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Determinants of Poor Blood Pressure Control in Hypertensive Patients: Findings from the Baseline Survey in West Bank, Palestine

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ABSTRACT

Hypertension remains poorly controlled in Palestine. Improvement of its management will require an understanding of the patient characteristics and treatment factors associated with uncontrolled hypertension. A cross-sectional analysis using data from prevalence of hypertension study in West Bank (N=2077) using two-stage stratified sampling method. We studied antihypertensive medication use, comorbidity, and blood pressure measurements for 573 hypertensive patients in 3 different primary care settings across Palestine. We concomitantly conducted comprehensive patient interviews covering demographic and clinical factors. Mean age of the patients was 57.5 ± SD 9.7 years. The mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 149±12 mm Hg and 91.2±9 mm Hg (respectively). Only 33.2% (190/573) of patients had mean blood pressure < 140/90 mm Hg during the study period. Those who are "uncontrolled" had high systolic blood pressure rather than diastolic pressure (59 vs 41%; P<0.01). 60% of uncontrolled hypertension found to be non-adherent to their drug regimen, 28% experience adverse effects and 56% were found to be on monotherapy. There was no statistically significant in difference in sex distribution, marital status and educational level between controlled and uncontrolled hypertension. Multivariate analysis revealed several independent predictors of poor hypertension control; being on monotherapy regimen [OR=2.14, 95% CI 1.51-2.59], being obese BMI >25 [OR=1.80, 95% CI 1.44-2.46], being non adherence to antihypertensive drugs [OR=2.67, 95% CI 2.34-3.11] and older age > 65 [OR=2.12, 95% CI1.78-2.86]. Hypertension remains poorly controlled in clinical Practice in West Bank. Physicians should aggressively treat elevated systolic BP. A number of factors contribute to poor control of hypertension including Non-adherence to drug regimens, frustration with treatment and obesity. Further identification of patients at risk of poor control can lead to targeted interventions to improve management.

Keywords: Hypertension, Palestine, Risk Factors, Pharmacists.

BACKGROUND

High blood pressure (BP), including pre-hypertension, is a major global health economic issue, accounting for about half of the total cases of stroke and ischemic heart disease. It is responsible for about 7.6 million deaths each year and costs over 92 million disability-adjusted life years, both of which represent 13.5 and 6.0% of the respective global total in the year 2001 (1-2). The risk factors of uncontrolled hypertension are well documented; these include clinical events such as myocardial infarction, stroke and end-stage renal disease. Recent studies sug gest that hypertension and its complications constitute a health issue in Palestine. Studies that evaluated cause-specific mortality and hospitalization discharge diagnoses as well as clinical observation support such observation (3-6). Despite proven benefits of anti-hypertensive drugs in reducing blood pressure and events such as stroke and coronary heart disease (7-11), the problem of uncontrolled hypertension is enormous. Data in the literature suggested that 79% of people with hypertension do not have their blood pressure under control (12). The Third National Health and Nutrition Survey in the United States showed that only 14-25% of treated hypertensive adults had achieved effective blood pressure control of <140/90 mmHg (13].In Palestine, the most recent data on hypertension by the Palestinian Hypertension Project (PHP) showed a prevalence rate of 27.6% (14). The Palestinian Hypertension Project is a joint project between Al-Quds University and Palestinian Ministry of Health, supported by Palestinian American Research Council (PARC). The percentage of blood pressure control in Palestine was ranging from 27% - 40% in different primary care centers (14), which can be improved by pharmacological means and modifications of life style (15). The study evaluated the role of socio-economic factors including age in control of blood pressure. In addition, the study measured patient awareness of desired target blood pressure and importance of blood pressure control. These points were not as extensively examined in Palestine by other studies (16). Second, the relationship between comorbidity and blood pressure control were explored. Third, the relationship between perceived adverse drug effects and influence blood pressure control were explored, because patients with side effects may be less likely to take their medications as directed (17).

METHODS

STUDY PARTICIPANTS

The study design was a cross-sectional survey conducted in the West Bank, Palestine. The estimated population of the West Bank is slightly more than 2 million and has a land area of 5640 km^2 (including East Jerusalem) according to the official Palestinian census of 2011(18). Quite a bit of heterogeneous can be found in the Palestinian population in terms of social classes, dietary habits and living area (urban versus rural). Such heterogeneity underscores the need to survey representative samples of these groups, and provides an opportunity to examine the effect of environmental risk factors on the risk of hypertension and related complications. Three main governorates, Nablus (north), Ramallah (center) and Hebron (south) of the West Bank, were evaluated with one rural and one urban Palestinian community in each, between May 2011 and December 2011.Two-stage stratified sampling method was used to select a representative sample of the population aged 25 years or over. Sample stratification was by site and rural versus urban areas. Screening for hypertension was conducted at six government primary health clinics for either patients or accompanying family members. The study was approved and funded by clinical research committee at Al-Quds University and by the Palestinian American Research Council committee. The researchers explained the nature and purpose of the study, and obtained consent from those who were willing to participate. Respondents were assured of the anonymity and confidentiality of the study and their right not to participate or withdraw from the study at any time.

DATA COLLECTION

During clinic visits, a standard questionnaire was administered by trained research staff. Demographic information including age, gender, education, occupation, and smoking status was collected. In addition, the questionnaire also included questions about diagnosis and treatment of hypertension. Information was collected on disease awareness, drug treatment and lifestyle modification to manage hypertension. Each participant had two BP measurements by trained and certified observers, according to protocol adapted from procedures recommended by the American Heart Association (AHA) (19]. The two BP measurements were taken with an interval of 3 min apart. Respondents were informed of their BP measurements. 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. The cuff was placed on the respondent's right arm 2–3 cm above the antecubital fossa. The research supervisors conducted weekly checks on compliance with BP measurement protocol. A subject was considered hypertensive if: average SBP ≥140mmHg, or average DBP ≥ 90mmHg and/or if patient self-reported treatment for hypertension with antihypertensive medication. Control of hypertension is defined as pharmacological treatment of hypertension associated with an average SBP <140mmHg and DBP <90mmHg. Treatment of hypertension is defined as the use of a prescription medication for management of high BP at the time of interview (20).

Adherence to antihypertensive drugs was measured by Morisky scale. The Morisky scale is a valid self-report adherence measure with four questions about common barriers to adherence (21); 1) Do you ever forget to take your prescription drugs? 2) Are you careless at times about taking your drugs? 3) Do you sometimes stop taking your drugs when you feel better? 4) Do you sometimes stop taking your drugs if they make you feel worse? All patients who answered "yes" to at least two of the four questions were classified as non adherent.

Data were collected and analyzed using the statistical package for social sciences (SPSS) version 17. The chi -square test was used to compare categorical variables like non-adherent, education level and smoking status in the two groups of controlled and uncontrolled hypertensives. Univariate associations were tested by placing each variable into a separate proportional odds model. For categorical variables, referent variables were created.

The proportional odds assumption was not violated for any variables on univariate analysis at a P value ≤0.05. Variables that were associated with the above-defined outcomes at a P value <0.2 were entered into the multivariate model. Variables with a P value ≤0.05 were kept in the final multivariate model, as were gender and site of care. We also examined interaction terms for potential entry into the model.

RESULTS

The study data indicates that 27.6% (573/2077) of Palestinian adult population aged 25 years and over had hypertension (Table 1, Ref 14). The prevalence of hypertension increased with age in both men and women. Prevalence of hypertension was higher among men than among women (29.2 vs 26.4% although the difference was not significant (P>0.05). 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 Mean age of hypertensive patients was 57.5 ± 9.7 years. The mean systolic blood pressure was 149 ± SD12 mm Hg while the mean diastolic blood pressure was 91.2 ± SD 9 mm Hg. Only 33.2% (190/573) of patients had mean blood pressure < 140/90 mm Hg (i.e. controlled hypertension).

Table (1): Prevalence of hypertension* in adult population, aged 25 years and over in West-Bank, Palestine.

Age (year)	Men n (%)	Women n (%)	Total n (%)
25-44	(17.0) 63	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)***

* Ref. 14

The characteristics' of controlled and uncontrolled hypertensives were summarized in Table 2. There were no significant differences between controlled and uncontrolled hypertensives in sex distribution, marital status, occupational status, educational level and cigarette smoking. On univariate analysis, we found the following characteristics to be associated with poor blood pressure control (Table 3): older age > 65 years, being on monotherapy for hypertension, being overweight or obese, lack of knowledge of appropriate target BP, and experience of an adverse effect of an antihypertensive medication.

Table (2): Distribution of controlled (CH) and uncontrolled hypertension (UCH) among previously diagnosed hypertensive subjects by selected variables (N=573).

Variable	CH n (%)	UCH n (%)
Total	190 (33.2)	383 (66.8)
Gender		
Male	101(53.2)	210(54.8)
Female	89(46.8)	173(45.2)
Age (Years)		
25-44	48(25.3)	43(11.2)
45-64	90(47.4)	217(56.7)
≥ 65	52(27.3)	123(32.1)
Residence		
Urban	121(63.7)	239(62.4)
Rural	69(36.3)	(36.5)
Marital Status		
Single	41(21.6)	50(13.0)
Married	130(68.4)	268(70.0)
Widowed	19(10.0)	65(17.0
Number of Medications		
0	11(5.8)	55(14.4)
1	115(60.5)	190(49.6)
2	55(28.9)	90(23.5)
≥3	9(4.7)	48(12.5)
Education		
Illiterate	22(11.6)	73(19.0)
Primary and secondary school	92(48.4)	199(52.0)
High school and above	76(40.0)	111(29.0)
Weight status		
Normal (18.5≤ BMI <23)	75(39.5)	90(23.5)
Overweight (23≤BMI<25)	100(52.6)	218(56.9)
Obese (BMI≥25)	15(7.9)	75(19.6)
Co-morbidity*	98(51.6)	171(44.6)
Reported side effects attributed to antihypertensive medication	33(17.4)	111(29.0)
Lack of knowledge of target BP	84(44.2)	190(49.6)
On monotherapy for hypertension	88(46.3)	157(40.9)

*These included other cardiovascular diseases; Angina, Myocardial Infarction Heart Failure and stroke

Table (3): Univariate Predictors of Poor Blood Pressure Control*

Variable	Odds of Poor control	95% Confidence Intervals
Gender		
Male	1.66	1.19-2.36
Female	Reference	
Age (Years)		
25-44	Reference	
45-64	1.53	1.19-1.83
≥ 65	2.33	1.29-3.88
Residence		
Urban	0.92	0.57-1.44
Rural	Reference	
Marital Status		
Single	1.08	0.89-1.28
Married	Reference	
Widowed	1.3	0.99-1.67
Education		
Illiterate	0.98	0.67-1.19
Primary and secondary school	Reference	
High school and above	0.78	0.51-0.99
Weight status		
Normal (18.5≤ BMI <23)	Reference	
Overweight (23≤BMI<25)	1.64	1.23-1.88
Obese (BMI≥25)	2.75	2.31-3.14
Adherence to antihypertensive drugs		
Adherent	Reference	
Non-Adherent	2.91	2.67-3.14
Co-morbidity	0.78	0.43-1.18
Reported side effects attributed to antihypertensive medication	1.88	1.23-2.34
Lack of knowledge of target blood pressure	1.67	1.29-2.24
On monotherapy for hypertension	2.19	1.89-2.92

With construction of a multivariate model as described above, we found the following factors to be significantly and independently associated with poor blood pressure control after adjusting for all other significant predictors: being on monotherapy regimen [OR=2.14, 95% CI 1.51-2.59], being obese BMI >25 [OR=1.80, 95% CI 1.44-2.46], being non adherence to antihypertensive drugs [OR=2.67, 95% CI 2.34-3.11], older age > 65 [OR=2.12, 95% CI1.78-2.86]

Table (4): Multivariate Model of Poor Blood Pressure Control*

Variable	Odds of Poor control	95% Confidence Intervals
Age (Years)		
25-44	Reference	
45-64	1.2	0.89-1.44
≥ 65	2.12	1.78-2.86
Number of Medications		
0	0.76	0.59-0.96
1	Reference	
2	1.98	1.61-2.34
≥3	2.77	2.14-3.10
Weight status		
Normal (18.5≤ BMI <23)	Reference	
Overweight (23≤BMI<25)	1.14	0.98-1.33
Obese (BMI≥25)	1.80	1.44-2.16
Adherence to antihypertensive drugs		
Adherent	Reference	
Non-Adherent	2.67	2.34-3.11
Co-morbidity	0.66	0.42-0.99
Reported side effects attributed to antihypertensive medication	1.67	1.29-1.97
Lack of knowledge of target BP	1.21	1.11-1.87
On Monotherapy for hypertension	2.14	1.51-2.59

*The odds ratio represents the likelihood of being in a higher blood pressure category. The model is adjusted for gender

DISCUSSION

Hypertension is the most common and most important risk factor for cardiovascular disease (22-25). Improved control of hypertension, in turn, has contributed to reductions in the incidence rates of stroke and ischemic heart disease (26). Despite improvements in the control of hypertension, there is evidence that considerable numbers of people still have uncontrolled high blood pressure (27-28). Because morbidity and mortality are reduced in proportion to BP reduction, it is important to identify the major causes of failure to control hypertension.

Only a small fraction (33.2%) of the 573 hypertensive patients evaluated had mean blood pressure less than 140/90 mm Hg, despite ongoing medical treatment. The fact that the majority of the hypertensive patients had SBP higher than recommended is a strong predictor of cardiovascular disease with advancing age (29). Older age > 65 years was associated with poorer blood pressure control relative to that seen in younger treated patients. Despite the proven benefits of antihypertensive therapy in this age group, older patients are still treated less aggressively compared with younger patients (29). The clinical benefits of treating systolic hypertension in older patients have been demonstrated in several randomized placebo controlled trials (28-30).

Another risk factor for poor blood pressure control was the lack of knowledge of appropriate SBP in the univariate analysis. Patients were significantly more likely to have a higher mean blood pressure if they indicated in the interview that they were not aware that their target SBP should be <140 mm Hg. Such patients may be less likely to see their physician if their blood pressure was outside the ideal range, take their medication or adopt healthy lifestyle changes. In some controlled trials, educational interventions have been shown to be effective in improving blood pressure control (30). Educational interventions have also been shown to improve compliance with blood pressure medication.

Like other economically developing countries, the health care system in Palestine faces a financial challenge. Although national and international guidelines require blood pressure to be measured during all outpatient visits, it is still very common that no blood pressure check-up is performed, especially in rural area. In addition, community-based blood pressure screening and education programs are uncommon in Palestine. Furthermore, clinicians are still used to treat only patients with blood pressure 160/95 mm Hg. Our findings highlight the need for developing a national high blood pressure education program to coordinate the effort of detection, prevention, and treatment of hypertension in Palestine.

The relationship between the number of antihypertensive drugs used during the study period and blood pressure control was studied. The active mechanism of blood pressure-lowering drugs varies from agent to agent and can be additive when combined appropriately. Unfortunately, combination therapy is used infrequently in the management of patients with hypertension. The current approach begins with lifestyle modifications and monotherapy. Although a single drug approach is ineffective in many patients, often the treatment regimen is not modified, leading to inadequate control of blood pressure. Combination multidrug therapy usually provides greater success at lowering blood pressure and provides a better side-effect profile with smaller drug doses than is possible with monotherapy.

Another potentially important observation was the relationship between poor blood pressure control and adverse events attributed to antihypertensive medications. In this study some patients on Angiotensin Converting Enzyme Inhibitors (ACEI) or calcium channel blockers for hypertension were more like to adhere to therapy than patients prescribed other antihypertensive drugs possibly because the former medications may have fewer side effects.

We found an association between non-adherence and poor control of hypertension, which supports the findings of earlier studies (31-32). It has been shown that adherence decreases with an increasing number of daily doses (33). Adherence improving strategies are needed. This population of non-adherent and uncontrolled hypertensives formed about 29.4% of our subjects and would be an ideal target for health education. Information about hypertension and its treatment is an important way to increase patients' motivation and understanding. It may be that patients with different levels of education have certain types of reaction at the different stages of the disease and treatment concerning adherence. This possible interaction should also be taken into consideration in future studies (34).

The results of this study showed a strong correlation between poor hypertension control and obesity; BMI>25. Previous population-based studies suggest that the probability of insufficient blood pressure control in obese patients is about 50% higher than in hypertensive patients with normal weight. Around 50% of overweight and obese patients have been reported to be hypertensive, the prevalence of hypertension increases further with higher grades of obesity (35). Similarly, almost 70% of hypertensive patients have been reported to be overweight, with more than 30% being obese (36-39).

Poor control of obesity hypertension may be related to its complex pathophysiologic effects on renal function and morphology. Obesity increases renal sodium reabsorption and impairs pressure natriuresis by activation of the renin-angiotensin and sympathetic nervous systems and by altered intrarenal physical forces (40)

Patients with substantial comorbidity, especially when blood pressure is a contributing factor, might be more likely to have better blood pressure control because the impact of hypertension would be more apparent to them compared with those with asymptomatic hypertension and no comorbidity. However, in this study the co-morbidity contributing Non-significantly to poor control of hypertension.

Several limitations of this study deserve mention. Specifically, BP was measured 3 times following a standard protocol during only a single visit. According to both World Health Organization and National Institute of Health guidelines, hypertension should be defined based on the average of at least 2 or more BP readings taken at 2 or more visits after an initial screening. Another limitation of the current study was the cross-sectional study design and was confined to adults who were 25 to 74 years old. The simple four questions method for quantitating medication compliance has potential shortcomings. Therefore better methods for detection of poor compliance need to be developed such as the use of electronic devices. Also only the goal SBP reading <140 or DBP < 90 consider controlled hypertension regardless the presence co-morbidity.

CONCLUSION

Data provide further evidence that poor blood pressure control is common in a variety of health care settings, and that patients at particular risk of poor control can be identified. We recommend targeted interventions to improve management in such patients which could make a substantial difference in stemming the epidemic of poorly controlled hypertension in Palestine.

Abbreviations

AHA: American Heart Association; ACEI: Angiotensin Converting Enzyme Inhibitors; BMI: Body mass index; BP: Blood Pressure; CI: Confidence interval; DBP: Diastolic blood pressure; OR: Odds Ratio; PARC: Palestinian American Research Council; PHP: Palestinian Hypertension Project; SBP: Systolic blood pressure; SPSS: Statistical Package for Social Sciences; WHO: World Health Organization.

Ethics

The study was approved and funded by clinical research committee at Al-Quds University and by the Palestinian American Research Council committee. The researchers explained the nature and purpose of the study, and obtained consent from those who were willing to participate..

Consent to publish

Respondents were assured of the anonymity and confidentiality of the study and their right not to participate or withdraw from the study at any time. Also all contributing authors are aware of publishing of this manuscript.

Competing interests

The authors declare that they have no conflict of interest.

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CONFLICT OF INTERESTS

The authors report no conflicts of interest in this manuscript

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