

ORIGINAL ARTICLE

Prevalence, awareness, treatment and control of hypertension in the Palestinian population

MR Khmour¹, HO Hallak¹, M Shaheen², AS Jarab³ and QN Al-Shahed⁴

We determined the prevalence of hypertension and the level of awareness, treatment and control of hypertension among Palestinian adults in a population-based cross-sectional survey. Two-stage stratified sampling method was used to select 2077 participants from the general population aged 25 years and over. Trained observers obtained two blood pressure (BP) measurements from each individual by the use of a standardized mercury sphygmomanometer after a 5-min sitting rest. Information on sociogeographical factors and antihypertensive medications was obtained using a standard questionnaire. Hypertension was defined as a mean systolic BP (SBP) ≥ 140 mm Hg, diastolic BP (DBP) ≥ 90 mm Hg, and/or use of antihypertensive medications. The overall prevalence of hypertension was 27.6%, with a higher percentage among men (29.2 vs 26.4%; $P = 0.04$). Hypertension increased with age in both men and women. Among hypertensive patients, 51.0% were aware of their elevated BP, 40.2% had treatment and only 9.5% achieved targeted BP control ($< 140/90$ mm Hg). Patients under antihypertensive treatment showed SBP and DBP that were only 3.1 mm Hg and 2.5 mm Hg lower than individuals without antihypertensive treatment, respectively. The data show that hypertension prevalence among Palestinian adults is high, whereas the proportions of awareness treatment and control of hypertension were low. Concerted public health effort is urgently required to improve the detection, treatment and control of hypertension in Palestine.

Journal of Human Hypertension (2013) 27, 623–628; doi:10.1038/jhh.2013.26; published online 11 April 2013

Keywords: hypertension; Palestine; prevalence; control; treatment

INTRODUCTION

Substantial socioeconomic and demographic changes have taken place in countries of the Eastern Mediterranean region over the past two decades. The population of this region has almost doubled, more people are in older age, and the proportion of urban population has been increasing.^{1–4}

Several lines of evidence suggest that hypertension and its complications are a major health problem in Palestine. First, the incidence of blood pressure (BP)-related clinical events such as myocardial infarction, stroke and end-stage renal disease appears to be increasing dramatically. Vital statistics (such as cause-specific mortality and hospitalization discharge diagnoses) along with clinical observations support this notion.⁵ Second, preliminary surveys suggest that the prevalence of hypertension may be as high as 24%.^{6–9}

To the best of our knowledge, this study is the first to present authentic nationwide current data about prevalence, awareness, treatment and control of hypertension among adults in one report. Two surveys of diabetes prevalence, one in a rural community and the other in an urban community, were conducted in 1996 and 1998, respectively;^{10,11} prevalence of components of the metabolic Syndrome was studied in 2001.⁷

In 2011, the Palestinian Hypertension Project was initiated at Al-Quds University. The Palestinian Hypertension Project is a joint project between Al-Quds University and Palestinian Ministry of Health, supported by Palestinian American Research Council. The principal Palestinian Hypertension Project objectives are (1) to estimate the magnitude of hypertension and its levels of

awareness, and control of hypertension in Palestinian adults; (2) to identify environmental factors associated with high BP in Palestine, and (3) to establish an infrastructure for research and education in the prevention and treatment of hypertension, as well as other cardiovascular disease risk factors.

The study herein addressed a number of issues that are relevant to the scientific community, health-care providers and public health in the West Bank, Palestine. These data included namely, national estimates of the prevalence of hypertension, medical utilization, status of hypertension awareness and control in the general adult population.

MATERIALS AND METHODS

A cross-sectional survey was conducted across the West Bank, Palestine. The West Bank, Palestine has a land area of 5640 km² (including East Jerusalem) and an estimated population of 2 274 929 according to the official Palestinian census of 2011.¹²

Palestinian population is quite heterogeneous in terms of its social class, dietary habits and living area (urban versus rural). Such heterogeneity within the Palestinian population underscores the need for surveying representative samples of these groups, and lends itself well to the studies that examine the effect of environmental risk factors on the presence of hypertension and its complications.

Two Palestinian communities in the three main governorate, Nablus (north), Ramallah (Center) and Hebron (south) of the West Bank, one rural and one urban, were surveyed between May 2011 and December 2011. Two-stage stratified sampling method was used to select a nationally representative sample of the general population aged 25 years or over. The sampling process was stratified by site and rural versus urban areas.

¹Faculty of Pharmacy, Al-Quds University, Jerusalem, Palestine; ²Pharm D Program, Birzeit University, Birzeit, West Bank, Palestine; ³Faculty of Pharmacy, Al-Zaytoonah University of Jordan, Amman, Jordan and ⁴Department of Pharmacy, Patient Friends Society/Al-Rahma PolyClinic, Nablus, Palestine. Correspondence: Dr MR Khmour, Faculty of Pharmacy, Al-Quds University, Abu Deis, PO Box 20002, Jerusalem 009722, Palestine.

E-mail: mkhdour@pharm.alquds.edu or maher.khdour@gmail.com

Received 17 September 2012; revised 5 February 2013; accepted 22 February 2013; published online 11 April 2013

Screening for hypertension was carried out at six governmental primary clinics in people aged 25 or over, attending health clinics either as patients or accompanying family members. The health clinics were randomly selected according to their site. Each clinic represented a distinct region of the country: Ramallah primary clinic (Urban, center), Der Qedies primary clinic (Rural, center), Nablus primary clinic (Urban, north), Zababda primary clinic (Rural, north), Hebron primary clinic (Urban, south) and Arab el-ramadin (Rural, south). Eligibility was based on age (≥ 25 years old), and mental and physical ability to participate.

During clinic visits, trained research staff administered a standard questionnaire. Information on demographic characteristics—including age, gender, education, occupation and smoking status was collected. The interview also included questions related to the diagnosis and treatment of hypertension. Information on the awareness of and drug treatment and lifestyle modification for hypertension was obtained.

Two BP measurements were obtained from each participant by trained and certified observers, according to a common protocol adapted from procedures recommended by the American Heart Association.¹³ A standardized mercury sphygmomanometer was used, and one of the three cuff sizes (small, regular or large) was chosen on the basis of the circumference of the participant's arm.¹³ The cuff was placed on the respondent's right arm 2–3 cm above the antecubital fossa. Two BP measurements were taken with an interval of 3 min apart. Respondents were informed of their BP measurements. During field surveys, supervisors conducted weekly checks on compliance with the BP measurement protocol. Hypertension is defined as an average systolic BP (SBP) ≥ 140 mmHg, an average diastolic BP (DBP) ≥ 90 mmHg and/or self-reported current treatment for hypertension with antihypertensive medication. Awareness of hypertension is defined as the self-report of any prior diagnosis of hypertension by a health-care professional. Treatment of hypertension is defined as the use of a prescription medication for management of high BP at the time of interview. Control of hypertension is defined as pharmacological treatment of hypertension associated with an average SBP ≤ 140 mmHg and DBP ≤ 90 mmHg.¹⁴ The distribution of BP levels based on categories established in the Sixth Report of the Joint National Committee on detection, evaluation and treatment of high BP,¹⁵ and WHO-International Society of Hypertension Guidelines for the management of hypertension¹⁶ are presented. These include six BP levels: optimal, normal, high normal, hypertensive grades 1, 2 and 3.

Data were analyzed using SPSS (version 18 for Windows; SPSS Inc, Chicago, IL, USA). Chi-square statistic was used to test for independency of the distribution of both the previously diagnosed and previously undiagnosed hypertensives, and the distribution of both controlled and uncontrolled hypertension among the various categories of study variables. The level of significance was set at P -value ≤ 0.05 . Multiple logistic regression analyses will be performed to test for the independent effect of purported risk factors on hypertension.

RESULTS

Sample characteristics

Characteristics of the sample are summarized in Table 1. The sample comprised 2077 participants, 58% were females subjects. The response rate was 73% for men and 79% for women. A total of 63.8% were from urban areas and the remaining 36.2% from rural areas. The mean age was 40.1 (s.d. 12.1 years) and range from 25 to 92 years. The majority of participants were married (79.2%), most had primary or secondary school education (46.0%). Current smoking among men were higher than women (32.1 vs 5.1%; $P=0.0001$). Overall, 21.3% of the sample had positive family history of hypertension.

Prevalence of hypertension

Overall, 27.6% of the Palestinian adult population aged 25 years and over had hypertension, representing 333 000 individuals (Table 2). The overall prevalence of hypertension was higher among men than among women (29.2 vs 26.4% $P=0.01$). The prevalence of hypertension increased with age in both men and women. Prevalence of hypertension was slightly higher in urban than in rural areas, but the difference was not significant (28.2 and 26.6%, respectively; $P=0.08$). The rate of hypertension among

Table 1. Characteristics of participants ($n=2077$) in a national sample survey of hypertension in West Bank, Palestine (2011)

Variable	Men, n (%)	Women, n (%)
Total	872 (42.0)	1205 (58.0)
Age (years)		
25–44	370 (42.5)	467 (38.8)
45–64	391 (44.8)	562 (46.6)
≥ 65	111 (12.7)	176 (14.6)
Residence		
Urban	560 (64.2)	765 (63.5)
Rural	312 (35.8)	440 (36.5)
Marital status		
Married	707 (81.1)	937 (77.8)
Non-married	165 (18.9)	268 (22.2)
Education		
Illiterate	170 (19.5)	270 (22.4)
Primary and secondary school	391 (44.8)	563 (46.7)
High school and above	311 (35.7)	372 (30.9)
Family history of hypertension		
Absent	681 (78.1)	954 (79.2)
Present	191 (21.9)	251 (20.8)
Smoking status		
Smoker	280 (32.1)	61 (5.1)
Non-smoker	458 (52.5)	1059 (87.9)
Ex-smoker	134 (15.4)	85 (7.0)
Weight status		
Normal	330 (37.8)	398 (33.0)
Overweight	360 (41.2)	523 (43.4)
Obese	182 (21.0)	284 (23.6)

Table 2. Prevalence of hypertension^a in adult population aged 25 years and over in West Bank, Palestine

Age, years	Men, n (%)	Women, n (%)	Total, n (%)
25–44	63 (17.0)	78 (16.7)	141 (16.8)
45–64	134 (34.3)	155 (27.6)	289 (30.3)
≥ 65	58 (52.3)	85 (48.3)	143 (49.8)
Total	255 (29.2)	318 (26.4)	573 (27.6)
Residence			
Urban	167 (29.6)	207 (27.1)	373 (28.2)
Rural	88 (28.2)	112 (25.3)	200 (26.6)
Total	255 (29.2)	318 (26.4)	573 (27.6)

^aSBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg, and/or taking antihypertensive medication.

smokers (29.2%) was higher than that among non-smokers (28.4%). However, this difference was not statistically significant ($P=0.62$).

Awareness, treatment and control of hypertension

Table 3 shows proportions of participants with hypertension who were aware of their hypertensive condition, were being treated with antihypertensive drugs, and who were both treated and controlled. Overall, 51.0% of those with hypertension were aware of their diagnosis, only 40.2% were taking prescribed medication to lower their BP, and only 9.5% achieved BP control. One-third (33.2%) of hypertensives who were being treated, successfully

controlled their BP. More than half of the women were aware of their hypertension, higher than the corresponding value in men (53.8 vs 39.8%, $P=0.01$). The prevalence of treatment and control were higher in women than in men (43.3 vs 36.1%, $P=0.02$, and 35.9 vs 29.3%, $P=0.01$, respectively).

Mean BP values

The gender- and age-specific mean BP levels for the total sample and for three subgroups defined by hypertension status are shown in Table 4. Overall, the mean (\pm s.d.) SBP was 124.7 ± 11.2 mm Hg and the mean DBP was 77.8 ± 8.2 mm Hg. Overall, men had slightly higher SBP and DBP levels than those of women. Both mean SBP and DBP increased with age throughout the entire age range. The mean SBP and DBP for normotensive participants were 24.8 and 12.8 mm Hg lower than the corresponding figures for those with treated hypertension, and 27.9 and 15.3 mm Hg lower than the corresponding figures for those with untreated hypertension, respectively. In contrast, individuals

under antihypertensive treatment showed only SBP 3.1 mm Hg and DBP 2.5 mm Hg lower than corresponding values among individuals without antihypertensive treatment.

Distribution of BP

Table 5 shows the gender- and age-specific estimates of the distribution of BP according to the international classification system outlined above. Overall, 53.2% of men and 61.3% of women had optimal or normal BP (SBP <130 mm Hg and DBP <85 mm Hg), whereas 17.6% of men and 13.1% of women had high normal BP. The prevalence of stages 1, 2 and 3 hypertension was 19.1, 6.8 and 3.3% in men, and 17.1, 5.9 and 2.6% in women, respectively. The proportion of hypertensive men with moderate or severe BP (for example, grade 2 or grade 3 hypertension with BP $\geq 160/100$ mm Hg) increased from 5.8% in patients aged 25–44

Table 3. Percentage of individuals with hypertension who are aware, treated and controlled, and Percentage of treated individuals with hypertension who are controlled in adult population aged ≥ 25 years in West Bank, Palestine

Age, years	Hypertensive			
	Aware	Treated	Controlled ^a	Controlled treated ^b
Men	47.2 (2.1)	36.1 (1.9)	7.6 (2.4)	29.3 (2.1)
25–44	42.1 (3.2)	25.1 (3.6)	8.2 (3.3)	32.1 (4.0)
45–64	49.3 (1.9)	40.2 (3.3)	6.9 (2.8)	28.9 (3.2)
≥ 65	58.2 (3.2)	58.3 (3.8)	7.9 (3.4)	21.5 (2.8)
Women	53.8 (2.4)	43.3 (1.8)	10.8 (1.6)	35.9 (2.4)
25–44	46.9 (3.5)	37.2 (2.1)	12.0 (1.9)	39.2 (3.8)
45–64	53.6 (2.9)	46.1 (2.7)	9.9 (2.2)	34.1 (3.3)
≥ 65	79.1 (2.8)	54.9 (3.1)	9.8 (2.4)	30.7 (2.8)
Total	51.0 (1.6)	40.2 (1.3)	9.5 (1.2)	33.2 (1.8)

Values are % (s.e.).
^aThis is the proportion of hypertensives with SBP >140 mm Hg and DBP >90 mm Hg. ^bThis is the proportion of hypertensives on an antihypertensive medication with systolic BP <140 mm Hg and diastolic BP <90 mm Hg.

Table 5. Percentage distribution of BP levels^a in adult population, aged 25 years and over, in West Bank, Palestine by age and gender

Age, years	Optimal	Normal	High normal	Stage 1	Stage 2	Stage 3
SBP (mm Hg)	> 120	> 130	130–139	140–59	160–179	≥ 180
DBP (mm Hg)	> 80	> 85	85–89	90–99	100–109	≥ 110
Prevalence in the entire population	35.6	22.4	15.2	17.9	6.1	2.8
Men	31.3	21.9	17.6	19.1	6.8	3.3
25–44	41.2	25.6	15.5	11.9	4.9	0.9
45–64	23.1	21.1	19.3	24.3	7.6	4.6
≥ 65	22.2	13.5	18.8	27.8	10.6	7.1
Women	39.3	22	13.1	17.1	5.9	2.6
25–44	50.5	24.1	11.7	9.8	3.4	0.6
45–64	33.4	21.8	16.5	18.3	6.6	3.4
≥ 65	22.1	20.6	18.3	23.4	11.1	4.5

Values are % (s.d.). Rows may not be total 100% because of rounding.
^aBased on categories established in the sixth report of the Joint National Committee on Detection, Evaluation and treatment of high blood pressure. # prevalence in the entire population.

Table 4. Mean (s.d.) of SBP and DBP (mm Hg) in a Palestinian adult population aged ≥ 25 years, by age and sex

Age, years	Normotensive		Treated hypertensive		Untreated hypertensive		Mean BP in the entire population ^a	
	SBP	DBP	SBP	DBP	SBP	DBP	SBP	DBP
Total	121.4 (9.0)	75.9 (6.7)	146.2 (8.8)	88.7 (6.7)	149.3 (9.8)	91.2 (6.4)	124.7 (11.2)	77.8 (8.2)
25–44	118.1 (10.4)	75.9 (8.8)	145.0 (12.1)	87.8 (7.6)	147.2 (10.3)	92.2 (7.7)	120.5 (10.7)	76.7 (7.8)
45–64	122.7 (10.1)	76.7 (6.7)	147.1 (10.3)	90.1 (6.4)	149.2 (11.1)	91.5 (8.0)	126.2 (11.3)	78.7 (9.0)
≥ 65	126.7 (9.2)	73.2 (8.8)	152.3 (10.8)	88.9 (9.0)	156.1 (10.3)	90.2 (8.2)	138.0 (10.9)	78.8 (6.9)
Men	124.6 (9.9)	77.1 (7.5)	147.8 (10.0)	89.9 (6.6)	149.9 (9.9)	92.2 (7.5)	126.8 (8.5)	79.9 (7.1)
25–44	120.2 (11.1)	76.1 (8.7)	145.8 (10.6)	88.9 (7.8)	147.9 (11.4)	92.9 (7.8)	121.4 (10.5)	78.8 (8.1)
45–64	127.3 (12.1)	78.7 (7.9)	148.7 (11.2)	90.6 (9.4)	150.2 (10.8)	92.7 (8.9)	129.7 (11.0)	80.1 (9.0)
≥ 65	129.1 (10.8)	76.6 (9.5)	153.5 (10.5)	90.5 (9.0)	156.1 (10.9)	88.5 (8.8)	137.7 (10.9)	79.0 (7.8)
Women	119.1 (9.4)	75.1 (7.8)	145.0 (9.2)	87.8 (9.1)	148.8 (8.7)	90.1 (6.9)	123.2 (9.3)	75.6 (7.6)
25–44	116.8 (10.6)	74.3 (9.8)	143.1 (10.1)	86.9 (9.2)	146.3 (9.9)	92.4 (7.9)	119.4 (10.9)	75.1 (8.2)
44–64	119.5 (11.2)	75.9 (7.9)	146.0 (11.1)	88.9 (8.7)	149.6 (11.3)	91.3 (8.4)	124.8 (10.1)	76.5 (8.0)
≥ 65	124.0 (10.7)	74.8 (9.1)	151.5 (10.9)	86.8 (9.3)	155.5 (10.4)	89.3 (7.0)	132.3 (11.4)	79.6 (8.1)

Abbreviations: DBP, diastolic blood pressure; SBP, systolic blood pressure Values are mean (s.d.).
^aMean BP levels in the entire population age 25 + (irrespective of treatment status), and according to age and gender.

Table 6. Multiple logistic regression showing factors associated with prevalence of hypertension in Palestinian population, by sex

Variables	Males		Females	
	OR (95% CI) ^a	P-value	OR (95% CI) ^a	P-value
Age group				
25–44	1:00		1:00	
45–64	2:34 (1.10–5.56)	0.001	2.13 (0.98–3.36)	0.001
≥65	3.61 (1.27–8.10)	0.001	3.21 (1.1–1.44)	0.001
Residence				
Rural	1:00		1:00	
Urban	1.11 (0.86–1.58)	0.10	1.23 (0.91–1.48)	0.12
Marital status				
Married	1:00		1:00	
Non-married	0.95 (0.79–1.44)	0.43	1.1 (0.88–1.58)	0.62
Family history				
Absent	1:00		1:00	
Present	1.82 (1.10–2.23)	0.001	2.13 (1.70–3.00)	0.001
Education				
Illiterate	1:00		1:00	
Primary and secondary school	1.22 (0.99–1.77)	0.10	1.12 (0.87–1.23)	0.10
High school and above	1.43 (1.13–1.91)	0.08	1.32 (0.71–1.2)	0.07
Weight status				
Normal	1:00		1:00	
Overweight	2.20 (1.64–3.42)	0.001	3.11 (1.99–3.66)	0.001
Obese	2.99 (1.17–4.37)	0.001	3.51 (2.10–4.81)	0.001

Abbreviations: CI, confidence interval; OR, odds ratio.

^aOR, adjusted for age, sex, urban/rural.

years to 12.2% in patients over 44–64 years. The proportion of women with grades 2–3 hypertension remained lower in the same age groups.

Factors associated with hypertension prevalence

Multivariable logistic models were constructed to further analyze the association of hypertension and sociogeographical factors separately among men and women. Any variables identified as tending to significance during the univariable analysis were included in the multivariable logistic regression analysis. After adjustment for age, sex and residency (urban/rural), the odds for hypertension increased with age and were statistically higher in all age groups compared with the 25–44 age group. As shown in Table 6, having family histories of hypertension, being overweight or obese were significantly associated with hypertension for both men and women. The association between hypertension and variables of residency, education and marital status was found to be not significant.

DISCUSSION

The present study provides the first data on the distribution of hypertension in West Bank, Palestine that have experienced a rapid cultural transition during the last three decades. This study was conducted in a representative sample of the Palestinian adult population using standard protocols and instruments with strong quality control procedures for measurement of BP, and collection of a wide array of sociogeographical characteristics to ensure the quality of the data collection.

This study found that hypertension affects more than a quarter of the adult population, amounting to ~3 33 000 people. A similar pattern was reported from other developed and developing countries.^{17–23} This shows that the global burden of hypertension is considerable, and it appears to be increasing, which is a cause for concern for health and other concerned authorities. This requires an urgent intervention plan. This study showed the significant relation of hypertension with advancing age in both sexes in agreement with international studies.^{24,25} Approximately 41% of individuals above the age of 60 years suffer from hypertension. This indicates the degenerative aging process, resulting in thickening and loss of elasticity of arteries, which is a contributing factor for high BP.²⁶

The higher prevalence of hypertension in men than women in this study appears to be in agreement with some national and regional studies.^{17,20,21} Overall, worldwide prevalence of hypertension, however, showed no significant gender difference.²⁶ Reported gender differences may result from biological differences, but they may be due to other sociodemographic, comorbidity and obesity confounding effect.

Our findings showed the prevalence of hypertension was slightly higher in urban than in rural areas, but the difference was not significant. The central region is highly urbanized, industrialized and developed compared with the southern and northern regions. Geographical variations in the prevalence of hypertension were reported by many studies in different regions of the world.^{17,27–29} These regional variations in BP may also be related to variation in socioeconomic, demographic and dietary characteristics, in addition to the geographical ones.

The percentage of awareness, treatment and control of hypertension is low in the Palestinian adult population. Approximately 51% of the hypertensive patients were aware of their disease at the time of the survey in agreement with a previous study.³⁰ Higher awareness of hypertension in this study was significantly more among females, older people and residents of urban region. In other countries, a quarter to more than half of hypertensives were unaware of their disease, and in some developing countries a devastating 85% unawareness rate was reported.^{31–34}

In general, the present study found that control of hypertension is limited to one-third (33.2%) among the individuals ever diagnosed with the condition. Control of hypertension is significantly higher among women rather than men, among the residents of urban rather than those of rural areas, and it increases with age. These may be the expected findings, as younger individuals usually suffer less comorbidity, which may facilitate hypertension control. Female subjects may be more concerned with their health status. Even more problematic, this study found practically no difference in mean BP between treated and untreated hypertensives. Individuals under antihypertensive treatment showed only SBP 3.1 mm Hg and DBP 2.5 mm Hg lower than corresponding values among untreated hypertensives. In contrast, US survey³⁵ had found 9/5 mm Hg reduction in mean BP on treatment overall, and the difference found in a Belgian survey was 12/13 mm Hg.³⁶

Consistent with the findings of other studies, our data showed a higher rate of hypertension among subjects with positive family history of this disease than their counterparts. Havlik³⁷ in his review concluded that about one-third to one-half of the variability in BP is explained by genetics. In agreement with other studies,^{2,13–15} the obese group appeared to have a higher risk of hypertension than the non-obese group, after adjusting for other potential cofounders. Inconsistent with the finding of other studies, our data failed to show a significant relationship between hypertension and living area (urban/rural) and education level. It is important to note though that being non-significant does not necessarily mean that the relationship does not exist. It could be the case that our sample sizes did not have enough power to detect some relationships.

These observations should encourage the development of national campaigns in order to increase public awareness, and should alert the health planners to start prevention programs and improve physicians' education and training. In countries with national health programs effectuated for cardiovascular risk reduction, the level of BP awareness has much improved, rising to 66% in United Kingdom³⁸ or 76% in United States,³⁹ and attesting the success of a coordinated policy for high BP detection.

Limitations

The diagnostic criteria recommended by the Joint National Committee 12 required BP measurements at two or more subsequent visits after an initial screen. It is clearly difficult to use such criteria to diagnose hypertension in large population surveys. Therefore, the prevalence of hypertension in this survey may have been overestimated. In addition, the percentage of treated hypertensives whos' BP were controlled may be underestimated.

CONCLUSION

The present study found that hypertension affects more than a quarter of the adult population, less than half of them were unaware of their disease and only one-third of those under drug treatment were controlled, as judged by their BP measurement of <140/90 mm Hg. Despite the availability of a large number of effective and well-tolerated antihypertensive drugs and other modalities, BP control rates are not satisfactory on a national and global scale.

The high prevalence of hypertension coupled with low proportions of awareness, treatment and control has important implications for public health staff, physicians, health-care providers and health policy decision makers in Palestine. Health-care provider should start comprehensive programs to increase public awareness and to combat the hypertension problem. Special attention will be given to groups most affected and those least aware or treated.

What is known about the topic

- Global burden of hypertension is considerable, and it appears to be increasing, which is a cause for concern for health and other concerned authorities.

What this study adds

- Only one-half of the hypertensives were aware of their disease at the time of the survey.
- Awareness of hypertension were more associated with females, older people and residents of urban region.
- The percentage of treatment and control of hypertension is low in the Palestinian adult population.
- Efforts to combat the hypertension problem should be comprehensive, including all sectors of the community.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

Technical and financial support for this study was made available by the Palestinian American Research Council. We also wish to thank Dr Asa'd Ramlawi, Head of the primary care department at the Palestinian Ministry of Health for his support. This project is Funded by the Palestinian American Research Council.

REFERENCES

- 1 Khosh-Chashm K. The impact of urbanization on health in the countries of the Eastern Mediterranean region. *Eastern Mediterranean Health J* 1998; **4**: S137–S148.
- 2 Hammoud El. Changing demographic and vital statistics patterns in the region during the past 50 years. *Eastern Mediterranean Health J* 1998; **4**: S58–S65.
- 3 Alwan A. Cardiovascular disease in the Eastern Mediterranean region. *World Health Stat Q* 1993; **46**: 97–100.
- 4 Nissenen A, Bothig S, Granroth H, Lopez A. Hypertension in developing countries. *World Health Stat Q* 1988; **41**: 141–154.
- 5 Abdul-Rahim H, Abu-Rmeileh N, Husseini A, Holmboe-Ottesen G, Jervell J, Bjertness E. Obesity and selected co-morbidities in an urban Palestinian population. *Int J Obes Relat Metab Disord* 2001; **25**(11): 1736–1740.
- 6 Health Survey—2000: main findings. Ramallah (PS): Palestinian Central Bureau of Statistics 2000.
- 7 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**(2): 275–279.
- 8 Berlowitz DR, Ash AS, Hickey EC, Friedman RH, Kader B, Moskowitz MA. Outcomes of hypertension care: simple measures are not that simple. *Med Care* 1997; **35**: 742–746.
- 9 Whelton PK, Gu D, Wu X, Wenqi G, Muntner P. Factors associated with hypertension awareness, treatment, and control in a representative sample of the Chinese population. *Hypertens* 2004; **43**: 578–585.
- 10 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* 2000; **6**(5–6): 1039–1045.
- 11 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* 2001; **7**(1–2): 67–78.
- 12 Demographic Distribution in Palestine. Palestinian Central Bureau of Statistics. *Health Statistics* 2007. http://www.pCBS.gov.ps/Portals/_pCBS/PressRelease/census2007_e.pdf.
- 13 Perloff D, Grim C, Flack J, Frohlich ED, Hill M, McDonald M *et al*. Human blood pressure determination by sphygmomanometry. *Circulation* 1993; **88**(1): 2460–2470.
- 14 The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure 2004.
- 15 Joint National Committee. The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Arch Intern Med* 1997; **157**(21): 2413–2446.
- 16 World Health Organization-International Society of Hypertension Guidelines for the Management of Hypertension. Guidelines Subcommittee. *J Hypertens* 1999; **17**(2): 151–183.
- 17 Al-Nozha M, Abdullah M, Arafah R, Khalil MZ, Khan NB, Al-Mazrou YY *et al*. Hypertension in Saudi Arabia. *Saudi Med J* 2007; **28**(1): 77–84.
- 18 Kamadjeu RM, Edwards R, Atanga JS, Unwin N, Kiawi EC, Mbanya JC. Prevalence, awareness and management of hypertension in Cameroon: findings of the 2003 Cameroon Burden of Diabetes Baseline Survey. *J Hum Hypertens* 2006; **20**(1): 91–92.
- 19 Ibrahim M, Rizk H, Appel L, el Aroussy W, Helmy S, Sharaf Y *et al*. Hypertension prevalence, awareness, treatment, and control in Egypt. Results from the Egyptian National Hypertension Project (NHP). *Hypertension* 1995; **26**(6): 886–890.
- 20 Erem C, Hacıhasanoğlu A, Kocak M, Deger O, Topbas M. Prevalence of pre-hypertension and hypertension and associated risk factors among Turkish adults: Trabzon Hypertension Study. *J Public Health* 2009; **31**(1): 47–58.
- 21 Son PT, Quang N, Viet NL, Khai PG, Wall S, Weinehall L *et al*. Prevalence, awareness, treatment and control of hypertension in Vietnam—results from a national survey. *J Hum Hypertens* 2012; **26**: 268–280.
- 22 Ordunez-Garcia PO, Espinosa-Brito AD, Cooper RS, Kaufman JS, Nieto FJ. Hypertension in Cuba: evidence of a narrow black-white difference. *J Hum Hypertens* 1998; **12**(2): 111–116.
- 23 Gupta PC, Gupta R, Pednekar MS. Hypertension prevalence and blood pressure trends in 88 653 subjects in Mumbai, India. *J Hum Hypertens* 2004; **18**(12): 907–910.
- 24 Degli Esposti E, Di Martino M, Sturani A, Russo P, Dradi C, Falcinelli S *et al*. Risk factors for uncontrolled hypertension in Italy. *J Hum Hypertens* 2004; **18**(3): 207–213.
- 25 Van Minh H, Byass P, Chuc K, Wall S. Gender differences in prevalence and socioeconomic determinants of hypertension: findings from the WHO STEPS survey in a rural community of Vietnam. *J Hum Hypertens* 2006; **20**(2): 109–115.
- 26 Kearney P, Whelton M, Reynolds K, Muntner P, Whelton K, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005; **365**(9455): 217–223.
- 27 Kershaw K, Diez Roux A, Carnethon M, Darwin C, Goff Jr DC, Post W *et al*. Geographic variation in hypertension prevalence among blacks and whites: the multi-ethnic study of atherosclerosis. *Am J Hypertens* 2010; **23**(1): 46–53.

- 28 Reynolds K, Dongfengb G, Muntner P, Wu X, Chen J, Huang G *et al*. Geographic variations in the prevalence, awareness, treatment and control of hypertension in China. *J Hypertens* 2003; **21**(7): 1273–1281.
- 29 Rampal L, Rampal S, Azhar M, Rahman A. Prevalence, awareness, treatment and control of hypertension in Malaysia: a national study of 16,440 subjects. *Public Health* 2008; **122**(1): 11–18.
- 30 Alsuwaida A, Alghonaim M. Gender disparities in the awareness and control of hypertension. *Clin Exp Hypertens* 2011; **33**(5): 354–357.
- 31 Meng X, Dong G, Wang D, Liu M, Lin Q, Tian S *et al*. Prevalence, awareness, treatment, control, and risk factors associated with hypertension in urban adults from 33 communities of China: the CHPSNE study. *J Hypertens* 2011; **29**(7): 1303–1310.
- 32 Psaltopoulou T, Orfanos P, Naska A, Lenas D, Trichopoulos D, Trichopoulou A. Prevalence, awareness, treatment and control of hypertension in a general population sample of 26,913 adults in the Greek EPIC study. *Int J Epidemiol* 2004; **33**(6): 1345–1352.
- 33 Egan Zhao Y, Axon R. US trends in prevalence, awareness, treatment, and control of hypertension, 1988–2008. *J Am Med Assoc* 2010; **303**(20): 2043–2050.
- 34 Ostchega Y, Hughes P, Wright J, McDowell M, Louis T. Are demographic characteristics, health care access and utilization, and comorbid conditions associated with hypertension among US adults? *Am J Hypertens* 2008; **21**(2): 159–165.
- 35 Burt VL, Whelton P, Roccella EJ, Brown C, Cutler JA, Higgins M *et al*. Prevalence of hypertension in the US adult population: results from the Third National Health and Nutrition Examination Survey, 1988–1991. *Hypertension* 1995; **25**: 305–313.
- 36 Henauw SD, Bacquer DD, Fonteyne W, Stam M, Kornitzer M, Backer GD. Trends in the prevalence, detection, treatment and control of arterial hypertension in the Belgian adult population. *J Hypertens* 1998; **16**: 277–284.
- 37 Havlik RJ. Predictors of hypertension. Population studies. *Am J Hypertens* 1991; **4**: 5865–5895.
- 38 Falaschetti E, Chaudhury M, Mindell J, Poulter N. Continued improvement in hypertension management in England: results from the health survey for England 2006. *Hypertension* 2009; **53**(3): 480–486.
- 39 Cheung B, Ong K, Man Y, Lam K, Lau C. Prevalence, awareness, treatment, and control of hypertension: United States National Health and Nutrition Examination Survey 2001–2002. *J Clin Hypertens* 2006; **8**(2): 93–98.