Cardiovascular Risk Factors in the Bedouin Population: Management and Compliance

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Abstract

Background: Until three decades ago coronary heart disease and stroke were considered rare in the Israeli Bedouin population. Today, this population shows increasing high prevalence compared to the Jewish population.

Objectives: To evaluate the prevalence of diagnosed cardiovascular risk factors among Bedouins (hypertension, diabetes mellitus, dyslipidemia), and to assess compliance with follow-up tests and drug treatment.

Methods: The study included all listed patients aged 20 years and older in eight clinics in major Bedouin towns, and in two large teaching clinics in Beer Sheva (Jewish population). Risk factor data were extracted from the clinics' computerized databases. For those diagnosed with hypertension, diabetes or dyslipidemia, drug purchasing data were collected from the pharmacy database to determine compliance with treatment, and from the central laboratory mainframe (HbA1c and low density lipoprotein-cholesterol) to evaluate follow-up and control.

Results: A significantly higher prevalence of diabetes in all age groups was found in the Bedouin population compared to the Jewish population; age-adjusted results show a prevalence of 12% vs. 8% respectively ($P < 0.001$). The prevalence of dyslipidemia and age-adjusted hypertension was lower among Bedouins (5.8% vs. 18.2%, $P < 0.01$ and 17% vs. 21%, $P < 0.001$ respectively). Two-thirds of hypertensive Bedouin patients and 72.9% of diabetic Bedouin patients were not compliant with treatment. For dyslipidemia only 10.4% of the Bedouins were compliant compared with 28.2% in the Jewish population ($P < 0.001$).

Conclusions: Compliance with drug therapy and follow-up tests was found to be a major problem in the Bedouin population.

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Coronary heart disease is considered the leading cause of death in adults in the western world, even though during the last 30 years morbidity and mortality have decreased by 25–60% in industrialized countries. In developing countries and traditional societies the prevalence of CHD is lower but was found to increase with urbanization and modernization and the abandonment of traditional lifestyles [1].

Studies from around the world regarding cardiovascular risk factors indicate a high prevalence in different Bedouin/Arab populations. A survey among Bedouins over the age of 20 in the United Arab Emirates indicated a high prevalence of diabetes, hypertension and obesity, with the highest prevalence among those living in established settlements [2]. A survey of 2128 people (mostly Bedouins) from Bahrain found high rates of diabetes (25–48%) and high cholesterol levels among the diabetics [3]. Another study [4] found a high prevalence of hypertension (47%) in the same population. High prevalence rates of diabetes (18%) were also found among Arab-Americans (20–75 years old) [5]. Cardiovascular risk factors in the Palestinian population of the West Bank show lower prevalence rates (diabetes 11%, hypertension 24%, hypertriglyceridemia 29%, low high density lipoprotein 44%) [6].

In Israel, an epidemiological survey among Bedouins in 1964 found only a few patients with hypertension or diabetes and none with ischemic heart disease [7,8]. A decade later, the incidence of CHD had begun to rise in the Bedouin population [9,10]. Hospitalization data in the Negev district (southern Israel) during the years 1994–1998 show an increase in hospitalization rates due to myocardial infarction among Bedouins, from 7.47 to 8.14 (per 1000 population). In the same period, the rates in the neighboring Jewish towns dropped from 7.4 to 5.6 (per 1000 population). The rate of hospitalization due to stroke among Bedouins increased from 5.34 to 5.90, and decreased from 4.31 to 2.75 in the Jewish towns [11].

In this study we wished to determine the prevalence of diagnosed cardiovascular risk factors in the Bedouin population (hypertension, diabetes mellitus, dyslipidemia), and to assess compliance with follow-up tests and drug treatment.

Subjects and Methods

Study population

Approximately 170,000 Bedouins live in the Negev region. The majority live in eight Bedouin towns and the rest live in small and temporary settlements (huts, tents). A small minority still conducts a semi-nomadic lifestyle. The present study was conducted in the eight largest Bedouin clinics in the Negev, which serve the majority of the Bedouin Negev population and belong to Clalit Health Services-Southern District – the largest of Israel's four health management organizations and the major health services provider for the Bedouin population. The study group

CHD = coronary heart disease

comprised 28,449 Bedouins who represent all patients aged 20 years and above listed in these eight Bedouin clinics, and the control group included 14,012 Jewish patients listed in two Beer Sheva teaching clinics serving a population that is representative of the Jewish population in Beer Sheva. This study received the local Institutional Review Board committee approval.

Data collection

Data of all listed patients over the age of 20 were extracted directly from each clinic's computerized database (electronic medical records). The data obtained included age, gender, and diagnosed risk factors (hypertension, diabetes, dyslipidemia). Other risk factors such as smoking or obesity were not included since we estimated under-recording in both populations. Annual prescription purchase data were obtained for each individual in the study population, including anti-hypertensive, anti-glycemic and lipid-lowering drugs. Hypertensive, diabetic and dyslipidemic patients' purchase data were extracted from the pharmacy's mainframe database for the period September 2001 through August 2002. Data of all HbA1c and LDL-C tests performed during that period were obtained from the central laboratory database.

Statistical analyses

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software version 11.5. Results of categorical variables are described as frequencies. Chi-square tests were used to analyze statistically significant differences of categorical variables. Continuous variables were analyzed using the independent *t*-test. *P* values ≤ 0.05 were considered statistically significant. Age-adjusted rates were calculated by means of the direct age-adjustment method, using the Jewish population as the reference population.

Definitions

- "Good" compliance: 9 months or more of drug purchasing during 1 year.
- "Less than good" compliance: less than 9 months purchasing during the year.
- Controlled diabetic patient: HbA1c < 8 mg/dl. Those without any HbA1c measurements during the last year were defined as non-compliant.
- Controlled dyslipidemic patient: individual LDL target level calculated separately for each patient, according to his/her risk factors. A dyslipidemic patient was considered controlled when more than half of the LDL laboratory results during the year met the individual target level. Patients with no LDL results during the last year were defined as non-compliant.

LDL-C = low density lipoprotein-cholesterol
PR = prevalence ratio
CI = confidence interval

Results

Diagnosed risk factors

Table 1 presents the age and gender-specific rate distribution. In the Bedouin population the younger age group is prominent. Table 2 shows the prevalence of diagnosed risk factors in the study population. In those above the age of 60 the prevalence of hypertension is significantly lower among Bedouins (34.4–39.6% vs. 45.7–59.6% respectively, $P < 0.01$). The age-adjusted prevalence rates show significantly lower rates among Bedouins (17% vs. 21%, $P < 0.001$, prevalence ratio 0.87, 95% confidence interval 0.83–0.90).

For diabetes, the prevalence rates in any given age group, as well as the age-adjusted prevalence rate (12% vs. 8%, $P < 0.001$, PR 1.23, 95% CI 1.19–1.27) were higher among Bedouins. The prevalence rate was especially notable among Bedouins in the age group 40–49, where it was three times higher than in the Jewish population of the same age.

A different trend was noted regarding diagnosed lipid metabolic disorder. We found a lower prevalence in the Bedouin population in all age groups (age-adjusted prevalence rates: 12% vs. 18%, $P < 0.001$, PR 0.75, 95% CI 0.71–0.78). In the age group 60 and older, the rate is nearly twice as low among Bedouins compared to the Jewish population (20.2% vs. 39.2%, respectively).

Table 1. Age and gender distribution of the Bedouin and Jewish populations in the Negev

	Bedouin			Jewish (Beer Sheva)		
	Male	Female	Total	Male	Female	Total
Age	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
20–29	5735 (46.2)	6690 (53.8)	12,425 (43.7)	1384 (46.8)	1568(53.1)	2952 (21.1)
30–39	3352 (44.9)	4111 (55.1)	7463 (26.2)	869 (42.5)	1174(57.5)	2043 (14.6)
40–49	1681 (43.0)	2232 (57.0)	3913 (13.7)	1260 (44.8)	1555(55.2)	2815 (20.1)
50–59	981 (41.3)	1396 (58.7)	2377 (8.4)	1097 (45.5)	1312(54.5)	2409 (17.2)
60–69	678 (49.8)	684 (50.2)	1362 (4.8)	791 (44.8)	976(55.2)	1767 (12.6)
70+	387 (42.6)	522 (57.4)	909 (3.2)	815 (40.2)	1211(59.8)	2026 (14.4)
Total	12,814 (45.0)	15,635 (55.0)	28,449	6216 (44.4)	7796(55.6)	14,012
Mean (SD)*	35.66(14.16)			47.80(17.95)		

* $P < 0.001$

Table 2. Diagnosed risk factors as identified in the medical records

	Hypertension		Diabetes		Lipid metabolic disorder	
	Bedouin	Jewish	Bedouin	Jewish	Bedouin	Jewish
Age	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
20-29	46 (0.4)	14 (0.5)	64 (0.5) †	6 (0.2) †	41 (0.3)*	26 (0.9)*
30-39	161 (2.2)	57 (2.8)	211 (2.8) *	26 (1.3) *	213 (2.9)	67 (3.3)
40-49	357 (9.1)	240 (8.5)	409 (10.5)*	98 (3.5) *	416 (10.6)	334 (11.9)
50-59	597 (25.1)	587 (24.4)	493 (20.7)*	247 (10.3)*	509 (21.4)*	630 (26.2)*
60-69	468 (34.4)*	808 (45.7)*	330 (24.2)*	356 (20.1)*	305 (22.4)*	712 (40.3)*
70+	360 (39.6)*	1208 (59.6)*	196 (21.6)	416 (20.5)	153 (16.8)*	775 (38.3)*
Total	1989 (7.0)*	2914 (20.8)*	1703 (6.0)*	1149 (8.2)*	1637 (5.8)*	2544 (18.2)*

* $P < 0.001$
† $P < 0.05$

Compliance with treatment and controlled illness

Table 3 depicts compliance with medications. For all risk factors, compliance is significantly higher in the Jewish population ($P < 0.001$). The highest compliance was found for hypertension treatment in the Jewish population: 61% compared to 32.8% among Bedouins. For diabetes and for patients diagnosed with both hypertension and diabetes, compliance in the Jewish population is in the range of 40%, compared to 27–30% among the Bedouin. We found that 72% in the Jewish population are compliant with the anti-hypertensive treatment for at least 9 months a year compared to only 45% in the Bedouin population. The rates for dyslipidemia compliance were low in both populations, with only 10.4% of Bedouin patients taking treatment with good compliance compared to 28.2% of Jewish patients.

Table 4 demonstrates the level of compliance with follow-up: 37.4% of diabetic Bedouin patients had two or more HbA1c measurements per year compared to 58.6% in the Jewish population, and 21.6% of diabetic Bedouins did not have any HbA1c follow-up test compared to 12.7% in the control group. Dyslipidemic patients' compliance with follow-up LDL tests show that 62.1% of the Bedouins are not controlled compared to 74.8% of the Jewish population.

Table 3. Medication purchasing compliance

Compliance		Bedouin n (%)	Jewish n (%)
Compliance with hypertension treatment	Good	653 (32.8)*	1778 (61.0)*
Compliance with diabetes treatment	Good	462 (27.1)*	488 (42.5)*
Compliance with lipid-lowering treatment	Good	171 (10.4)*	718 (28.2)*
Compliance with hypertension & diabetes treatment (among those diagnosed for both)	Good with both	185 (29.9)*	288 (41.4)*

Good compliance considered as 9 months of purchase per year or above.
* $P < 0.001$

Table 4. Compliance with chronic disease follow-up

		Bedouin n (%)	Jewish n (%)
No. of HbA1c measurements a year (among those diagnosed for diabetes)	0	367 (21.6)‡	146 (12.7)‡
	1	699 (41.0)‡	330 (28.7)‡
	2 or more	637 (37.4)‡	673 (58.6)‡
Rates of controlled* diabetic patients	Controlled	503 (29.5)‡	659 (57.4)‡
Rates of controlled† dyslipidemic patients	Controlled	620 (37.9)‡	640 (25.2)‡

* Controlled was defined as most (more than 50%) HbA1c test results under < 8 mg/dl.
† Target LDL level was calculated individually.
‡ P < 0.001

Discussion

The prevalence of diagnosed hypertension among Bedouins over the age of 60 is significantly lower than in the Jewish population. These findings may stem from under-recording in the medical records or under-diagnosis. However, another possible explanation could be that many elders have not yet abandoned their traditional lifestyle [7,8], while the younger generations have adopted a more modern way of living.

Bedouins are diagnosed for diabetes at significantly higher rates than the Jewish population. These rates are still lower compared to the Bedouin population in Bahrain [3]. This might be attributed to genetic factors, combined with lifestyle changes and onset at a younger age that is manifested during adulthood (40–49 years old). The smaller differences between the Bedouin and the Jewish populations in the older age groups, as mentioned before, could be attributed to the fact that elderly Bedouins are still practicing a traditional lifestyle [7].

The rate of diagnosed lipid metabolic disorder and the rate of uncontrolled dyslipidemia are lower among Bedouins compared to the Jewish population and to the data from other previous studies. In 1995 a large screening survey in the United Emirates reported a prevalence of 50% for hypercholesterolemia [12]. In a study currently underway, higher rates of dyslipidemia (31%, with 14% having LDL above 130, 10% having hypertriglyceridemia and 21% having low HDL) were identified among Bedouins when dyslipidemia screening was performed (Dreiher et al., personal communication, unpublished data). Therefore, the low rate of dyslipidemia in the present study might be due to under-screening. In the case of under-screening the first to be screened are frequent clinic visitors and those who are compliant with their physician's recommendations. This might explain the higher control rate among Bedouins as compared to the Jewish population.

The World Health Organization published guidelines aimed at increasing adherence and compliance in patients with chronic illnesses – in recognition of the importance of this issue for the long-term health of the population. Five main intertwined factors were noted as influencing compliance: the health system medical team, socioeconomic factors, disease factors, patient-related factors, and factors relating to treatment. These challenge the approach holding the patient responsible for managing and controlling his/her illness [14].

The rate of compliance with treatment was found to be alarmingly low in the Bedouin population compared to the Jewish population, and this held true for all three risk factors (hypertension, diabetes, dyslipidemia). The differences were even greater in the older age groups. While there is an increase in compliance with age in the Jewish population, such a trend was not observed among Bedouins. The low rates of compliance with lipid-lowering treatment in both populations are consistent with previous studies showing that adherence to statin therapy is poorer compared to other medications [15,16]. The extremely low rates of compliance can also be attributed to the mid to low socioeconomic status of the study population and its high rate

of unemployment. It explains why they often choose to forgo the anti-lipidemic drugs.

A study in 1998 found that 38–64% of patients continued to take anti-hypertensive treatment [17]. In another study from Finland using a questionnaire to assess compliance, the rate of good compliance with treatment was 86% [18]. It appears that less than one-quarter of treated patients achieve control [19]. Among hypertensive Bedouins only a third were taking treatment with good compliance, compared to 61% in the Jewish population. Special attention should be paid to Bedouin patients diagnosed with both hypertension and diabetes, as more than half of this group were not taking any treatment with good compliance.

Low compliance can be attributed to factors that are system related and patient related [18]. System-related factors include lack of follow-up, giving the patient partial information, lack of medical-team support, and problematic scheduling for blood pressure checkup. For a certain segment of the Bedouin population accessibility is a definite problem because of the large distances they have to travel to reach the clinic. This is especially true for older patients who do not drive and need to be transported. Patient-related factors include denial of illness, giving up, frustration, economic problems, as well as considering the chronic illness as "silent" (thus less disturbing) compared to an acute illness with symptoms that demand immediate relief. The rate of unemployment in the Bedouin population is very high, and since there is a co-payment charge for medication this most likely constitutes an economic obstacle to good compliance.

Furthermore, when looking at the Bedouin population in the Negev, special attention should be paid to specific factors such as physician-patient communication issues (language), accessibility of the clinic, risk factor awareness, patient definition for good compliance, and the residential differences (permanent vs. semi-nomadic). Equally important, however, is the stigma of being labeled with a chronic disease, which might be a social disadvantage that affects the patient's social status.

The study's main limitation is the fact that it is based on medical records data that might be incomplete or lacking at times due to physicians' recording practices. However, we tried to eliminate this bias by cross-referencing our data with laboratory and pharmaceutical data and by not including major risk factors such as smoking and obesity, which we know are under-documented. Since the findings are so striking, we believe that despite the presumed under-reporting in the medical records, they only serve to emphasize the need for better understanding of the reasons for lack of compliance. Furthermore, we believe there is a minimal bias regarding clinic and physician characteristics since the physicians working with the Bedouin population are trained in the same program as those working in the Jewish population (sometimes one physician serves both). If there are differences in physicians' recording behavior (e.g., differences in familiarity with e-records, diagnosis criteria), this will affect recording behavior in both population sectors.

Considering the CHD "epidemic" and the increasing stroke incidence among Bedouins in the last 30 years, as compared with a decrease in morbidity and mortality from those diseases in the Jewish population, there is an urgent need to redirect research resources in order to establish a culturally and economically sensitive program to improve primary prevention of cardiovascular diseases among the Bedouins in the southern district of Israel. It would be especially important to evaluate compliance factors.

References

1. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. *Circulation* 1998;97:596–601.
2. El Mugamer IT, Ali Zayat AS, Hossain MM, Pugh RN. Diabetes, obesity and hypertension in urban and rural people of Bedouin origin in the United Arab Emirates. *J Trop Med Hyg* 1995;98:407–15.
3. Al Mahroos F, McKeigue PM. High prevalence of diabetes in Baharainis. Associations with ethnicity and raised plasma cholesterol. *Diabetes Care* 1998;21:936–42.
4. Al-Mahroos F, Al-Roomi K McKeigue PM. Relation of high blood pressure to glucose intolerance, plasma lipids and educational status in an Arabian Gulf population. *Int J Epidemiol* 2000;29:71–6.
5. Jaber LA, Brown MB, Hammad A, et al. Epidemiology of diabetes among Arab Americans. *Diabetes Care* 2003;26:308–13.
6. Abdul-Rahim HF, Husseini A, Bjertness E, Giacaman R, Gordon NH, Jervell J. The metabolic syndrome in the West Bank population: an urban-rural comparison. *Diabetes Care* 2001;24:275–9.
7. Ben Assa S. The medical work among the Bedouins in the Negev. *Harefuah* 1961;61:211–12 (Hebrew)
8. Ben Assa S. Observations on 2000 Bedouin Patients. *Harefuah* 1961;67:450–3 (Hebrew)
9. Kain Z. Ischemic heart disease among the Negev Bedouins. MD thesis 1985, Ben-Gurion University of the Negev, Beer Sheva.
10. Zamir M. Myocardial infarction in the Bedouin population in the Negev (a survey of 35 cases). MD thesis 1972, Tel Aviv University Medical School, Ramat Aviv.
11. Weitzman S, Rosen S. Report of the working group on "Health Needs of the Negev Population." The Goldman Foundation, 2001.
12. Agarwal MM, Hughes PF, Haliga AA, Newman P, Sheekh-Hussen MM, Shalabi AG. Relevance of cholesterol screening in the United Arab Emirates. A preliminary study. *Eur J Epidemiol* 1995; 11:581–5.
13. Fraser D, Weitzman S, Blondheim S, Shany S, Abou-Rbiah Y. The prevalence of cardiovascular risk factors among male Bedouins: a population in transition. *Eur J Epidemiol* 1990;6:273–8.
14. Adherence to Long-Term Therapies – Evidence for Action. Geneva: World Health Organization, 2003.
15. Kulkarni SP. Long-term adherence with cardiovascular drug regimens. *Am Heart J* 2006;151:185–91.
16. Eagle KA. Adherence to evidence-based therapies after discharge for acute coronary syndromes: an ongoing prospective, observational study. *Am J Med* 2004;117:73–81.
17. Bloom BS. Continuation of initial antihypertensive medication after 1 year of therapy. *Clin Ther* 1998;20:671–81.
18. Jokisalo E, Kumpusalo E, Enlund H, Halonen P, Takala J. Factors related to non-compliance with antihypertensive drug therapy. *J Hum Hypertens* 2002;16:577–83.
19. Hyman DJ, Pavlik VN. Characteristics of patients with uncontrolled hypertension in the United States. *N Engl J Med* 2001;345:479–86.

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