

Prevalence And Demographic Profile Of White-coat Hypertension In The Patients Visiting A Tertiary Care Center in Eastern Nepal:

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ABSTRACT

BACKGROUND: There is unequivocal evidence showing that at hospital environment BP levels are usually different from measures found at other settings. Therefore, ambulatory BP is expected to be more dependable, as well as allow the identification of a relevant subgroup of white-coat hypertension patient.

METHODS: This was a single center descriptive cross-sectional study conducted to assess the prevalence of white-coat hypertension among 50 participants consisting of 31 males and 19 females referred for 24 hour Ambulatory BP monitoring in BPKIHS, Dharan, Nepal, between October 2021 to December 2021.

RESULTS: The prevalence of white-coat hypertension was 19 (32%) among 50 participants, while 31(62%) of them had sustained hypertension. Prevalence of WCHTN and sustained hypertension in young age ≤ 35 years was 4 (21.1%) and 10 (32.3%) respectively, similarly middle age 36-54 years was 13(68.4%) and 16(51.6%) and elderly ≥ 55 years was 2(10.5%) and 5(16.1%) respectively. Most participants were of middle age group 36-54 years' age. While of sex distribution pattern of WCHTN and sustained hypertension, male was 11(57.9%) and 20 (64.5%) respectively and female was 8(36.8%) and 15(48.4%) respectively. The association between the demographic variables age, sex and BMI and white-coat HTN was not statistically significant.

CONCLUSION: The study showed that White-coat hypertension was more common in male patients and in middle age group 36-54 years, but was not statistically significant. Prevalence of white-coat hypertension was 19(38%). There was no significant association between white-coat hypertension and demographic variables.

Keywords: White-coat HTN, Sustained HTN, 24hr ABPM monitoring

BACKGROUND

Cardiovascular disease is the leading cause of mortality worldwide, accounting for 30% of all deaths. Today, there is unequivocal evidence showing that at hospital environment BP levels are usually different from measures found at other settings. Therefore, ambulatory BP is expected to be more dependable, as well as to allow the identification of a relevant subgroup of white-coat hypertension patient¹. White-coat hypertension (WCHTN) is defined as elevated office blood pressure but normal blood pressure when measured by Ambulatory Blood Pressure Monitoring (ABPM) ². The main limitation of traditional auscultatory measurement at an office or clinic, apart from observer bias, comes from offering only a momentary BP measurement, usually under circumstances that can influence the BP level. To improve the assessment of actual 24-h BP levels, techniques for obtaining automated BP profiles over 24 h and BP

measurements at home have been developed. Ambulatory BP monitoring (ABPM) is now the gold standard method for evaluating true BP levels, providing a more accurate estimation of true individual BP³. The diagnosis of WCHTN and MHTN has important epidemiological, clinical, and economic implications. Patients with masked hypertension are underdiagnosed and therefore undertreated, presenting significant cardiovascular risk. On the other hand, individuals with WCHTN, which does not substantially increase the cardiovascular risk, may receive unnecessary life-long

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treatment, resulting in economic losses⁴. This descriptive cross sectional study was undertaken in BPKIHS to study prevalence of White-coat hypertension referred to our cardiac facility in BPKIHS and its association with the demographic profiles.

METHODOLOGY

A single center descriptive cross-sectional study was conducted to assess the prevalence of white-coat HTN using 24hr ABPM monitoring. The 24 hour ECG Holter monitoring of 50 consecutive patients from October 2021 to December 2021 were included. Each patient provided an informed consent and the study was approved by institutional review committee (IRC), BPKIHS, Dharan (Ref No:16/078/079).

Inclusion Criteria: Age greater than or equal to 18 years, ABP monitoring done for 24 hours, had hypertension, had at least 70% of expected readings, 20 readings during the day and at least 7 readings during the night and who gave consent.

Exclusion Criteria: Patients with atrial fibrillation, those who consumed medication for hypertension.

The sampling method for this study was convenience sampling.

Using prevalence (P) of White Coat Hypertension to be 9 % in previous studies Paudel N et al⁵. Hence, sample size is estimated using following formula: $n = Z^2Pq/d^2$,

where, n= sample size, Z=95% CI value of 1.96, P= prevalence, q=1-P, d= precision (5%)

The average number of patients visiting cardiology department requiring ABP monitoring is about 12 per month. The duration of the study was 3 months. Hence, there would be about 36 subjects to be evaluated for Holter monitoring. Hence, corrected sample size was estimated using following formula:

$$N = n / (1 + n / \text{estimated sample size}) = 28$$

And after adding 10% of sample size as non responders our sample size would be 31. But all 50 patients presenting during the study period were included in the study.

Blood pressure was measured with auscultatory aneroid sphygmomanometer after five minutes of rest in sitting position with back and arm supported. Standard size cuff was used at the level of heart, recorded in both arm and higher value taken, three readings were taken two minutes apart and BP recorded an average of last two readings in accordance with standard guidelines². Those patients with hypertension, office BP ≥ 140 and or 90 mm Hg would undergo 24 hours ABP monitoring study.

Twenty-four hours Ambulatory Blood Pressure measure (TONOPORT V) was measured using a validated device by oscillometer technique. ABP cuff was wrapped around the patient's arm which was connected to a recorder worn by a patient using a belt around the waist. Patients were instructed to stop moving, not to exert, not to talk and to keep arm still at the level of the heart as cuff would inflate and deflate to record blood pressure. The monitor was programmed to record BP at 30 minutes and 60 minutes' intervals during day and night respectively. The night time was set in accordance with the sleep on and sleep off pattern of the patient commonly between 10 pm to 6 am. Measurements on recorder was downloaded in a computer and analyzed with CARDIOSOFT program and blood pressure was categorized into 24-hour, daytime and nighttime mean. Participants would be included in the analyses if they had at least 70% of expected readings and twenty measurements during the day and at least seven readings during the night, following ESH recommendations.⁶ ABP monitoring was done for 24 hours among the patients who had hypertension. The reports were reviewed by the cardiologists (authors). The ABP monitoring reports were evaluated for the presence of white-coat hypertension or sustained hypertension or nocturnal dipping pattern

The prevalence of White-coat hypertension and Sustained hypertension was compared with the clinically relevant age group distribution of the patients based on (1) young individuals who were ≤ 35 years-old; (2) middle-aged individuals who were within the age range of 36–54 years old; and (3) elderly patients who were ≥ 55 years old; and similarly with sex distribution (male & female). The prevalence of white-coat hypertension and Sustained hypertension was compared with the nocturnal dipping pattern among the participants. The prevalence of these abnormalities were expressed in terms of absolute numbers and percentages. The data were subjected to appropriate Chi-square statistical analyses, where applicable. Classification of hypertension was done as per 2018 ESC/ESH (European Society of Cardiology/ European Society of Hypertension) guideline for the management of arterial hypertension².

All the data were analyzed by using SPSS, version 16 (SPSS Inc., Chicago IL). The prevalence of these abnormalities were expressed in terms of absolute numbers and percentages. The data were subjected to appropriate Chi-square statistical analyses, where applicable.

RESULTS

A total of 50 patients were enrolled in the study; 31(62%) males and 19(38%) females within the age range of 28–68 years with mean age of 41.62(± 9.23) years. (Table 1). Fourteen (28%) patients were young individuals of age ≤ 35

years, 29 (58%) were middle-aged individuals between 36 and 54 years, and 7 (14%) were elderly patients of 55 years and above. Sixteen (32%) patients were smoker and 27(54%) were regular alcohol consumer, 2 patients (4%) were hypertensive not under medication, 16 patients (32%) were diabetic, 16 patients (32%) were dyslipidemic. The prevalence of white-coat hypertension was 19 (32%) among 50 participants, while 31(62%) of them had sustained hypertension.

Table 1. Baseline characteristics of study participants (n=50):

Baseline characteristics	Frequency(percentage)
Age(mean±SD)	41.62±23 years
Male	31(62%)
Female	19(38%)
Smoker	16(32%)
Alcohol intake	27(54%)
Systemic hypertension	2(4%)
Diabetes mellitus	16(32%)
Dyslipidemic	16(32%)
Body mass index (kg/m ²)	
• Underweight (<18.5 kg/m ²)	1(2%)
• Normal weight (18.5-24.9 kg/m ²)	17(34%)
• Overweight (25-29.9 kg/m ²)	24(48%)
• Obese(≥30 kg/m ²)	8(16%)
White-coat hypertension	19(38%)
Sustained hypertension	31(62%)
Nocturnal dipping present	28(56%)
Nocturnal dipping absent	22(44%)

Prevalence of WCHTN and sustained hypertension in young age ≤35 years was 4 (21.1%) and 10 (32.3%) respectively, similarly middle age 36–54 years was 13(68.4%) and 16(51.6%) and elderly ≥55 years was 2(10.5%) and 5(16.1%) respectively. Most participants were of middle age group of 36–54 years age.

Table 2: Prevalence of white-coat HTN and sustained HTN among the study participants (n=50)

Variables	White-coat HTN n=19(38.0%)	Sustained HTN n=31(62.0%)
Age(years)		
≤35 years	4(21.1%)	10(32.3%)
36-54 years	13(68.4%)	16(51.6%)
≥54years	2(10.5%)	5(16.1%)
Gender		
Male	11(57.9%)	20(64.5%)
Female	8(42.1%)	11(35.5%)
Smoker	5(26.3%)	11(35.5%)

Alcoholic	13(68.4%)	14(45.2%)
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While sex distribution of WCHTN and sustained hypertension was male 11(57.9%) and 20 (64.5%) respectively and female 8(36.8%) and 15(48.4%) respectively. Majority of the participants were male. (Figure 1)

Figure 1: Age and sex distribution of white-coat hypertension:

Similarly, in white-coat hypertension participants, night time dipper was present more often 12(63.2%) than nondipper 7(36.8%) than in sustained hypertensive patients, where nighttime dipper was 16(51%) and nondipper 15(48.4%) but the relation was not statistically significant. (p=0.139) (figure 2)

Figure 2: Nocturnal dipping pattern among total participants(N=50)

The association between the demographic variables age, sex and BMI and white-coat HTN was not statistically significant as calculated by chi-square test. (table 3)

Table 3: Association between demographic profile and white-coat HTN and sustained HTN among the study participants(n=50):

Age	White-coat HTN	Sustained HTN	P value
≤35 years	4(21.1%)	10(32.3%)	0.505
36-54 years	13(68.4%)	16(51.6%)	
≥55 years	2(10.5%)	5(16.1%)	
Gender			
Male	11(57.9%)	20(64.5%)	0.640
Female	8(42.1%)	11(35.5%)	
BMI status (according to WHO)			
Under weight <18.5 kg/m ²	0	1(3.2%)	0.403
Normal weight 25-24.9 kg/m ²	6(31.6%)	11(35.5%)	
Overweight 25-29.9 kg/m ²	8(42.1%)	16(51.6%)	
Obese ≥30 kg/m ²	5(26.3%)	3(9.7%)	

Most participants were overweight, followed by normal weight as classified by WHO classification but was not statistically significant.

DISCUSSION

Systemic hypertension is the major disease burden all over the world taking many lives secondary to its vascular events with significant mortality and morbidity.⁷ The prevalence of white-coat hypertension was 19% in our study. In similar study done by Bhattarai M et al⁸ prevalence of white-coat

hypertension was 14.28%.

In our study there was no association between demographic variables like age, sex and BMI with white-coat hypertension. Although both white-coat HTN and sustained hypertension was more common in middle age group (36-54 years) and in male and overweight participants but was not statistically significant. In similar study done by Bhattarai et al white-coat HTN was more common in middle age group (36-55 years) 11(13.42%) and in male participants 8(10.39%) but also was not statistically significant.

In a study done in Eastern Nepal, prevalence was 17% similar to our study. Prevalence of WCH has been estimated as low as 10% and as high as 50% of patients with elevated office BP. Reasons for this wide range are related to the selection of the population studied (treated or untreated, population-based, or referred hypertensive patients) and to the definition criteria. However, prevalence was 26% of untreated and 27% of treated patients with elevated office BP, in a study from Spanish ABPM registry 9. They represent a global prevalence of about 20% of all patients included in the Registry.

Similarly, more male patients were enrolled compared to female patients (M:F=1.6:1), while male and female were in similar number and gender ratio was, M:F=1.2:1 in study done by Bhattarai et al 8, while in study conducted by Kaul U et al, gender ratio was M:F=2:1.10

There was a higher prevalence of WCH among nonsmokers, female gender, and patients with lower clinic SBP, and logistic regression analysis showed that age, gender, and smoking history were independent predictors of WCH as seen in Gupta H et al 11. There was predominance of female patients, elderly, smokers, obese in white-coat hypertension groups in study conducted by Maria L et al 1; while in our study WCH was more in non-smoker 14(73%) compared to smoker 5(26%), male gender 11(57.9%) compared to female 8(42.1%), alcoholic 13(68.4%) compared to nonalcoholic 6(31.6%), nondiabetic 15(12.9%) compared to diabetic 4(6.1%).

In our study, nondippers were found in 22(44%) of participants, similar to Spanish ABPM registry study where 44.5% nondipping was present¹² and similar study done in Kathmandu by Bhattarai M et al⁸ nondipping was present in 33.5% of patients. It is concerning that nondipping worsens the prognosis of hypertensives and is related to advanced cardiovascular disease. The Syst-Eur study found that cardiovascular risk is higher in older white-coat hypertensive nondippers independent of the average 24-h BP¹³. Studies have shown that the risk of future cardiovascular disease events is less in patients with WCH than true hypertensives. In general, individuals with WCH have lower morbidity than patients with sustained

hypertension but high morbidity than the clinically normotensive. Identification of these patients with WCH, which are otherwise at low risk of cardiovascular events, is utmost important to prevent overtreatment.¹¹ Using 24-h ABPM to address major issues, such as reliably diagnosing night-time hypertension and white coat hypertension (WCH) may lead to improved diagnosis of hypertension and reduced healthcare costs for the long-term⁴.

LIMITATIONS OF STUDY

Short duration of study, so limited participants were included. Patients daily routine activities may interfere with the accurate measurement of blood pressure. The prevalence of white-coat hypertension was based on a single office BP measurement which could lead to erroneous diagnosis in real practice in case of different outcome.

CONCLUSIONS

White-coat hypertension was more common in male patients and in middle age group 36-54 years, but was not statistically significant. Prevalence of white-coat hypertension was 19(38%). Prevalence of nocturnal dipping was higher as compared to available literature 12(63.2%). There was no significant association between white-coat hypertension and demographic variables.

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ABBREVIATIONS

ABPM	-	Ambulatory blood pressure monitoring
ACC	-	American college of cardiology
AF	-	Atrial flutter
AFIB	-	Atrial fibrillation
AHA	-	American heart association
CCU	-	Coronary care unit
CI	-	Confidence interval
CVD	-	Cardiovascular disease
DM	-	Diabetes mellitus
ECG	-	Electrocardiogram
ECHO	-	Echocardiography
ESC	--	European Society of Cardiology
HF	-	Heart failure
HTN	-	Hypertension
IHD	-	Ischemic heart disease
MHTN	--	Masked Hypertension
OPD	-	Out patient department
SHT	--	Sustained Hypertension
WCHTN	--	White-coat Hypertension