

## Blood Pressure Levels and Urinary Frequency in Hypertensive Patients: A Cross-sectional Analysis

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### Abstract

**Background:** Hypertension has been identified as the leading global risk factor for mortality and as the third leading risk factor for disease burden. It is defined as a systolic blood pressure of 140 mmHg or more, or a diastolic blood pressure of 90 mmHg or more, or taking antihypertensive medication. Though it is known that nocturia is multifactorial, available literature does not relate elevated blood pressure level with increased urinary frequency, and is scarce at best.

**Objective:** To determine the association between blood pressure levels and urinary frequency in hypertensive patients.

**Methods:** A cross-sectional study was carried out in the OPD (Out Patient Department) of a secondary care hospital of Karachi among patients with self-reported history of hypertension and on anti-hypertensive medication. A total of 292 patients, aged 18 or above, were included in the study by convenient sampling for the duration of 6 months from January 2018 till July 2018. After taking informed consent, participants' relevant information was collected by means of a structured questionnaire designed specifically for the study whereas their blood pressure level was measured with the help of sphygmomanometer using stethoscope. Chi-square test of independence was applied to determine the association between blood pressure levels and the urinary frequency whereas the significance level was set at 0.05.

**Results:** The study results revealed a significant positive association between both systolic and diastolic blood pressure levels and increased urinary frequency ( $p=0.047$  and  $p=0.045$  respectively) though after stratifying on the basis of gender and age this association persisted only for diastolic blood pressure level in male patients ( $p=0.026$ ) and for both systolic and diastolic blood pressure levels in  $\geq 50$  year old patients ( $p=0.026$  and  $p=0.015$  respectively).

**Conclusion:** The study findings revealed a significant positive association between both the elevated systolic and diastolic blood pressure levels and the increased frequency of urination but after age and gender based stratification, it held true only for diastolic blood pressure level in male patients and for both systolic and diastolic blood pressure levels in patients aged 50 years or above. Further evaluation of the study findings with better study designs and a larger sample size is recommended.

**Keywords:** Blood pressure levels; Urinary frequency; Hypertensive patients

### Introduction

Hypertension has been identified as the third leading risk factor for disease burden worldwide [1]. It has been estimated that 29% of the world population will suffer from high blood pressure by the year 2025, that men and women have similar overall prevalence of

hypertension, and that such prevalence increase with age consistently in all world regions [2].

According to the World Health Organization, the total prevalence of high blood pressure in Pakistan is estimated to be 25.2% [3]. It also estimates hypertension to cause 7.5 million deaths annually [4].

Hypertension is defined as a Systolic Blood Pressure (SBP) of 140 mmHg or more, or a Diastolic Blood Pressure (DBP) of 90 mmHg or more, or taking antihypertensive medication [5].

Based on the recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7), blood pressure for adults aged 18 years or older has been classified into four categories as normal, prehypertension, stage 1 hypertension and stage 2 hypertension: Normal-systolic<120 mmHg, diastolic<80 mmHg; Prehypertension-systolic 120-139 mmHg, diastolic 80-89 mmHg; Stage 1 Hypertension-systolic 140-159 mmHg, diastolic 90-99 mmHg and Stage 2 Hypertension-160 mmHg or greater, diastolic 100 mmHg or greater [6].

Although nocturia is known to be multifactorial, available literature, scarce at best, does not relate elevated blood pressure level with increased urinary frequency [7-9].

A thorough literature search did not reveal ample pertinent data assessing such a relationship, especially in Pakistan. In order to establish a relevant local data base, this study was therefore intended to determine the association between blood pressure levels and urinary frequency in hypertensive patients.

## Materials and Methods

After taking ethical approval, across-sectional study was carried out in the outpatient department of a secondary care hospital of Karachi among patients with self-reported history of hypertension and on anti-hypertensive medication.

The study sample consisted of a total of 292 patients, aged 18 or above, included in the study by convenient sampling. History of diabetes, cardiac events, neurological disorders, cluster headache, gastrointestinal disease, visual problems, and morbid obesity were exclusion criteria of the study.

After taking informed consent, participants' relevant information was collected by means of a structured questionnaire designed specifically for the study whereas their blood pressure level was measured with the help of sphygmomanometer using stethoscope.

The data were entered and analyzed on SPSS version 20. Chi-square test of independence was applied to determine the association between blood pressure levels and the urinary frequency whereas the significance level was set at 0.05. The duration of the study was 6 months.

## Results

The study results revealed a significant positive association between both systolic and diastolic blood pressure levels and increased urinary frequency (p=0.047 and p=0.045 respectively) where stage 1/stage 2 hypertensive patients were more likely to have increased urinary frequency than those who were normotensive/pre-hypertensive (45.1% vs. 33.0% and 46.9% vs. 35.4% respectively) (Table 1).

Variable	Increased Urinary Frequency		P
	Yes (n=120)	No (n=172)	
	Frequency (%)	Frequency (%)	
<b>Systolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	88 (45.1)	107 (54.9)	0.047
Normotensive/Pre-hypertensive	32 (33.0)	65 (67.0)	

<b>Diastolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	68 (46.9)	77 (53.1)	0.045
Normotensive/Pre-hypertensive	52 (35.4)	95 (64.6)	

**Table 1:** Overall association between blood pressure levels and urinary frequency.

After stratifying on the basis of gender it was seen that among male patients a significant positive association was found only between diastolic blood pressure level and increased urinary frequency (p=0.026) where stage 1/stage 2 hypertensive patients were more likely to have increased urinary frequency than those who were normotensive/pre-hypertensive (53.5% vs. 35.4%) (Table 2).

Variables	Increased Urinary Frequency		P
	Yes (n=66)	No (n=84)	
	Frequency (%)	Frequency (%)	
<b>Systolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	49 (48.0)	53 (52.0)	0.146
Normotensive/Pre-hypertensive	17 (35.4)	31 (64.6)	
<b>Diastolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	38 (53.5)	33 (46.5)	0.026
Normotensive/Pre-hypertensive	28 (35.4)	51 (64.6)	

**Table 2:** Association between blood pressure levels and urinary frequency in males.

After stratifying on the basis of gender it was seen that among female patients none of the systolic or diastolic blood pressure levels were significantly associated with increased urinary frequency (Table 3).

Variables	Increased Urinary Frequency		P
	Yes (n=54)	No (n=87)	
	Frequency (%)	Frequency (%)	
<b>Systolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	39 (42.4)	53 (57.6)	0.171
Normotensive/Pre-hypertensive	15 (30.6)	34 (69.4)	
<b>Diastolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	30 (41.1)	43 (58.9)	0.479
Normotensive/Pre-hypertensive	24 (35.3)	44 (64.7)	

**Table 3:** Association between blood pressure levels and urinary frequency in females.

After stratifying on the basis of age it was seen that among  $\leq 49$  year old patients none of the systolic or diastolic blood pressure levels were significantly associated with increased urinary frequency (Table 4).

Variables	Increased Urinary Frequency		P
	Yes (n=56)	No (n=106)	
	Frequency (%)	Frequency (%)	
<b>Systolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	34 (35.4)	62 (64.6)	0.784
Normotensive/Pre-hypertensive	22 (33.3)	44 (66.7)	
<b>Diastolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	26 (35.6)	47 (64.4)	0.799
Normotensive/Pre-hypertensive	30 (33.7)	59 (66.3)	

**Table 4:** Association between blood pressure levels and urinary frequency among  $\leq 49$  years old.

After stratifying on the basis of age it was seen that among  $\geq 50$  year old patients a significant positive association was found between both systolic and diastolic blood pressure levels and increased urinary frequency ( $p=0.026$  and  $p=0.015$  respectively) where stage 1/stage 2 hypertensive patients were more likely to have increased urinary frequency than those who were normotensive/pre-hypertensive (55.3% vs. 32.3% and 59.7% vs. 37.9% respectively) (Table 5).

Variables	Increased Urinary Frequency		P
	Yes (n=62)	No (n=63)	
	Frequency (%)	Frequency (%)	
<b>Systolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	52 (55.3)	42 (44.7)	0.026
Normotensive/Pre-hypertensive	10 (32.3)	21 (67.7)	
<b>Diastolic Blood Pressure</b>			
Stage 1/Stage 2 Hypertensive	40 (59.7)	27 (40.3)	0.015
Normotensive/Pre-hypertensive	22 (37.9)	36 (62.1)	

**Table 5:** Association between blood pressure levels and urinary frequency among  $\geq 50$  years old.

## Discussion

The study results revealed a significant association between both systolic and diastolic blood pressure levels and urinary frequency ( $p<0.05$  for both) where patients with elevated blood pressure levels complained of higher frequency of urination than those whose blood pressure levels were controlled.

Moreover, after stratifying on the basis of gender and age, this association persisted only for diastolic blood pressure level in male patients and for both systolic and diastolic blood pressure levels in  $\geq 50$  year old patients ( $p<0.05$  for all).

Nocturia is known to be most prevalent in females and in people of older age [7]. The preliminary study findings were therefore re-assessed post gender and age based stratification to control for their potential confounding effects and, as expected, they were found to persist for diastolic blood pressure level in male patients only and for both systolic and diastolic blood pressure levels in  $\geq 50$  year old patients only, indicating that the initial results were indeed confounded by both gender and age of the study participants.

Several factors have been implicated as a cause of increased urinary frequency at night, or at day for that matter, but literature is silent about any potential role of elevated blood pressure levels in such a phenomenon.

Hypertensive patients, even when on anti-hypertensive medication, don't always have well controlled blood pressure levels [10]. As 41.1% of the study participants complained of increased urinary frequency, any potential role of their elevated blood pressure levels was worth investigating. Unfortunately, as a thorough literature search did not reveal any pertinent published data, a meaningful comparison of the study findings with earlier literature could not be made.

## Limitation

The prime limitation of the study was the use of convenient sampling technique because of time constraints.

## Conclusion and Recommendation

The study findings revealed a significant positive association between both the elevated systolic and diastolic blood pressure levels and the increased frequency of urination but after age and gender based stratification, it held true only for diastolic blood pressure level in male patients and for both systolic and diastolic blood pressure levels in patients aged 50 years or above. Further evaluation of the study findings with better study designs and a larger sample size is recommended.

## Conflict of Interests:

The authors report no conflict of interests.

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