

## Original Article

# Determinants of Poor Blood Pressure Control in Hypertensive Patients - An Area-based Study

Amal M Al-Mehza<sup>1</sup>, Ali A Al-Yahya<sup>2</sup>, Majeda M Al-Qattan<sup>3</sup>, Huda S Al-Duwaisan<sup>4</sup>, Bader NMB Al-Otaibi<sup>5</sup>

<sup>1</sup>Primary Health Care, Hadiya Clinic, Kuwait

<sup>2</sup>Primary Health Care, Jaber Al Ali Clinic, Kuwait

<sup>3</sup>Primary Health Care, Reqee Clinic, Kuwait

<sup>4</sup>Primary Health Care, Yarmouk Clinic, Kuwait

<sup>5</sup>Primary Health Care, Reqaa Clinic, Kuwait

Kuwait Medical Journal 2004, 36 (4):270-274

## ABSTRACT

**Objective:** To determine the factors responsible for poor blood pressure control among patients on treatment for hypertension, with the hypothesis that patient non-compliance would be an important determinant.

**Design:** Patients attending the hypertension clinic of Hadiya Center and receiving medication for hypertension were followed up for at least three months. They were labeled as uncontrolled if the mean of three consecutive measurements of systolic blood pressure was 140 mmHg and/or mean diastolic blood pressure was 90 mmHg.

**Setting:** Hadiya Family Practice Center in Ahmadi Health District in Kuwait.

**Subjects:** One hundred fifty four hypertensive patients were included in the study.

**Main Outcome Measures:** Compliance (as measured by pill count in the last three months), smoking, alcohol consumption, diet, interfering medications, exercise, demographic variables (measured by an interviewer - administered questionnaire), and body mass index.

**Results:** Out of 154 subjects recruited in this study, 132 completed the required follow-up of three months.

Eighty four (64%) out of these 132 patients had uncontrolled hypertension. The mean age of the patients was 54 years and female to male ratio was 1.3:1. Seventeen percent of the uncontrolled hypertensives were non-compliant by pill count (taking < 80 % of drugs) as compared to 2% of the controlled hypertensives ( $p < 0.05$ ). There was a statistically significant difference in the mean age and exercise between controlled and uncontrolled hypertensives ( $p < 0.05$ ,  $< 0.01$  respectively). The mean age was 52 and 56 years in controlled and uncontrolled hypertensives, respectively. Uncontrolled hypertensives had a decreased physical activity level as compared to the controlled hypertensives. There was no statistically significant difference in the mean body mass index, sex distribution, marital status, occupational status, educational level, income, cigarette smoking, alcohol consumption, diet and interfering medication rates between controlled and uncontrolled hypertensives. **Conclusion:** Patient's poor compliance with antihypertensive therapy and sedentary life constitute the major determinants of poor blood pressure control in hypertensive patients.

KEYWORDS: blood pressure control, compliance, hypertension

## INTRODUCTION

Hypertension (defined as a blood pressure [systolic/diastolic] 140/90 mmHg)<sup>[1,2]</sup> is an internationally common disease<sup>[3]</sup> and an important treatable public health problem<sup>[4-6]</sup>. It is a major risk factor and a powerful predictor of cardiovascular morbidity and mortality<sup>[6-13]</sup> with proven benefits of treatment<sup>[14-17]</sup>. Control of hypertension protects against stroke, congestive cardiac failure, and all other causes of mortality<sup>[7,10-12,18]</sup>.

Despite proven benefits of anti-hypertensive drugs in reducing blood pressure and events such as stroke and coronary heart disease<sup>[14-17,19]</sup>, 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<sup>[20]</sup>. 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<sup>[21]</sup>.

In Kuwait, the most recent data on hypertension showed a prevalence rate of 26.3%<sup>[22]</sup>. The percentage of blood pressure control in Kuwait was ranging from 27% - 40% in different primary care centers<sup>[23]</sup>, which can be improved by pharmacological means and modifications of life style<sup>[14]</sup>. The main aims of the study were; 1) to determine the factors responsible for poor blood pressure control among hypertensive subjects, 2) to estimate pressure control among hypertensive subjects, and 3) to estimate the extent of patient non-compliance with anti-hypertensive medications in these patients.

Address correspondence to :

Dr. Amal M. Al-Mehza, RCGPC(UK), Primary Health Care, Hadiya Clinic, P.O.Box :900 Kuwait. Tel: ( 965) 3949537/8, 3962154, Fax: ( 965) 3962154, E-mail : AM5AlMehza @ hotmail.com

## PATIENTS AND METHODS

### Subjects:

Hypertensive patients (n = 154) attending the hypertension clinic of Hadiya center and receiving medications were randomly included in the study. Hadiya center is the only family medicine center in Ahmadi health district serving a total population of 13,000. It has an established hypertension clinic with a registry. These subjects were followed for at least three months.

### Setting and Measurements:

During this time three blood pressure (BP) measurements were taken at an interval of at least two weeks. Patients were on their medication for at least six weeks prior to measurements. The blood pressure control was assessed and a questionnaire was completed to determine risk factors for uncontrolled hypertension. Patients were labeled as uncontrolled hypertensives if the mean of three measures of systolic blood pressure (SBP) was 140 mmHg and /or diastolic blood pressure (DBP) was 90 mmHg<sup>[1,2]</sup>.

The determinants of poor BP control include: age, sex, marital status, occupational status, educational level, income, cigarette smoking, alcohol consumption, exercise, diet, obesity, interfering medications and patient non-compliance<sup>[24-27]</sup>.

Patient non-compliance with antihypertensive drugs was measured at the end of follow-up, by asking the patient and by doing a pill count. Subjects who had consumed less than 80% of the prescribed drugs were labeled as being non-compliant<sup>[24]</sup>.

Body mass index (BMI) was calculated as weight in kg over the square of height in m (kg/m<sup>2</sup>). Interfering medications include: non-steroid anti inflammatory drugs (NSAID), oral contraceptives pills (OCP), corticosteroids, antidepressants and decongestant drugs (taken for at least one month during follow up). These determinants were measured by an interviewer - administered questionnaire.

### Statistical Analysis:

Data were collected and analyzed using the statistical package for social sciences (SPSS). The chi -square test was used to compare categorical variables like non-compliance, alcohol consumption and smoking in the two groups of controlled and uncontrolled hypertensives. The two sample t- test was used to compare means of age and BMI. P 0.05 was used as the cut - off level for statistical significance.

**Table 1**

Comparison of the mean age, mean BMI, sex distribution and sociodemographic features in controlled and uncontrolled hypertensives.

Variables	Hypertension		p Value
	Controlled (n = 48)	Uncontrolled (n = 84)	
Mean age in years (SD)	51.7 (9.6)	55.8 (9.6)	0.023
Mean BMI (SD)	31.9 (4.8)	33.3 (5.5)	0.144
Female	32	47	0.227
Male	16	37	
<b>Marital status</b>			
Currently married	39	65	0.601
Unmarried (single, divorced, widow)	9	19	
<b>Occupational status</b>			
Unemployed	6	15	0.055
Retired	9	31	
Housewife	18	24	
Employed	15	14	
<b>Educational level</b>			
Illiterate	20	29	0.862
Elementary school	7	17	
Intermediate school	8	16	
Secondary school	7	10	
Above (college, post-graduate)	6	12	
<b>Income in KD*</b>			
Low (<500)	14	18	0.479
Middle (500 - <1000)	11	26	
High ( 1000)	18	30	

\*KD = Kuwaiti Dinar

## RESULTS

Out of the 154 subjects recruited into the study, 132 completed the follow-up of three months, of which 84 (64%) subjects had uncontrolled hypertension. The mean age of subjects was 54 (SD  $\pm$  9.8) years and the female to male ratio was 1.3:1.

There were no significant differences in the mean BMI, sex distribution, marital status, occupational status, educational level, income, cigarette smoking, alcohol consumption, diet and interfering medication rates in controlled and uncontrolled hypertensives (Table 1,2).

There was significant difference in the mean age and exercise rates in controlled and uncontrolled hypertensives (p<0.05, <0.01 respectively) (Table 1,2). Uncontrolled hypertensives had a higher mean age (56 years) and decreased physical activity level.

One out of 48 (2%) amongst controlled hypertensives was non-compliant by pill count as compared with 14 out of 84 (17%) amongst uncontrolled hypertensives. This difference was statistically significant (p<0.05) (Table 2).

There was no statistically significant difference in the mean age, sex distribution, marital status, occupational status, educational level and income in compliant and non-compliant subjects.

**Table 2**

Comparison of smoking, alcohol consumption, diet, interfering medication, exercise and compliance rates in controlled and uncontrolled hypertensives

Variables	Hypertension		p Value*
	Controlled (n = 48)	Uncontrolled (n = 84)	
<b>Smoking</b>			
Current smokers	4	7	1.000
Non-smokers (including ex-smokers)	44	77	
<b>Alcohol consumption</b>			
Alcohol consumer	1	1	0.686
Non-alcohol consumer	47	83	
<b>Diet</b>			
Regular diet	32	50	0.416
Low salt diet	16	34	
<b>Interfering medication</b>			
Taken	4	7	1.000
Not taken	44	77	
<b>Exercise</b>			
Regular (30 min 3 times a week)	13	7	0.004
No exercise	35	77	
<b>Compliance</b>			
Compliant	47	70	0.011
Non-compliant	1	14	

\* Chi-square test

## DISCUSSION

Hypertension is the single most common and most important risk factor for cardiovascular disease<sup>[7-13,28,29]</sup>. Improved control of hypertension, in turn, has contributed to reductions in the incidence rates of stroke and ischaemic heart disease<sup>[7,10-12,14-17,30]</sup>.

Despite improvements in the control of hypertension in the United States, there is evidence that considerable numbers of people still have uncontrolled high blood pressure<sup>[26,31-36]</sup>.

Because morbidity and mortality are reduced in proportion to BP reduction, it is important to identify the major causes of failure to control hypertension. The evidence suggests that patient characteristics and behavior patterns explain much of the poor BP control in patients under medical care. The most important of these factors is compliance to medication<sup>[24,26,27,35,37-44]</sup>. However, other factors associated with poor BP control are excessive alcohol intake, life stress, lower income, younger age, black race, male sex, and unmarried state<sup>[24-27]</sup>.

Obese patients are more likely to develop hypertension and demonstrate decreased responsiveness to antihypertensive medications<sup>[45,46]</sup>. Cigarette smoking is a risk factor for hypertension and smokers have a five fold increased risk of hypertensive crisis<sup>[47]</sup>.

Various studies have demonstrated a J-shaped relationship between alcohol consumption and blood pressure with the mean blood pressure increasing by approximately 1mmHg for every unit of alcohol consumed in excess of two units per day<sup>[48,49]</sup>.

Additional factors include lower socioeconomic class<sup>[42,50]</sup> and interference from other drugs such as NSAIDs, oral contraceptives, corticosteroids, tricyclic antidepressants and decongestants<sup>[4,51]</sup>. Reduction in salt intake<sup>[52]</sup> and increased physical activity<sup>[53]</sup> will reduce blood pressure and thus improve control.

Our study investigated the factors responsible for poor BP control among patients attending Hadiya Family Center for treatment of hypertension. In this study, non-compliance, decreased physical activity and a higher mean age were significant predictors of uncontrolled hypertension.

We found a drug non-compliance rate of 11% at the end of follow - up and this was a significant predictor of poor BP control. Hence, compliance-improving strategies are needed<sup>[54]</sup>. This population of non-compliant and uncontrolled hypertensives formed about 17% of our subjects and would be an ideal target for health education. Seventy of 84 (83%) uncontrolled hypertensives were compliant by pill count suggesting that factors other than non-compliance were responsible, or that the treatment regimen lacked vigor.

The mean age of the uncontrolled hypertensives was higher than that of the controlled hypertensives (55.8 vs 51.7 years respectively) and this was a significant predictor of poor BP control. This requires more attention towards control of BP since in most populations, the risks of cardiovascular disease rise steeply with rising age.

The finding of a sedentary lifestyle rate of 91.7% in uncontrolled hypertensives, suggests that this is a significant predictor of poor BP control. It also highlights the importance of health education in modifying this lifestyle factor.

Our finding of non-compliance being a significant predictor of poor BP control while other factors such as mean BMI, sex distribution, occupational status, educational level, marital status, alcohol consumption and smoking not showing a significant difference in controlled and uncontrolled hypertensives, was similar to that reported in some studies<sup>[24,31,37,42]</sup>.

The study has certain limitations. This is an area-based study conducted in one health district. The result of this kind of study may therefore be more relevant and significant if it did include several health districts of Kuwait and a larger population sample. The simple pill count 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.

In conclusion, we recommended that psychosocial factors like non-compliance and sedentary life should be looked for in subjects with poor BP control and appropriate steps should be taken to improve compliance and to increase the level of physical activity in hypertensive subjects in order to achieve better BP control.

#### ACKNOWLEDGMENT

The authors would like to thank Prof Nasra Shah, Dr Kamal Al-Shoumer and Mrs Indu Menon for their support and comments on this manuscript.

#### REFERENCES

- World Health Organization- International Society of Hypertension- Guidelines for the Management of Hypertension. Guidelines Subcommittee. *J Hypertens* 1999; 17:151-183.
- Primary Health Care Clinical Practice Guideline Series: Hypertension, Kuwait. Ministry of Health, Central Department of Primary Health Care: 2001; 2.
- Arauz- Pacheco C, Parrott M A, Raskin P. The treatment of hypertension in adult patients with diabetes. *Diabetes Care* 2002; 25: 134-147.
- Joint National Committee. Fifth report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure. *Arch Intern Med* 1993; 153:154-183.
- Neaton JO, Grimm J, Richard H, et al. Treatment of mild hypertension study. Research group final report. *JAMA* 1993; 270:713-724.
- Houston MC. Hypertension strategies for therapeutic intervention and prevention of end-organ damage. *Prim Care* 1991; 18:713-753.
- Glasser SP. Hypertension syndrome and cardiovascular events; high blood pressure is only one risk factor. *Postgrad Med* 2001; 110:29-36.
- Pocok SJ, McCormack V, Gueyffier F, et al. A score for predicting risk of death from cardiovascular disease in adults with raised blood pressure, based on individual patients data from randomized controlled trials. *BMJ* 2001; 323:75-81.
- Palatini P, Frigo G, Vriz O, et al. Early signs of cardiac involvement in hypertension. *Am Heart J* 2001; 142:1016-1023.
- Palmieri V, Wachtell K, Gredts K, et al. Left ventricular function and hemodynamics of inappropriate left ventricular hypertrophy in patients with systemic hypertension: the left study. *Am Heart J* 2001; 141:784-791.
- Sung J, Ouyang P, Bacher AC, et al. Peripheral endothelium - dependent flow - mediated vasodilatation is associated with left ventricular mass in older persons with hypertension - *Am Heart J* 2002; 144:39-44.
- Wachtell K, Palmieri V, Olsen MH, et al. Urine albumin/creatinine ratio and echocardiographic left ventricular structure and function in hypertensive patients with electrocardiographic left ventricular hypertrophy: The LIFE Study . *Am Heart J* 2002; 143:319-326.
- Sever P, Beevers G, Bulpitt C, et al. Management guidelines in essential hypertension: report of the second working party of the British Hypertension Society. *BMJ* 1993; 306:983- 987.
- The 2001 Canadian Hypertension Recommendations - what is new and what is old but still important. *Can J Cardiol* 2002; 18:591-603.
- Rosei EA. Assessment of Pre clinical Target Organ Damage in Hypertension : Left Ventricular Hypertrophy. *European Society of Hypertension Scientific Newsletter: Update on Hypertension Management* 2001;2: No.10.
- Lever AF, Ramsay LE. Treatment of hypertension in elderly. *J Hypertens* 1995; 13:571-579.
- MacMachons, Rodgers A. The effect of blood pressure reduction in older patients: an overview of five randomized controlled trials in elderly hypertensives. *Clinic Exp Hypertens* 1993; 15: 967-978.
- Medical Research Council Working Party, MRC Trial of Treatment of Mild Hypertension Principal results. *Br Med J Clin Res* 1985; 291:97-104.
- Collins R. Blood pressure, stroke and coronary heart disease. Part 2, short term reductions in blood pressure: overview of randomised drug trials in their epidemiological context. *Lancet* 1990; 335:827-838.
- Adults taking action to control their blood pressure- United States, 1990. *MMWR Morb Mortal Wkly Rep.* 1994; 43:509-511, 517.
- Burt VL, Whelton P, Roccella FJ, et al. Prevalence of hypertension in the US adult population. Results from the third national health nutrition examination survey, 1988-1991. *Hypertension* 1995; 25:305-13.
- El Reshid K, Al-Owish R, Diab A. Hypertension in Kuwait: the Past, Present and Future. *Saudi J Kidney Dis Transplant* 1999; 10:357-364.
- Al-Yahya AA, AL-Duwaisan HS, Al-Mehza AM. Improving the Diagnosis of Hypertension and Assessment of Vascular Risk Factors through A Clinical Audit in Kuwait Family Practice. *KMJ* 2003; 35:105-110.
- Joshi PP, Salkar RG, Heller RF. Determinants of poor blood pressure control in Urban hypertensives of central India. *J Hum Hyperten* 1996; 10:299-303.
- Mc Alister FA, Lewanczuk RZ, Teo KK . Resistant hypertension : An over view. *Can J Cardiol* 1996; 12:822-828.
- Winickoff RN, Murphy PK. The Persistent problem of Poor Blood Pressure Control . *Arch Intern Med* 1987; 147:1393-1396.
- Buck CW, Donner AP. Blood pressure control in hypertensives: a model for the study of life events. *J Chr Dis* 1984; 4:247-253.
- Kannel WB. Blood pressure as a cardiovascular risk factor. *JAMA* 1996; 275: 1571 -1576.
- Levy D, Larson MG, Vasan RS et al . The progression from hypertension to congestive heart failure . *JAMA* 1996; 275:1557-1562.
- Ostfeld AM , Wilk E . Epidemiology of stroke , 1980 - 1990 : a progress report . *Epidemiol Rev.* 1990; 12:253-256.
- Caro JJ, Salas M , Speckman JL. Persistence with treatment for hypertension in actual practice. *CMAJ* 1999; 160:31- 37.
- Mancia G , Sega R, Milesi C, et al. Blood pressure control in the hypertensive population. *Lancet* 1997; 349:454-457.
- Stock well DH, Madhavan S, Cohen H, et al. The determinants of hypertension awareness, treatment and control in an insured population . *Am J public Health* 1994; 84:1768 -1774.
- Joffres MR. Hamet P, Rabkin SW, et al. Prevalence, control and awareness of high blood pressure among Canadian adults. *Canadian Heart Health Surveys Research Group. CMAJ* 1992; 146:1997 -2005.
- Shea S, Misra D, Ehrlich MH, et al. Predisposing factors for

- severe, uncontrolled hypertension in an inner-city minority population. *N Engl J Med* 1992; 327:776-781.
36. Francis C K. Hypertension, cardiac disease, and compliance in minority patients. *Am J Med* 1991; 91:295-365.
  37. Leenen FHH. Intermittent blood pressure control: Potential consequences for outcome. *Can J Cardiol* 1999; 15:13-18.
  38. Bittar N. Maintaining long-term control of blood pressure: the role of improved compliance. *Clin Cardiol* 1995; 18:312-316.
  39. Jones JK. Discontinuation of and changes in treatment after start of new courses of antihypertensive drugs: a study of a United Kingdom population. *Br Med J* 1995; 311:293-295.
  40. McCombs JS, Nichol MB, Newman CM, *et al.* The costs of interrupting antihypertensive drug therapy in a Medicaid population. *Med Care (US)* 1994; 32:214-226.
  41. Psaty BM. Temporal patterns of antihypertensive medication use among elderly patients. *JAMA* 1993; 270:1837-1841.
  42. Shea S, Misra D, Ehrlich MH, *et al.* Correlates of Non adherence to Hypertension Treatment in an Inner-City Minority population. *Am J Public Health* 1992; 82:1607-1612.
  43. Setaro JF, Black HR. Refractory hypertension. *N Engl Med* 1992; 327:543-547.
  44. Wagner EH, James SA, Beresford SAA, *et al.* The Edgecomb county High Blood Pressure Program: I. Correlates of uncontrolled hypertension at base line. *Am J Public Health* 1984; 74:237-242.
  45. Modan M, Almong S, Fuchs Z, *et al.* Obesity, glucose intolerance, hyperinsulinemia, and response to antihypertensive drugs. *Hypertension* 1991; 17:565-573.
  46. Isaksson H, Cederholm T, Jansson E, *et al.* Therapy resistant hypertension associated with central obesity, insulin resistance, and large muscle fiber area. *Blood pressure* 1993; 2:46-52.
  47. Toner JM, Close CF, Ramsay LE. Factors related to treatment resistance in hypertension. *Q J Med* 1990; 77:1195-1204.
  48. Keil U, Swales JD, Grobbee DE. Alcohol intake and its relation to hypertension. *Cardiovasc Risk Factors* 1993; 3:189-200.
  49. Puddey IB, Beilin LJ, Vandongen R. Regular alcohol use raises blood pressure in treated hypertensive subjects: A randomized controlled trial. *Lancet* 1987; 21:647-651.
  50. Isaksson M, Danielsson M, Rosenhamer G *et al.* Characteristics of patients resistant to antihypertensive drug therapy. *J Intern Med* 1991; 229:421-426.
  51. Johnson AG, Nguyen TV, Day Ro. Do non steroidal anti-inflammatory drugs affect blood pressure? A meta-analysis. *Ann Intern Med* 1994; 121:289-300.
  52. Cutler JA, Follman D, Alexander PS. Randomized controlled trials of sodium reduction: an overview. *Am J Clin Nutr* 1997; 65:643-651.
  53. Fagard RH. The role of exercise in blood pressure control: supportive evidence. *J Hypertens* 1995; 13:1223-1227.
  54. Clark LT. Improving compliance and increasing control of hypertension: needs of special hypertensive populations. *Am Heart J* 1991; 121:664-669.