Evaluation Of The 24 Hours Blood Pressure Variability In Normotensive And Hypertensivve Individuals Diagnosed On Office Readings

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Abstract : To overcome problem of over or under diagnosing of hypertension, the concept of 24hr blood pressure (BP) measurements was evolved. This study was designed to evaluate BP variability in office normotensive and office hypertensive individuals and to diagnose white coat hypertension among office hypertensive individuals and masked hypertension among office normotensives. A total of 50 cases (25 normotensives and 25 hypertensives) were studied. Three consecutive office readings at an interval of 30 minutes were obtained. Then 24 hr ambulatory blood pressure monitoring (ABPM) was mounted. Out of 50 patients, 22 (44%) were true normotensive, 24 (48%) true hypertensive 3 (6%) masked hypertensive, and 1 (2%) with white coat hypertension. Out of 25 hypertensive patients, 24 (96%) were true hypertensive and 1(4%) with white coat hypertensive. The correlation between BMI and Systolic BP by both Office recordings and ABPM measurements showed that with low BMI (17) the MSBP office was 97 and MSBP 24hr was 97, as the BMI increased to the maximum of 35.5 the MSBP office and MSBP 24hr also increased to 190 and 184 respectively. The results show that ABPM technique is superior to office BP measurement and home BP measurement in diagnosing hypertension. ABP monitoring also identifies the individuals having significant BP variability in 24hrs. The white coat hypertension and masked hypertension can also be diagnosed more accurately and certainty. The results also show that the rise in BMI is accompanied by rise in mean systolic BP.

Keywords : hypertension, ambulatory blood pressure monitoring, white coat hypertension, masked hypertension, BMI

Introduction : Blood pressure (BP) is the lateral pressure exerted by circulating blood upon the walls of blood vessels.1 An accurate measurement of blood pressure is very important for the diagnosis and treatment of hypertension.2, 3 As According to WHO 2008 statistics, the prevalence of hypertension was 22.6% among women and 23.1% among men in India.3 It is the significant cause of morbidity and mortality worldwide and has significant impact on the coronary artery disease (CAD) and cerebrovascular accidents (CVA). It is the cause for nearly 7.5 million deaths worldwide which is about 12.8% of all deaths.4 Hence, attaining the diagnosis of high blood pressure and its continuous monitoring is important.

Ambulatory blood pressure (ABP) monitoring has been found to be accurate in all groups of patients including children, pregnant woman, obese and old people. Ambulatory BP monitoring is quite safe.

As the office BP recording measures the instantaneous blood pressure and a typical office BP reading lasting few minutes gives thin slice of a huge data on which physicians make a diagnosis and plan the management for hypertension. The 24 hr BP recording has ability to extend the window of understanding BP fluctuation over extended period. Most studies about the prognostic relevance of BP variations show that higher the alterations in 24-hour BP variability pattern, higher is the hypertensive target organ damage.5 Further there is no diurnal difference of increased amplitude and blood pressure variations on hypertensive target organ damage.6-9

In the present study, an attempt has been made to evaluate the 24 hours blood pressure variability in normotensive and hypertensive individuals as diagnosed on the basis of office readings and to apply the results in clinical practice to reduce the cardiovascular morbidity and mortality.

Materials and Methods : The present study was carried out on patients attending Medicine & Cardiology OPD of a tertiary care hospital. A total of 50 individuals between 18 to 70 years belonging to both sexes (Group 1- consisting 25 normotensive and group 2- 25 hypertensive individuals) were included as subjects. A total of three consecutive office readings at an interval of 30 minutes were obtained. Then 24 hr ABPM monitor was mounted on no dominant arm and removed 24hours later. Readings were made every 15 minutes between 6 am to 10 pm and every 30 minutes between 10 pm to 6 am. The ABPM-05 with the serial number- 2013/507694, manufactured by, the MeditechKft. [H-1184 Budapest, MikszathKalmanu. 24, Hungary] was used for ABPM monitoring. The individuals were categorized by taking into consideration recommended values of Office & Ambulatory BP Measurements.10 Patients taking

Antihypertensive, Patients with secondary hypertension and Pregnant females are excluded from study. The data obtained was analyzed by using appropriate statistical tests.

Results and Discussion : The importance of high BP and its continuous monitoring is well known. The Blood pressure profile since childhood varies with age, sex, weight, height, body mass index (obesity), family history of hypertension, socio - economic status and dietary habits.4, 11This is a well known fact that office BP may not reflect the true BP. An individual patient's BP changes widely throughout a 24-hour period and is therefore impossible to determine accurately, except by repeated measurements. Home BP readings provide a clear picture for accurate diagnosis and management. Thus, the office BP measurements of short duration can mislead the doctor in detecting the correct levels of BP and arriving at correct diagnosis. To overcome the problem of over diagnosing or under diagnosing the hypertension, the concept of 24hr BP measurements was evolved. In spite of the importance of BP variability in 24 hr, much work has not been done. This study was designed to evaluate BP variability in office normotensive and office hypertensive patients and to diagnose white coat hypertension among office hypertensive patients and masked hypertension among office normotensive patients.

The Mean Systolic Blood Pressure (MSBP) office in normotensive was 124.4 and 163.65 in hypertensive patients. The Mean Diastolic Blood Pressure (MDBP) office in normotensive and hypertensive patients was 78.44 and 97.35 respectively. MMAP office was 93.68 in normotensive and 120 in hypertensive patients. MPP office was 46.08 and 66.3 in normotensive and hypertensive patients. The p-valve was 0.01, which is statistically significant (Table 1).

Table 1: Comparison of office BP measurements in Normotensive and Hypertensive patients

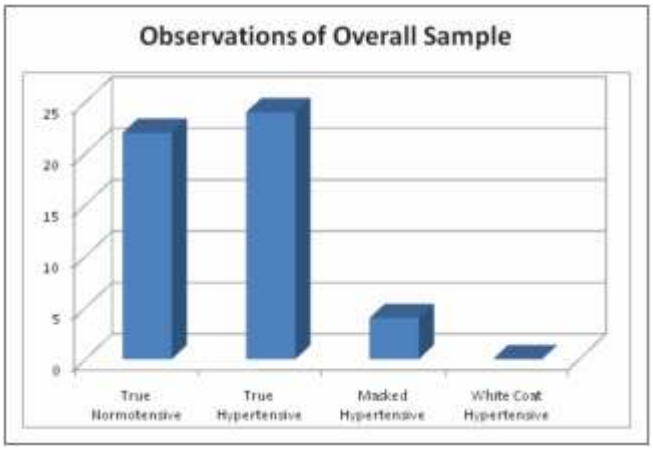
	NORMOTENSIVE	HYPERTENSIVE
MSBP office	124.4	163.65
MDBP office	78.44	97.35
MMAP office	93.68	120
MPP office	46.08	66.3

The MSBP24hr in normotensive was 121 and 154.65 in hypertensive patients. MDBP24hr in normotensive and hypertensive patients was 72.32 and 92.78 respectively. MMAP24hr was 88.72 in normotensive and 113.48 in hypertensive patients. MPP24hr was 48.8 and 62.22 in normotensive and hypertensive patients. The p-valve was 0.01, which is statistically significant (Table 2).

Table: 2 Comparison of 24hour BP measurements in Normotensive and Hypertensive patients

	NORMOTENSIVE	HYPERTENSIVE
MSBP 24hr	121	154.65
MDBP 24hr	72.32	92.78
MMAP 24hr	88.72	113.48
MPP 24hr	48.8	62.22

Out of 50 patients, 22 (44%) were true normotensive, 24 (48%) were true hypertensive 3 (6%) were masked hypertensive, and 1 (2%) with white coat hypertension (Graph 1).



Graph 1: Showing among overall 50 samples, True Normotensive, True Hypertensive, Masked Hypertensive and White Coat Hypertensive

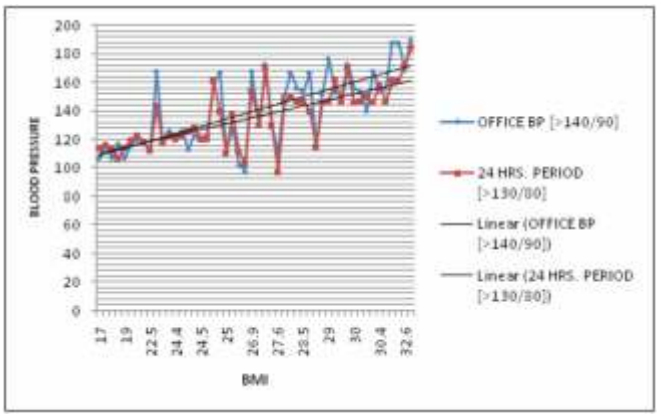
Masked hypertension is defined as untreated hypertensive patients with a clinic BP < 140/90 mmHg and HBPM or daytime ABPM > 135/85 mmHg.12 The correlation of masked hypertension with target organ damage is well known. In our study out of 25 office normotensive patients, 22 (88%) were true normotensive and 3 (12%) with masked hypertensive. Ben-DovIZet et al.13 have found that the prevalence of MH tended to increase from 8% to 18% (P = 0.06). Sobrino 14 and the working group for the study of MH in Spain (ESTHEN) did a prospective study on 302 hypertensive patients with Mean age of 56.2 years and found 48% MH in hypertensive patients. Cacciolatic et al.15 reported overall prevalence of MH in 16% and 41% in participants with a normal office BP. Ugajin et al.16 in Japanese study observed an incidence of MH

to be 11% and Trudel et al.17 has proposed that the higher prevalence of MH is seen in older males and reported a prevalence of 15%. A lot of variations in the incidence of masked hypertension have been reported in the literature. On the perusal of the available literature, more than 10% of patients may have masked hypertension and are subjected to increased cardiovascular risk, despite normal office blood pressure readings.

The patients with raised office blood pressure readings but normal ambulatory blood pressure (< 135/85 mm Hg) without any evidence of target organ damage despite consistently elevated office readings. These patients have "office only" or white coat hypertension, caused by a transient adrenergic response.18

In our study out of 25 hypertensive patients, 24 (96%) were true hypertensive and 1(4%) with white coat hypertensive. Abir-khalil et al.19 observed that from a total of 2462 patients who underwent ambulatory blood pressure monitoring either in borderline hypertension (group 1) or for assessment of antihypertensive treatment (group 2) or for hypotension (group 3). Overall, 817 (33.2%) patients showed WCH, 460 (32.8%) in group 1 and 357 (37.0%) in group 2. Alves et al.20 has also observed that out of one hundred and nine (109) selected subjects for the study, 53.2% subjects were considered normotensive (NT) and 46.8% were diagnosed as hypertensive. From those who are normotensive patients, 64.7% were classified as essential hypertension patients (HT) and 35.3% as white coat hypertensives (WCH). Chrysant21 found in the study of treatment of white coat hypertension the prevalence of WCH is high and varies from 20-45%. Contrary to these studies our study showed only one case (4%) of white coat hypertension. This lower incidence may be because of small sample size, population characteristics, etc.

The correlation between BMI and Systolic BP by both Office recordings and ABPM measurements showed that with low BMI(17) the MSBP off was 97 and MSBP 24hr was 97, as the BMI increased to the maximum of 35.5 the MSBP off and MSBP 24hr also increased to 190 and 184 respectively (Graph 2).



Graph 2: Showing correlation between BMI and Systolic BP by both Office recordings and ABPM measurements

Body mass index (BMI) is independently associated with increased morbidity and mortality from HTN, type II diabetes, cardiovascular disease and other chronic diseases.22 In our study, we can clearly appreciate that with low BMI of 17kg/m2 the MSBP off was 97 and MSBP 24hr was also 97, but as the BMI increased to the maximum of 35.5 the MSBP off and MSBP 24hr also increased to 190 and 184 respectively. Colin et al.23 found that strength of association between BMI and HTN varies in different ethnic groups. The Honolulu Heart Program cohort analyzing old Japanese men revealed the close relationship between basal BMI and systolic and diastolic blood pressures.24 Similar results have been obtained by Huang et al.25 in China and by Amador et al.26 in Mexico and found positive associations between BMI and BP in lean Chinese populations.27, 28 Thus, we can conclude that the rise in BMI (mainly weight) is accompanied by rise in mean systolic BP. As we know that obesity is a known cause of hypertension and our observation is also in accordance with the fact.

The results of present study show that the ABPM technique is superior to office BP measurement and home BP measurement in diagnosing hypertension in true sense. ABP monitoring also identifies the patients who are having significant BP variability in 24hrs. The white coat hypertension and masked hypertension can also be diagnosed with more accurately and certainty. The results also show that the rise in BMI (mainly weight) is accompanied by rise in mean systolic BP.

Conflict of interest : None to declare

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