagnosed diabetic Bedouins could be identified between 1961 and 1971 [3]. The Bedouin are a population in transition from a traditional to a western lifestyle, characterized by changes in dietary habits and a reduction in physical activity.

in the study. It is important to note that at the time of the study about 74% of the Rahat population was insured in the Clalit Health Services, providing a fair representation of the entire Rahat community.

Table 1 shows the prevalence of diabetes. Overall, 7.3% of men and 9.9% of women aged 35 years and older were diagnosed as diabetic. As expected, prevalence increases with age in both genders, being higher in women than in men. A relative decrease in the prevalence was observed in the 65 year and older age group, which may reflect a survival advantage of non-diabetic people, due to a selective higher mortality in diabetic patients in this age group. Table 2 describes the clinical characteristics of the diabetic population. Diabetic Bedouin women are significantly more obese than men, have better controlled diabetes, and lower serum

Table 1. Number and percent of diabetic people, by age and gender, in Rahat, 2000

Age group (yr)	Prevalence (per 100 persons)		P*
	Men (n=108)	Women (n=163)	
35-44	19/610 (3.1)	27/794 (3.6)	0.58
45-54	32/417 (7.7)	58/482 (12.0)	0.03
55-64	40/229 (17.5)	51/224 (22.8)	0.16
≥65	17/208 (9.2)	25/151 (16.5)	0.01
All ages	108/1464 (7.3)	163/1651 (9.9)	0.001

* P value based on Mantel-Haenszel stratified analysis of prevalence of diabetes in men and women, by age.

Table 2. Clinical and biochemical characteristics of known diabetic patients in Rahat, by gender

Characteristic	Men (n=108)	Women (n=163)	P
Age (yr)	52.3 (13.0)	53.0 (11.7)	NS
Duration of known diabetes (yr)	7.2 (5.0)	7.5 (7.1)	NS
Body mass index	29.0 (5.3)	30.9 (6.0)	<0.002
Systolic blood pressure (mmHg)	126.2 (16.6)	127.5 (18.7)	NS
Diastolic blood pressure (mmHg)	78.2 (7.9)	78.2 (8.0)	NS
Fasting plasma glucose* (mmol/L)	10.7 (2.9)	10.4 (2.9)	NS
HbA1c (%)	9.4 (2.3)	8.7 (2.0)	<0.002
Total cholesterol (mmol/L)	5.4 (1.1)	5.5 (1.1)	NS
Triglycerides (mmol/L)	2.2 (1.3)	2.2 (1.2)	NS
LDL-C (mmol/L)	3.3 (0.1)	3.4 (0.8)	NS
HDL-C (mmol/L)	1.2 (0.4)	1.2 (0.4)	NS
Serum creatinine (μmol/L)	88.6 (26.6)	70.8 (26.5)	<0.001
Microalbumin ≥ 30 mg/L (%)	57	37	<0.001
Diabetic retinopathy (%)	28	21	NS
History of stroke (%)	6	3	NS
Ischemic heart disease (%)	17	6	0.004
Lower limb amputation (%)	2	1	NS
On chronic dialysis (%)	-	1	NS

Data are presented as means (± SD) or percent.

* Mean of last two plasma glucose measurements.

LDL-C = low density lipoprotein cholesterol, HDL-C = high density lipoprotein cholesterol

creatinine and urinary microalbumin levels. They also have a significantly lower prevalence of ischemic heart disease. Table 3 presents the medications prescribed to diabetic patients. Except for a significantly higher proportion of men receiving aspirin, no gender differences were observed in the provision of hypoglycemic or cardiovascular medications. Table 4 compares the findings of the present study with those obtained using a similar methodology from a recent cohort of diabetic patients in primary care clinics in the Negev city of Beer Sheva. Jewish diabetic patients were significantly older, had a longer duration of diagnosed diabetes, and significantly higher systolic blood pressure, total and low density lipoprotein-cholesterol, creatinine and urinary microalbumin levels. Conversely, they had significantly lower fasting plasma glucose and HbA1c levels, suggesting better diabetes control. To determine if this difference in diabetes control could be explained by differences in intensity of diabetes management, data on provided medications were compared between the two populations. A significantly higher percent of diabetic Bedouins than diabetic Jews receive either insulin alone or insulin combined with oral

Table 3. Hypoglycemic and cardiovascular medications (per 100 patients) provided to diabetic individuals, by gender

Medication	Men (n=108)	Women (n=163)	P
Diet alone	9.0	12.0	NS
Oral hypoglycemic agents	76.0	69.0	NS
Insulin	13.0	12.0	NS
Insulin + oral hypoglycemic agents	2.0	7.0	NS
Beta blockers	13.0	9.0	NS
ACE inhibitors	46.0	41.0	NS
Ca channel blockers	9.0	8.0	NS
Diuretics	4.0	4.0	NS
Statins	5.0	4.0	NS
Fibrates	10.0	11.0	NS
Aspirin	22.0	7.0	0.0002

Table 4. Characteristics of Bedouin and Jewish diabetic patients in primary care clinics in the Negev

Characteristic	Bedouins (n=271)	Jews (n=201)	P
Age (yr)	52.8 (12.2)	65.6 (11.8)	<0.0005
Duration of known diabetes (yr)	7.3 (6.2)	9.3 (8.1)	<0.0005
Body mass index	30.2 (5.8)	31.0 (5.3)	NS
Systolic blood pressure (mmHg)	126.9 (17.9)	141.1 (22.1)	<0.0005
Diastolic blood pressure (mmHg)	78.2 (8.0)	79.0 (10.2)	NS
Fasting plasma glucose (mmol/L)	10.6 (2.9)	9.5 (3.3)	<0.005
HbA1c (%)	9.2 (2.4)	8.0 (1.9)	<0.0005
Total cholesterol (mmol/L)	5.4 (1.1)	6.0 (1.3)	<0.0005
Triglycerides (mmol/L)	2.3 (1.3)	2.4 (1.3)	NS
LDL-C (mmol/L)	3.3 (0.8)	5.4 (1.1)	<0.0005
HDL-C (mmol/L)	1.2 (0.9)	1.1 (0.3)	NS
Creatinine (mol/L)	78.8 (26.6)	88.4 (26.5)	<0.001
Microalbumin ≥ 30 mg/L (%)	45.0		

Data are presented as means (± SD) or percentage.

hypoglycemic agents (17.0 vs. 4.0%, respectively, $P < 0.005$), while no differences were observed between these groups in relation to reported dietary or oral hypoglycemic treatment.

Discussion

Diabetes and obesity, which were largely unknown in the Bedouin population of the Negev a quarter of a century ago [2,3], have become major public health problems. More specifically, in each age-specific group the prevalence of diabetes in our Bedouin study population was about twice the rate among Jews in Beer Sheva and in Jewish Israeli workers in a previously reported nationwide survey [7]. Moreover, the high body mass index values in the present study, particularly in women, suggest that obesity may be a very prevalent condition among Bedouins. In a previous study of a random sample of Negev Bedouin men over age 30, the mean BMI was 25.0 among "settled" compared to 23.0 among "traditional" Bedouins, suggesting that the process of transition from a traditional to a modern lifestyle was accompanied by an increase in weight [8]. The finding of lower HbA1c levels and a higher prevalence of microalbuminuria in Bedouin women as compared to men deserves further attention. One possible explanation is that compliance with diet and hypoglycemic therapy is higher among women than men, but this hypothesis was not tested in the present study. The lower levels of serum creatinine (even within the normal range) and prevalence of microalbuminuria in women, compared to men, seem not to be related to differences in blood pressure levels, or in the prescription of angiotensin-converting enzyme inhibitors between men and women. Similar gender differences in creatinine levels and in the prevalence of microalbuminuria were reported in a previous study [9].

The findings of the present study may have been distorted by several potential biases. First, it is possible that the prevalence of diabetes seen in the Rahat population is not representative of the whole Bedouin population, however unreported data from other Bedouin primary care clinics seem to support our findings. Second, our study is based on known diabetic patients, and therefore the described prevalence could be an underestimate. If this were the case, the differences in prevalence between Jews and Bedouins in our study would have been of a greater magnitude. The comparison of diabetic Bedouins in Rahat with Jews from primary care clinics in Beer Sheva disclosed some interesting observations. First, while BMI was similar in the two groups, Bedouins still had a pattern of lower values of cardiovascular risk factors, such as systolic blood pressure, total and LDL-cholesterol, and urinary microalbumin. Bedouins were also significantly younger than Jews at the time of the diabetes diagnosis, suggesting that they may become sympto-

matic at earlier ages. This may be supported also by their shorter duration of known diabetes. It seems that during their rapid transition from a traditional to a modern lifestyle, Bedouins maintain some of the "protective" factors in their cardiovascular risk profile, but due to an increase in obesity and probably a decrease in physical activity, diabetes appears as the first morbid manifestation.

In summary, the results of the present study support clinical observations indicating that diabetes, virtually unknown among Bedouins in the Negev three decades ago, has become a major public health problem in this population. It is possible that diabetes and obesity are indicators of an epidemiologic transition from a traditional to modern lifestyle. Primary preventive measures, particularly targeted at the prevention of obesity among adolescents and young adults, should be the major focus of future interventions.

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BMI = body mass index

Nothing is more dreadful than ignorance in action

Goethe (1749-1832), German poet, novelist and dramatist, considered the founder of modern German literature