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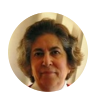
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The Metabolic Syndrome in the West Bank Population

An urban-rural comparison

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OBJECTIVE — To compare the prevalence of components of the metabolic syndrome, including hypertension, abnormal glucose metabolism, dyslipidemia, central obesity, and overall obesity, between a rural and an urban Palestinian West Bank community.

RESEARCH DESIGN AND METHODS — A total of 500 rural and 492 urban men and women aged 30–65 years participated in a community-based cross-sectional survey. Diabetes and impaired glucose tolerance were diagnosed using the oral glucose tolerance test. BMI, waist-to-hip ratio, and blood pressure were measured, and blood samples were taken from each subject. Sociodemographic characteristics were investigated using a questionnaire.

RESULTS — Hypertriglyceridemia, low HDL cholesterol, overall obesity, and smoking were significantly more prevalent in the urban population, whereas central obesity was more prevalent in the rural population. Prevalence of hypertension was not significantly different between the rural and urban populations (25.4 and 21.5%, respectively; $P = 0.15$). The age-adjusted prevalences of diabetes were high: 11.3% (8.5–14.1 95% CI) and 13.9% (10.8–17.0) in the rural and urban populations, respectively, but not significantly different. In each community, the age-adjusted prevalence of the metabolic syndrome as defined by the World Health Organization was 17%.

CONCLUSIONS — Although no significant differences were found in the prevalences of hypertension and diabetes between the two populations, other components of the metabolic syndrome, namely elevated triglycerides, low HDL cholesterol, and overall obesity, were more prevalent in the urban population. Given the rapid urbanization of the Palestinian population, the implications for a rise in noncommunicable diseases should be a major public health concern.

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Substantial socioeconomic and demographic changes have taken place in countries of the Eastern Mediterranean region (EMR) over the past two decades. The population of this region has almost doubled, more people are living into older age, and the proportion of the urban population has been increasing (1–3).

The transition from a rural to an urban lifestyle is associated with a deterioration in the cardiovascular disease (CVD) risk profile because of adverse changes in dietary habits and physical activity patterns (4). Although CVD and its clustering of risk factors, known as the metabolic syndrome, have been a feature of Westernized societies, CVD is now emerging as a major health concern in developing countries, including countries of the EMR (3,5).

There is no internationally agreed upon definition for the metabolic syndrome, but the World Health Organization (WHO) has recently proposed a working definition that includes a measure of impaired glucose regulation and/or insulin resistance as well as two or more of the following components: raised arterial blood pressure, raised plasma triglycerides and/or low HDL cholesterol, central obesity and/or high BMI, and microalbuminurea (6). To our knowledge, the prevalence of components of the metabolic syndrome has never been studied in the Palestinian West Bank, where 46.5% of the population is urban (7). Two surveys of diabetes prevalence, one in a rural community and the other in an urban community, were conducted in 1996 and 1998, respectively (8,9). The present study, which is based on these surveys, compares the prevalence of selected components of the metabolic syndrome. It is expected that urban residence will be associated with a higher prevalence of these risk factors than rural residence.

RESEARCH DESIGN AND METHODS

Two Palestinian communities in the center of the West Bank, one rural and one urban, were surveyed in December 1996/January 1997 and April/May 1998, respectively. A rural area, according to the classification of the Palestinian Central Bureau of Statistics, is a location that has <4,000 residents (7). The rural community Kobar village is located 15 km from the nearest city, Ramallah, and it is entirely Muslim. The urban population resides in Old Ramallah, which is a well-defined predominantly Muslim community located in the heart of Ramallah. The latter is a major city in the West Bank, located 16 km north of Jerusalem.

Study populations and methods have been detailed in previous articles (8,9).

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Abbreviations: CVD, cardiovascular disease; EMR, Eastern Mediterranean region; FBG, fasting blood glucose; IGT, impaired glucose tolerance; OGTT, oral glucose tolerance test; SES, socioeconomic status; WHO, World Health Organization; WHR, waist-to-hip ratio.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Table 1—*Selected characteristics of the rural and urban study populations*

	Rural	Urban
n	500	492
Sex*		
Men	41.8 (209)	38.6 (190)
Women	58.2 (291)	61.4 (302)
Average age (years)†		
Men	43.9 ± 10.2	42.7 ± 9.6
Women	43.8 ± 11.0	45.0 ± 10.5
Average education (years)		
Men	9.5 ± 4.2	8.9 ± 4.8
Women	4.9 ± 4.8	7.1 ± 5.1
Current smokers (%)‡		
Men	47.6	58.7
Women	3.1	18.0
Men whose *main* occupation is farming (%)	9	0

Data are *n*, % (*n*), and means ± SD. *$P = 0.31$ (χ^2 test); †$P = 0.23$ (men), $P = 0.18$ (women) (two-sided independent samples *t* test); ‡$P = 0.026$ (men), $P < 0.001$ (women) (χ^2 test).

Inclusion criteria, survey methods, and diagnostic criteria applied were identical in both locations. After an initial household census survey, all eligible men and women were invited to take part in a detailed individual testing survey. Eligibility was based on age (30–65 years), residence within the borders of the survey area at least 6 months before the individual testing survey, and mental and physical ability to participate. There were 588 eligible people in the rural community and 831 in the urban community. A total of 500 men and women from the rural community and 492 from the urban community participated in the individual testing surveys, representing response rates of 85 and 59%, respectively.

The individual testing surveys were held at community centers, and the model protocol by Dowse and Zimmet (10) was followed. Testing procedures included blood pressure and anthropometric measurements (height, weight, and waist and hip circumferences), fasting blood glucose (FBG) measurements, and blood lipids tests. Sociodemographic and smoking information was assessed using a questionnaire, and diabetes and impaired glucose tolerance (IGT) were assessed using the oral glucose tolerance test (OGTT).

The diagnostic values for the OGTT, according to WHO guidelines of 1985, were >11.1 and 7.8–11.1 mmol/l for diabetes and IGT, respectively, at 2 h after glucose load (11). According to WHO guidelines, obesity for men and women was defined as BMI >30 kg/m^2, and central obesity was defined as a waist-to-hip ratio (WHR) >0.90 for men and >0.85 for women. Hypertension was defined as blood pressure ≥140/90 mmHg, and dyslipidemia was defined as hypertriglyceridemia (≥1.70 mmol/l) and/or HDL cholesterol <0.90 mmol/l in men and <1.0 mmol/l in women (6).

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences for Windows. Diabetes prevalence was adjusted to the WHO world standard population (30–64 years) by direct standardization, excluding individuals aged 65 years (12). In Table 2, continuous population characteristics were also age-adjusted using the WHO world standard population structure, and the individuals aged 65 years were included in the 60–64 group. Descriptive bivariate analysis between continuous population characteristics and location of residence (urban/rural) was performed using multiple regression analysis, including age as a categorical variable. For categorical independent factors, age-adjusted odds ratios and 95% CIs were calculated (Table 3). Because of the small numbers in some cells, Table 4 was age-adjusted using a logistic regression model rather than direct standardization, and the proportion of the population with the metabolic syndrome was age-adjusted by direct standardization.

RESULTS — Selected characteristics of the study populations are compared in Table 1, indicating no significant differences in the average ages or sex distribution between the two populations. Smoking was significantly more prevalent in the urban population after controlling for age, and it was significantly more prevalent among men than among women in both locations.

Table 2—*Bivariate relations between location (rural vs. urban) and age-standardized continuous population characteristics*

	n		Mean ± SE*		
Factor	Rural	Urban	Rural	Urban	*P*†
Blood pressure (mmHg)					
Systolic	500	492	124.8 ± 0.86	122.6 ± 0.85	0.103
Diastolic	500	492	76.3 ± 0.49	78.4 ± 0.47	0.001
Glucose metabolism (mmol/l)					
FBG	477	491	4.1 ± 0.08	4.9 ± 0.10	<0.001
2-h blood glucose‡	465	446	5.98 ± 0.12	5.65 ± 0.11	0.123
Blood lipids (mmol/l)					
Total cholesterol	495	491	5.15 ± 0.05	5.23 ± 0.06	0.591
HDL cholesterol	498	479	1.17 ± 0.02	0.90 ± 0.01	<0.001
LDL cholesterol	487	486	3.27 ± 0.06	3.75 ± 0.05	<0.001
Triglycerides	500	492	1.53 ± 0.07	1.86 ± 0.12	0.009
BMI (kg/m^2)					
Women	289	302	29.1 ± 0.38	30.4 ± 0.34	0.001
Men	208	190	26.5 ± 0.31	27.6 ± 0.34	0.029
WHR					
Women	289	302	0.88 ± 0.005	0.82 ± 0.003	<0.001
Men	209	190	0.93 ± 0.005	0.92 ± 0.005	0.086

*Age-standardized according to the WHO world standard population. †*P* value for location in a multiple regression with location and age (30–39, 40–49, 50–59, and 60–65 years) as predictors. ‡Excluding individuals diagnosed with diabetes before the survey.

Table 3—*Prevalence of selected components of the metabolic syndrome in the rural and urban communities and associations (odds ratio) between location and components*

Factor*	*n*	Rural [% (*n*)]	Urban [% (*n*)]	Odds ratio†	95% CI
Hypertension					
Women	593	23.7 (69)	23.2 (70)	0.84	0.55–1.29
Men	399	27.8 (58)	18.9 (36)	0.64	0.39–1.07
Total	992	25.4 (127)	21.5 (106)	0.75	0.54–1.04
Diabetes					
Women	593	9.6 (28)	14.9 (45)	1.58	0.92–2.70
Men	399	10.0 (21)	7.4 (14)	0.78	0.38–1.62
Total	992	9.8 (49)	12.0 (59)	1.27	0.84–1.94
IGT					
Women	593	10.3 (30)	7.0 (21)	0.59	0.33–1.07
Men	399	6.2 (13)	4.2 (8)	0.70	0.28–1.74
Total	992	8.6 (43)	5.9 (29)	0.64	0.39–1.05
Hypertriglyceridemia					
Women	593	20.6 (60)	31.1 (94)	1.69	1.15–2.49
Men	399	25.4 (53)	40.5 (77)	2.08	1.35–3.20
Total	992	22.6 (113)	34.8 (171)	1.85	1.39–2.46
Low HDL cholesterol					
Women	586	24.8 (72)	55.7 (165)	3.80	2.67–5.40
Men	391	33.2 (69)	69.9 (128)	4.64	3.01–7.15
Total	977	28.3 (141)	61.2 (293)	4.0	3.06–5.23
Overall obesity					
Women	591	36.0 (104)	48.7 (147)	1.65	1.17–2.32
Men	397	17.4 (36)	30.0 (57)	2.13	1.31–3.45
Total	988	28.2 (140)	41.5 (204)	1.84	1.40–2.41
Central obesity					
Women	591	62.6 (181)	26.5 (80)	0.16	0.11–0.23
Men	399	69.9 (146)	58.9 (112)	0.67	0.43–1.02
Total	990	65.7 (327)	39.0 (192)	0.31	0.23–0.40

*Components of the metabolic syndrome were defined as follows: hypertension (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg); diabetes (OGTT results ≥11.1 mmol/l or previously diagnosed diabetes); IGT (OGTT results ≥7.8 and <11.1 mmol/l); overall obesity (BMI >30 kg/m^2); central obesity (WHR >0.85 in women or >0.90 in men); hypertriglyceridemia (triglycerides ≥1.70 mmol/l); low HDL cholesterol (<1.0 in women or <0.9 in men). †Odds ratios adjusted to age, using age-groups 30–39, 40–49, 50–59, and 60–65 years; the rural location serves as reference.

Table 2 compares the age-standardized means of various components of the metabolic syndrome between the rural and urban communities. In the urban population, diastolic blood pressure, FBG, LDL cholesterol, and triglycerides were significantly higher than that in the rural population, and the average HDL cholesterol level was significantly lower. Urban men and women had significantly higher BMI averages than their rural counterparts, whereas the average WHR was significantly lower in urban women compared with rural women. In a linear regression analysis of urban women, WHR was found to be significantly associated with the number of pregnancies after controlling for age ($P = 0.004$).

The sex-specific prevalence of components of the metabolic syndrome in the two populations is described in Table 3, using WHO-defined cutoff points. Rural–urban differences were tested using age-adjusted odds ratios to control for the various age structures. Dyslipidemia and overall obesity were significantly more prevalent in urban men and women. Within the urban population, hypertriglyceridemia and low HDL cholesterol levels were significantly more prevalent among men than women. In the rural population, the prevalence of low HDL cholesterol levels, but not hypertriglyceridemia, was significantly different between the sexes (data not shown). Central obesity was significantly more prevalent among rural women compared with their urban counterparts, but the difference between rural and urban men was not significant after controlling for age.

The prevalences of hypertension, diabetes, and IGT were not significantly different between the two populations. The prevalence of diabetes was 11.3% (8.5–14.1 95% CI) and 13.9% (10.8–17.0) in the rural and the urban populations, respectively, after adjusting to the WHO world standard population. It is noteworthy that most diabetic subjects were diagnosed before the survey, and the proportion of subjects diagnosed before the survey was equally high in both the rural and urban populations (71 and 78%, respectively).

The clustering of components of the metabolic syndrome (i.e., co-occurrence in the same individual) is shown in Table 4. The prevalence of components of the metabolic syndrome was compared between normoglycemic individuals and those with diabetes or IGT to assess aggregation. After adjusting for age, 73.4% (70.8% rural and 76.1% urban) of individuals with diabetes or IGT had at least two other components of the metabolic syndrome compared with 54.4% (51.7% rural and 57.1% urban) of normoglycemic individuals ($P < 0.001$). Of the total population, an equal proportion of both the rural and the urban populations (17%) had diabetes or IGT in addition to at least two other components (the WHO definition of the metabolic syndrome).

CONCLUSIONS — Increasing urbanization of many countries of the region has helped increase the prevalence of risk factors for CVD, such as obesity, decreased physical activity, smoking, hypertension, and diabetes (1,13,14). The "metabolic syndrome" is a term that refers to the clus-

Table 4—*Age-adjusted clustering of components of the metabolic syndrome by location*

	Rural		Urban	
	+2 components*	+3 components†	+2 components*	+3 components‡
Normoglycemic	51.7	18.4	57.1	24.2
Diabetes or IGT	70.8	25.3	76.1	42.2

Data are %. *$P < 0.001$, †$P > 0.1$, ‡$P > 0.05$, using a χ^2 test.

tering of a number of CVD risk factors, typically including glucose metabolism disturbances, abnormal blood lipids, high blood pressure, and obesity (15). The prevalence of the metabolic syndrome has never been studied on a population level in the Palestinian West Bank, to our knowledge. In this study, the results of a rural and an urban community-based survey are compared.

The high response rate in the rural community (85%) meant that selection bias was unlikely to be of concern. On the other hand, the lower response rate in the urban community (59%) necessitated an examination of the demographic characteristics of nonresponders to assess potential selection bias. Responders and nonresponders were compared by age, sex, level of education, and socioeconomic status (SES). No significant differences were found in the average ages, age distribution, or average years of education of the two groups for either sex. Women were significantly over-represented in the study population, which was dealt with in the analysis by sex stratification. Although information on SES was not available directly from nonresponders, a comparison between responders and the population eligible for the survey gave an indirect indication that responders and nonresponders did not differ significantly in that respect.

Diabetes, IGT, dyslipidemia, obesity, and central obesity were compared between the two populations as continuous and categorical characteristics. It is important to remember, however, that the odds ratios presented in Table 3 cannot be interpreted as approximations of risk because of the high prevalence of the dependent variables. The direction of the differences between the two populations in dyslipidemia and obesity in Tables 2 and 3 is predictable, given the expected differences in dietary habits and physical activity. The higher prevalence of central obesity in the rural population might be partly a result of the higher parity among rural women (mean number of pregnancies in rural women = 6.5 compared with 5.7 in urban women, P = 0.008). In the EMR, data from national surveys in Saudi Arabia, Bahrain, Jordan, and Egypt reveal a high level of obesity (BMI $>$30 kg/m^2) in those populations, especially in women (16–19), but data on central obesity in the region are scarce.

The absence of a statistically significant difference in the prevalences of diabetes, IGT, and hypertension between the two populations may be, in part, a function of the sizes of the study populations and should therefore be interpreted with caution.

The prevalence of the metabolic syndrome, usually associated with urban residence and with a Western lifestyle, was equal in the rural and the urban communities (17%). In cross-sectional studies, clustering of the components of the metabolic syndrome has been assessed by comparing the observed frequency of those components and their combinations to the expected prevalence under the assumption of independence (15). Table 4 shows that, in both populations, the prevalence of two or more components of the metabolic syndrome is significantly more likely in individuals with diabetes or IGT than in normoglycemic individuals.

Sociologists have commented on the homogenous social conditions that prevail in Palestinian rural and urban areas, because of the "twin processes of 'ruralization' of the cities and 'urbanization' of the countryside" (22). Thus, even though more than half the Palestinians in the West Bank still reside in rural areas, they cannot be called a peasant society because of the significant decline in the role of agriculture as a source of livelihood and a focus for the organization of social relationships (22).

In line with the situation in the EMR, the results of this study point to the need for action to address the burden of CVD risk factors, including prevention policies and programs as well as further research into modifiable risk factors, such as obesity and physical inactivity. It is obvious that prevention should be the key strategy for avoiding the human and financial costs at stake, especially in view of limited resources.

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References

1. Khosh-Chashm K: The impact of urbanization on health in the countries of the Eastern Mediterranean region. *Eastern Mediterranean Health J* 4:S137–S148, 1998
2. Hammoud EI: Changing demographic and vital statistics patterns in the region during the past 50 years. *Eastern Mediterranean Health J* 4:S58–S65, 1998
3. Alwan A: Cardiovascular disease in the Eastern Mediterranean region. *World Health Stat Q* 46:97–100, 1993
4. Solomons NW, Gross R: Urban nutrition in developing countries. *Nutr Rev* 53:90–95, 1995
5. Defronzo RA, Ferrannini E: Insulin resistance: a multifacted syndrome responsible for NIDDM, obesity, hypertension, dyslipidemia, and atherosclerotic cardiovascular disease. *Diabetes Care* 14:173–194, 1991
6. World Health Organization: *Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications. Part 1: Diagnosis and Classification of Diabetes Mellitus.* Geneva, World Health Org., 1999 (WHO/NCD/NCS/99.2)
7. Palestinian Central Bureau of Statistics: *Population, Housing and Establishment Census-1997, Final Results, Population Report, Palestinian Territory, First Part.* Ramallah, Palestine, Palestinian Central Bureau of Statistics, 1999
8. Husseini A, Abdul-Rahim H, Awartani F, Jervell J, Bjertness E: Prevalence of diabetes mellitus and impaired glucose tolerance in a rural Palestinian population. *Eastern Mediterranean Health J.* In press
9. Abdul-Rahim HF, Husseini A, Giacaman R, Jervell J, Bjertness E: Diabetes mellitus in an urban Palestinian population: prevalence and associated factors. *Eastern Mediterranean Health J.* In press
10. Dowse GK, Zimmet P: A model protocol for a diabetes and other noncommunicable disease field survey. *World Health Stat Q* 45: 360–369, 1992
11. World Health Organization: *Diabetes Mellitus: Report of a WHO Study Group.* Geneva, World Health Org., 1985 (Tech. Rep. Ser., no. 727)
12. Esteve J, Benhamou E, Raymond L: *Statistical Methods in Cancer Research.* Lyon, France, International Agency for Research on Cancer, 1994
13. Pearson TA: Cardiovascular diseases as a growing problem in developing countries: the role of nutrition in the epidemiologic transition. *Pub Health Rev* 24:131–146, 1996
14. Alwan A: Chronic diseases in the Eastern Mediterranean Region: an overview. In *Diet-Related Non-Communicable Diseases in the Arab Countries of the Gulf.* Musaiger AO, Miladi SS, Eds. Cairo, Egypt, FAO/RNEA, 1996, p. 1–15
15. Liese AD, Mayer-Davis EJ, Haffner SM: Development of the multiple metabolic syndrome: an epidemiologic perspective. *Epidemiol Rev* 20:157–172, 1998
16. World Health Organization: *Obesity: Preventing and Managing the Global Epidemic.* Geneva, World Health Org., 1998 (WHO/NUT/NCD/98.1)
17. Ajlouni K, Jaddou H, Batieha A: Obesity in Jordan. *Int J Obes* 22:624–628, 1998
18. Al-Nuaim AR, Al-Rubeaan K, Al-Mazrou Y, Al-Daghari N, Khoja T: High prevalence of overweight and obesity in Saudi Arabia. *Int J Obes* 20:547–552, 1996

19. Herman WH, Ali MA, Aubert RE, Engelgau MM, Kenny SJ, Gunter EW, Malarcher AM, Brechner RJ, Wetterhall SF, Destefano F, Thompson TJ, Smith PJ, Badran A, Sous ES, Habib M, Hegazy M, abd el Shakour S, Ibrahim AS, el Moneim el Behairy A: Diabetes mellitus in Egypt: risk factors and prevalence. *Diabet Med* 12:1126–1131, 1995
20. Grundy SM: Multifactorial causation of obesity: implications for prevention. *Am J Clin Nutr* 67 (Suppl. 3):563S–572S, 1998
21. Papoz L, Ben Khalifa F, Eschwege E, Ben Ayed H: Diabetes mellitus in Tunisia: description in urban and rural populations. *Int J Epidemiol* 17:419–422, 1988
22. Ugland OF, Tamari S: Aspects of social stratification. In *Palestinian Society in Gaza, West Bank and Arab Jerusalem: A Survey of Living Conditions*. Heiberg M, Øvensen G, Eds. Oslo, Norway, FAFO, 1993, p. 221–246