Original Article

Proportion and Determinants of Uncontrolled Hypertension among Treated Hypertensive Patients

Faris Al-Lami * M.B,Ch.B MSc. PhD

Summary

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Hypertension (HT) remains poorly controlled even in the developed countries in spite of the improvement in management. Many studies found that about 70% of people with HT remain uncontrolled. The aim of this study is to determine the proportion, and determinants of uncontrolled HT (UHT) among treated hypertensive patients. A random sample of 214 known hypertensive patients, on regular treatment for a minimum of one year was included. The mean of three blood pressure (BP) readings measured two weeks apart was considered. Controlled BP was defined as systolic BP≤140mmHg, and diastolic BP≤90 mmHg. A questionnaire was used to collect data on certain demographic variables (age, gender, marital status, educational status, crowding index), smoking habit, salt, and alcohol intake, number of used antihypertensive drugs, frequency of BP checking, co morbid illnesses, and certain anthropometric measurements. The proportion of UHT is 68%. Although the proportion of UHT was higher among older age patients, males, currently married, college graduate, those using three antihypertensive drugs, patients with no dietary salt restriction, or no co morbid illnesses, but these factors were not proved to be statistically significant. Current smoking, Body Mass Index (BMI) ≥25 Kg/m^2(reflecting overweight/ Obesity), and frequency of BP checking were statistically significant predictors of UHT.

Introduction:

The importance of hypertension (HT) is increasing all over the world including our region. In certain countries in the Eastern Mediterranean Region the prevalence of HT is up to 25% of adult population. It predisposes individuals to the development of cardiac, renal, cerebrovascular and other complications that lead to increased morbidity and mortality, causes considerable suffering and results in enormous cost (1)

The control of HT is complex and multidimensional process (2). Randomized control trials had clearly shown that the good control of blood pressure (BP) reduces complications, disabilities, and mortality in people with HT. Thus good management of HT is central to any strategy formulated to control HT at the community level (1).

Despite the improvement in the management of HT in the past several years, HT remains poorly controlled even in the most developed countries. In USA, it is found that only 29% of people with HT had their BP controlled (< 140/90 mmHg) (3). This is seen in many parts of the world, where nearly 70% of patients with HT are uncontrolled (4). Treated uncontrolled HT patients have the worst atherogenic index, and are at increased risk of early mortality, signalling the need for strict BP control (5). The reasons of this "epidemic" of uncontrolled HT (UHT) are unclear, and several explanations have been considered. In addition to the underlying pathophysiology, BP control is potentially determined by multiple other factors. Some of these factors are related to the patient as the demographic variables (6-17), compliance (4, 15, 16, 18, 19), co morbid illnesses (9-11, 14, 20, 21), personal habits (11, 19), and others are related to the policy of the treating physician, and the health system (10, 14, 16, 17, 21-28).

The aim of this study is to determine the proportion of uncontrolled HT among the treated hypertensive patients, and to identify the potential predictors of UHT.

**Department of Community Medicine, College of Medicine, University Of Baghdad*

Patients and Methods

This is a cross sectional study that was conducted during January-July/2005 in two popular clinics in Baghdad. Hypertensive patients in Iraq are usually received their medication from the popular clinics for a subsidized cost. The studied patients were a known hypertensive patients on the basis of having a chronic diseases book with a diagnosis of HT and on regular treatment for a minimum period of one year. A systematic random sample was used. Every third hypertensive patient attending the clinic's pharmacy to receive the treatment and who accept to attend the clinic for BP measurement, for three times within two months period (with a minimum of two weeks apart) was included in the study.

Data were collected using a questionnaire that filled in through a direct interview with the patients. The questionnaire was constructed to collect information about certain sociodemographic variables, including the age, gender, occupation, marital status, educational status, and crowding index (number of family members/number of living rooms).

Data on personal habits including smoking status and alcohol intake were collected. The number of cigarettes smoked per day, and number of years of smoking were reported for current smokers to calculate the pack year smoke index (number of cigarette smoked per day X number of years of smoking / 20).

The frequency of BP checking, the number of antihypertensive drugs used, and the dietary habits concerning salt intake were reported for each patient. The chronic diseases book of the patients were also assessed to determine the presence of co morbid illnesses particularly diabetes mellitus, ischemic heart diseases, or asthma.

Certain anthropometric measures were calculated for each patient. The height was measured using a fixed wall chart, while the patient is bare footed. The height was approximated to nearest cm. The weight was measured using the common weight scale with periodic standardization. The patient was weighted with minimum acceptable clothes, and the weight was approximated to the nearest kg. The body mass index (BMI) was calculated according to the formula: Weight (Kg)/ Height^2 (m^2) WHO classification of BMI was considered. BMI values of <25 Kg/m^2 were considered as normal, 25-29.99 Kg/m^2 as overweight, and 30+ Kg/m^2 as obese (29).

The waist to hip ratio (WHR) was also calculated. WHO protocol for measuring the WHR, and their classification were also considered. WHR >0.85 was considered abnormal for females, while > 1 was considered abnormal for males (29).

The blood pressure (BP) was measured according to WHO protocol (1). Each patient should have three BP measurements, of a minimum of two weeks apart. The mean of these readings was considered for analysis.

To determine the proportion of uncontrolled HT (UHT), all patients having a mean systolic blood pressure (SBP) of >140mmHg, and /or a mean diastolic blood pressure (DBP) of >90mmHg were considered uncontrolled. The remaining patients were considered controlled HT (CHT) patients (30).

After determining the proportion of UHT patients in the whole study group, those with UHT were compared with the patients having CHT for the variables mentioned above.

Statistical Methods: SPSS, version 13 was used for data entry and analysis. Chi square test of independence was used for frequency data to test whether significant association exist between HT control status and the potential risk factors. For the sake of analysis, some R X C tables were compressed to facilitate chi square calculation. Student's t-test was used to test for significant difference between means of certain variables among the two groups. The odds ratio, and the 95% confidence interval was calculated for variables showing significant association Forward stepwise logistic regression analysis was used to identify the significant unconfounded risk factors.

Results

The proportion of patients with uncontrolled hypertension (UHT) among the treated hypertensive patients in this study is 68% (143 patients). The mean (± SE) SBP among the patients with controlled HT (CHT), and the patients with UHT were (133.03±1.07), and (161.20±1.5) mmHg, respectively, while the mean (± SE) DBP of the patients in the two groups were (83.09±0.7), and (98.3±0.75) mmHg, respectively.

Among the 143 patients with UHT, we found that 86 patients (60.1%) had uncontrolled systolic and diastolic BP, 37 (25.9%) had uncontrolled SBP, and 20 (14%) had uncontrolled DBP.

Patients with UHT were compared to the patients with controlled hypertension (CHT) for certain demographic variables. Concerning age, we found that the lowest proportion of UHT was among the young patients aged <40 years (50%). No statistical significant association was found between age and HT control status (Table 1). The mean age (± SE) of patients with UHT was 56.59 (±0.89) years compared to 55.97(± 1.35) years for patients with CHT. The difference was also not statistically significant (P>0.05).

Regarding gender, the proportion of UHT among males was 67.9%, compared to 66.1% among females. . No statistical significant association was found between gender of the patients and HT control status (P>0.05) Table 1. Concerning the occupation of the patients, since the majority of the study group were females, we found that 55.6% of the whole study group were housewives, with almost similar proportions among the two groups. The highest proportion of UHT was found among state employees (82.4%). No statistical significant association was found between the occupation and HT control status (P>0.05) Table1.

Regarding the marital status, we found that the highest proportion of UHT was among the married patients (68.7%). Comparing married to other categories we found no statistical significant association between marital status and HT control status (P>0.05) Table 1.

On studying the relationship between HT control status and educational status, the highest proportion of UHT was found among college graduates (73.7%) No statistical significant association was found between educational status and HT control (P>0.05), Table 1.

The mean (±SE) crowding index of patients with UHT was 3.6(±0.14), compared to 3.8 (±0.22) for the other group. The difference was not statistically significant (P>0.05).

Table (1): Distribution of the study group by HT control status and certain demographic variables

		Controlled HT (71)		Uncontrolled HT (143)		Total (214)		P-value
		No	%	No	%	No	%	
AGE (Years)	<40	5	50.0	5	50.0	10	100	>0.05
	40-49	10	28.6	25	71.4	35	100	
	50-59	29	34.5	55	65.5	84	100	
	60-69	17	28.8	42	71.2	59	100	
	70+	10	38.5	16	61.5	26	100	
GENDER	Male	27	32.1	57	67.9	84	100	>0.05
	Females	44	33.8	86	66.1	130	100	
OCCUPATION	Unemployed	6	42.9	8	57.1	14	100	>0.05
	Housewives	40	33.6	79	66.4	119	100	
	State Employees	4	17.4	19	82.6	23	100	
	Non State Employees	9	31.0	20	69.0	29	100	
	Retired	12	41.3	17	58.7	29	100	
MARITAL STATUS	Single	1	50.0	1	50.0	2	100	>0.05
	Married	51	31.3	112	68.7	163	100	
	Divorced	2	40.0	3	60.0	5	100	
	Widow	17	38.6	27	61.4	44	100	
EDUCATIONAL STATUS	Illiterate	43	36.1	76	63.9	119	100	>0.05
	Primary	15	28.3	38	71.7	53	100	
	Secondary	8	34.8	15	65.2	23	100	
	College	5	26.3	14	73.7	19	100	

Hypertensive patients in the two groups were compared for smoking habit. The highest proportion of UHT was found among the current smokers (83.3%). There is a statistically significant association between smoking status and HT control status (P<0.01) (Table 2). The odds ratio is 2.96, with 95% confidence interval of 1.27-6.90. The mean (±SE) of the number of cigarettes smoked per day among patients of the UHT group was 4.67(±0.88) compared to 2.18(±0.7) among patients with CHT. The difference was statistically significant (P<0.05). The mean (±SE) number of years of smoking was 5.02(±0.87) among patients with UHT compared to 2.69(±0.99) for the other group, but the difference was not statistically significant (P>0.05). The mean (±SE) of pack year smoke index for patients with UHT was 5.71(±1.13) compared to 2.37(±0.88) for the other group. The difference is statistically significant (P<0.05).

Regarding alcohol intake, we found the majority of the patients in the two groups were non drinkers, and only 11 patients were consuming alcohol, eight of them had UHT. No statistical significant association was found between alcohol intake and HT control status (P>0.05) Table 2.

Table (2): Distribution of the study group by HT status, smoking status and alcohol intake

		Controlled HT (71)		Uncontrolled HT (143)		Total (214)		P-value
		No	%	No	%	No	%	
SMOKING STATUS	Non Smoker	55	35.3	101	64.7	156	100	<0.01
	Ex-smoker	9	56.3	7	43.7	16	100	
	Current Smoker	7	16.7	35	83.3	42	100	
ALCOHOL INTAKE	No alcohol intake	68	33.5	135	66.5	203	100	>0.5
	Alcohol intake	3	27.3	8	72.7	11	100	

Among the total study group, there were 122 patients (57%) receiving drug monotherapy, compared to eight patients (3.7%) receiving three drugs. The highest proportion of UHT was among patients receiving three drugs (75.0%). No statistical significant association was found between number of antihypertensive medications used and HT control status (P>0.05) Table 3.

Concerning the frequency of BP checking we found that there is a progressive decline in the proportion of UHT patients with the increase in the frequency of BP checking. There is a statistically significant association between frequency of BP checking and HT control status (P<0.01) Table 3. The odds ratio is 3.19, with 95% confidence interval of 1.38-7.3.

The two groups were compared for dietary salt restriction. We found that the highest proportion of UHT patients were among the group with no dietary salt restriction (73%), but still there was no statistically significant association between dietary salt restriction and HT control status (P>0.05) Table 4.

Table (3): Distribution of the study group by HT control status, number of antihypertensive drugs, frequency of BP checking, and pattern of salt intake.

		Controlled HT (71)		Uncontrolled HT (143)		Total (214)		P-value
		No	%	No	%	No	%	
NO. OF USED ANTIHYPERTENSIVE DRUGS	One drug	42	34.4	81	65.6	122	100	>0.05
	Two drugs	27	32.5	56	67.5	83	100	

	Three Drugs	2	25.0	6	75.0	8	100	
FREQUENCY OF BP CHECKING	Less than one per month	7	15.9	37	84.1	44	100	<0.01
	One per month	46	36.5	80	63.5	126	100	
	More than one per month	18	40.9	26	59.1	44	100	
PATTERN OF SALT INTAKE	No salt restriction	10	27.0	27	73.0	37	100	>0.05
	Restricted Table salt	30	33.7	59	66.3	89	100	
	Restricted table and cooking salt	31	35.2	57	64.8	88	100	

The body mass index (BMI), and the Waist: Hip ratios (WHR) were measured for all the patients. As far as the BMI is concerned, we found that the proportion of UHT among patients with normal BMI (BMI<25) was 51.5%, compared to 65.5% among those with overweight or obesity (BMI ≥25). There was a statistically significant association between BMI and HT control status (P<0.01) (Table 5). The odds ratio is 2.16, with 95% confidence interval of 1.03-4.52. The mean (±SE) of BMI for patients with UHT was 30.4 (0.42) compared to 27.2(±0.57) for patients in the other group. The difference was statistically significant (P<0.05).

Regarding the WHR we found that 64.8% of patients with normal WHR (considering the patient's gender) had UHT, compared to 68.3% of patients with WHR exceeding the normal limit (considering gender). There was no statistical significant association between WHR and HT control status (P>0.05) (Table 5). The mean (±SE) WHR for patients with UHT was 0.96(±0.007) compared to 0.95(±0.121) for patients in the other group. The difference was not statistically significant (P>0.05).

Table (5): Distribution of the study group by HT status, body weight and waist: hip ratio

		Controlled HT (71)		Uncontrolled HT (143)		Total (214)		P-value
		No	%	No	%	No	%	
BODY WEIGHT	Overweight/ Obese	55	30.4	126	69.6	181	100	<0.01
	Normal	16	48.5	17	51.5	33	100	
WAIST: HIP RATIO	High WHR	39	31.7	84	68.3	123	100	>0.05
	Normal WHR	32	35.2	59	64.8	91	100	

The two groups were also compared for co morbid illnesses particularly Diabetes Mellitus, Ischemic Heart Diseases, and Asthma. There were 124 patients free from co morbid illnesses; 86 of them (69.4%) had UHT. Among the 90 patients with co morbid illnesses, there were 57 patients (63.3%) with UHT. There was no statistical significant association between associated medical illnesses and HT control status (P>0.05) Table 6.

Table (6): Distribution of the study group by HT status and co morbid illnesses

CO MORBID ILLNESSES		Controlled HT (71)		Uncontrolled HT (143)		Total (214)		P
		No	%	No	%	No	%	
	No	38	30.6	86	69.4	124	100	>0.05
	DM	11	32.4	23	76.6	34	100	
	IHD	14	42.2	19	57.6	33	100	
	DM+IHD	4	28.6	10	71.4	14	100	
	Asthma	4	44.4	5	55.6	9	100	

Discussion:

The proportion of UHT in this study is 68%, which is close to the figures reported in many studies conducted in different parts of the world including USA (10), Italy (8), France (6), Spain (25), Korea(31), Iran(13), and Nigeria(22,6). Some studies reported higher figures (19, 20); others reported lower figure (5, 12, 23, 32-34). These variations could be attributed to the variation in the cut off point for the definition of CHT, different patients' inclusion criteria, and patients' sources.

Among those with UHT, the proportion of patients with uncontrolled both systolic and diastolic BP in this study (60%), is close to the figures reported in a study conducted in Al-Bahrain (50.4%)(34), and the Framingham study (52.2%)(9). The proportion of UHT patients having only uncontrolled SBP is higher in our study than those having only uncontrolled DBP. This is also compatible with Framingham study (9), and other studies (25, 34), while the reverse was found in a study conducted in Sweden (20).

Although the lowest proportion of UHT was seen among the youngest group, but age was not found to be a significant factor for HT control. Many studies found that old age is a significant risk factor for UHT (6, 8-12, 14, 16). This may be attributed to the conservative attitude of the physicians to prescribe more drugs to attain the required BP values at this age.

Gender was not found to be a significant factor affecting BP control. This is consistent with (8). The proportion of UHT was slightly higher among males than females; which is consistent with the results of many studies (7, 12, 16, 31). Few other studies found the reverse (13, 17).

On comparing married versus other forms of marital status, we found that marital status is not a significant factor that affects BP control. Joshi et al, 1996, found similar result. Shah, and Cook, 2001, found that living alone and poor social support leads to poor BP control. We think that being currently unmarried did not mean that they are living alone or lacking social or moral support as far as most of them are living within extended families. It was found that stress life events are significant risk factors for UHT (15, 19). Hopelessness, frustration with treatment, and perceived tension with BP measurement were significant risk factors too (16).

Educational status was also found a non significant factor for BP control, in consistence with Joshi et al, 1996. It was found that lack of knowledge by the patient of the target BP (10), and the growth of awareness of the importance of strict BP control (21) are significant factors affecting BP control. These factors are probably not affected by number of years of schooling as far as the school curricula do not included educational material about the majority of chronic non communicable diseases. Crowding index (CI) was calculated and used as a proxy measure for socioeconomic status. The mean was higher for the CHT group as compared to the other group, although the difference was not significant. Concerning the economic aspect, this factor can not be linked to the availability of antihypertensive drugs, since these drugs are available to all HT patients at the popular clinics for a subsidized cost, although many physicians are skeptical about the potency of these drugs. Kasson et al, 2003 found that higher income is a risk factor for UHT. High CI may reflect better social and moral support to the patients.

In this study, smoking was found a significant factor that affect BP control. This finding is consistent with Shah and Cook, 2001. We found that current smokers had almost three times greater chance to have UHT as compared to non smokers. It was found that people with HT who smoke have 2-3 folds greater incidence of stroke and coronary heart diseases than HT patients with comparable BP who do not. Stopping smoking rapidly reduces this risk (35). Interestingly, we found that the number of cigarettes smoked, is a significant factor for UHT, rather than the number of years of smoking.

In this study, the number of HT patients consuming alcohol was very small; most of them on occasional basis. This will make the current study unsuitable to evaluate the role of alcohol as a factor affecting BP control. This factor was also inadequately studied in the reviewed literatures.

Around 60% of HT patients in this study were receiving one drug and only 3.7% were receiving three drugs. These figures are very close to those reported by Primatesta and Poulter, 2004. Although the highest proportion of CHT was seen among those receiving one drug, the number of antihypertensive drugs is not a significant factor affecting BP control, Knight et al, 2001, found that multidrug regimen and reporting side effects for these drugs are significant risk factors for UHT. Similarly, Stergiou et al, 2003, found that using triple antihypertensive treatment at base line is a risk factor for UHT. On the contrary, other studies found that monotherapy is a risk factor for UHT (16, 23). Ohta et al, 2004, demonstrated that using new antihypertensive treatment improves BP control. It had been found that physicians' behavior towards antihypertensive therapy and their reticence to modify this therapy play a crucial role in adequate BP control (24, 28). Primary care physicians did not increase antihypertensive medications adequately for patients with UHT. Attempts to understand and to change physicians' prescriptions behavior could decrease the burden of UHT among treated HT patients (26). Physicians seem to target their action at DBP of 100mmHg, whereas guidelines recommendations targeting DBP of <90mmHg (27). In >50% of UHT patients no measures were taken by doctors to optimize treatment, 1/3 were still using drug monotherapy (25).

The frequency of BP checking was used as a proxy measure for the compliance of the patients. It was found to be a significant factor for BP control. Our findings were consistent with many studies which found non compliance a significant risk factor for UHT (4, 15, 16, 18, 19).

We had studied the pattern of dietary salt intake which also reflects the patients' compliance. Although, we found the highest proportion of UHT was among those with no salt restriction, but this was not a significant factor. An overview of 14 population based studies, and 24 observational studies that calculated the slope of regression of SBP, and DBP. All demonstrated a significant reduction of BP with reduction of salt intake (36)

Overweight and obesity (assessed by BMI) were found significant risk factors for UHT; this is consistent with many other studies (9, 20, 21). Evidence for a direct, strong (2-6 folds excess risk), and consistent relationship between obesity and HT emerges from cross-sectional and prospective observational studies (37). Central obesity indicated by high WHR, is positively correlated with HT in several populations (38, 39). In this study, we found that UHT was more among those with high WHR compared with those having normal WHR, but this factor was not found to be a significant factor. It could be due to the high prevalence of central obesity particularly among females in our study group.

The proportion of UHT was lower among those with co morbid illnesses, although it was not a significant factor. This finding is consistent with many studies (9-11, 14). This may be explained on the basis of the better patients' compliance, better follow up, and more aggressive physician's attitude to attain the desirable BP. Bog-Hansen et al, 2003, found that DM is a risk factor for UHT.

Limitation of the study: since this is an observational study, it is difficult to impute causality with certainty for any of the assigned risk factors. It is recommended to study these factors by analytic study.

Conclusion:

About two thirds of treated hypertensive patient were uncontrolled. Among a number of potential predictors of UHT, only smoking, frequency of BP checkin and overweight/ obesity proved to be statistically significant risk factors.

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