Ambulatory blood pressure profile and left ventricular geometry in Nigerian hypertensives

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ABSTRACT

Background: Left ventricular hypertrophy (LVH) is an independent cardiac risk factor in hypertensives and the structural classification of left ventricular (LV) geometry provides additional prognostic information. Ambulatory blood pressure (ABP) monitoring has been shown to be superior to office blood pressure (BP) in relation to hypertension LVH. We investigated ambulatory BP variables in relation to LV geometric patterns in Nigerian hypertensives. **Materials and Methods:** A total of 130 patients (males = 96, females = 34) with hypertension had their 24-hours ambulatory BP and trans-thoracic 2D/M- mode echocardiography. Data were analyzed with SPSS 13.0. $P < 0.05$ was considered statistically significant. **Results:** The mean age of the patients was 54.08±11.88 years. The prevalence rate of abnormal LV geometry was 48.4%. Mean ambulatory Systolic BP (day time, night time and 24-hour-average) was significantly higher in patients with LVH compared with those without LVH. Day-night systolic and diastolic BP decay (i.e. percentage nocturnal decline in BP) was also significantly lower in LVH group than in the group without LVH. Patients with eccentric LVH had abnormal day time mean ambulatory systolic BP, night time mean ambulatory systolic BP, elevated day time and night time systolic BP loads, as well as non-dipping diastolic BP pattern. Significant correlates of LV mass index in this study population were mean ambulatory systolic BP (day time: r = 0.355, $P = 0.004$; night time: r = 0.343, $P = 0.005$; 24- hour average: r = 0.358, $P = 0.004$) and day-night decay (systolic: r = -0.388, $P = 0.007$; diastolic: r = -0.290, $P = 0.022$) as well as 24-hour systolic BP variability. **Conclusion:** The presence of LVH in hypertension was associated with higher mean ambulatory systolic BP and lower percentage nocturnal decline in systolic and diastolic BP than its absence which appeared to be worse in patients with eccentric LV geometry when compared with other geometric patterns.

Key words: Ambulatory blood pressure, left ventricular geometry, hypertensives, Nigerians

INTRODUCTION

Ambulatory blood pressure (ABP) monitoring has been shown to be superior to office blood pressure (BP) in relation to hypertension target organ damage.[1] A large number of studies, mostly among white population, have been investigated - on a cross-sectional basis, the organ damage accompanying hypertension is more closely related to 24-hour average than to office BP. The results have almost invariably shown this to be the case regardless of whether the damage is quantified in the heart (LVH or dysfunction), in the kidney (proteinuria), in the brain (cerebral lacunae or white matter lesions as identified by nuclear magnetic resonance), in the small and large arteries, or by a comprehensive organ damage score.[2,3]

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In addition to left ventricular hypertrophy (LVH), which has been widely documented to be an independent cardiac risk factor in both the general population and hypertensive patients,[4,5] the structural classification of LV geometry also provides useful and additional prognostic information.[6-8]

Though some authors have described LV geometric patterns in newly presenting hypertensive patients in Nigerian population,[9] no studies, to the best of our knowledge had investigated ABP variables in relation to LV geometric patterns in Nigerian hypertensive. This study, therefore sought to determine the relationship between ABP and LV geometric patterns in Nigerian hypertensive patients.

MATERIALS AND METHODS

The study population consisted of 130 patients (males = 96, females = 34) with hypertension (mean age 54.08±11.88 years) consecutively selected from those who were referred to the cardiac laboratory of Tender heart Specialist Clinic, Akure, Southwest Nigeria for non-invasive cardiac assessment. Ethical clearance for the study was approved by the Ethics and Research Committee of the University Teaching Hospital Ado Ekiti which the laboratory serves and all the participants gave written consent to participate in the study. Demographic parameters of subjects were noted and recorded. All subjects were clinically examined to evaluate their body mass index (BMI) and cardiovascular status. They were considered hypertensive if they had a resting systolic blood pressure (SBP) >140mmHg and/or diastolic blood pressure (DBP) > 90mmHg measured after at least 15 minutes of rest in the sitting position with a mercury sphygmomanometer and adapted cuff at the brachial artery or if they were on antihypertensive therapy.[10] Korotkoff phase 1 was used for SBP and phase 5 for DBP. Three consecutive measurements were performed at 5-min intervals and the mean values for SBP and DBP were noted as office SBP and DBP, respectively. Excluded were patients with established chronic renal failure (CRF) or serum creatinine >1.5mg% (132 umol/L), ischemic heart disease, congestive heart failure, valvular heart disease, hemoglobinipathy and diabetes mellitus.

Ambulatory BP monitoring

Ambulatory BP was recorded using Schiller BR 102- Plus. The cuff was fixed to the non-dominant arm and the device was set to obtain automatic BP readings at 15-min intervals during the day time and at 30-min intervals during the night-time. The patient was then sent home with instructions to perform his or her usual activities, to hold the arm immobile at the time of the measurements, note on a diary the occurrence of any unusual events, and return 24-h later for device removal. Day time and night time periods were defined individually according to the patient self-reported data of going-to-bed and getting-up times. Interpretation of ABP profile was done according to the recommendations of the British Hypertension Society.[11] Percentage nocturnal BP decline was defined by calculating the percentage of decline in both SBP and DBP during the night, using the following formula: (day time BP–night time BP)/day time BP × 100. A normal dipping pattern (dipper) was diagnosed when the reduction in the average SBP during the night period was >10% of mean SBP during the day. An abnormal dipper pattern (non-dipper) was diagnosed when the night average SBP reduction was <10% with respect to day values.[12]

SBP and DBP loads in the entire 24-h and separately for the day time and night time were calculated. Day time and night time BP loads were calculated using a threshold of 140/90mmHg and 120/80mmHg respectively.[13] The individual loads are the percentage of elevated readings during each time period. SBP and DBP variability was assessed as the standard deviation of the mean (co-efficient of variation) of 24-hour ambulatory SBP and DBP recordings.

Echocardiography assessment

All the patients had transthoracic 2D and 2D-derived M-mode echocardiography performed according to standard procedure, with simultaneous electrocardiographic recordings while in the left lateral decubitus position using a standard ultrasound machine (Philips SONOS 4500) with S3 transducer of frequency 3-1MHZ. LV end-diastolic measurements were taken during at least three cycles[14] and included LV internal diameter (LVIDD), posterior wall thickness (PWT) and interventricular septal thickness (IVST). Left ventricular mass index (LVMI) was estimated from the American Society of Echocardiographic Formula (14) as stated below:

Estimated LVMI (g/m^2) = $0.80\,[1.04\,(LVIDD + PWT + IVST)^3 - (LVIDD)^3] + 0.6g/BSA$.

Upper normal limits for LV mass index were 134 and 110 g/m^2 in men and women.[15] Relative wall thickness (2 × posterior wall thickness/LV diastolic diameter) was calculated.[16] A partition value of 0.45 for relative wall thickness was used for both men and women.[17] Patients with increased LV mass index and increased relative wall thickness were considered to have concentric hypertrophy, and those with increased LV mass index and normal relative wall thickness were considered to have eccentric hypertrophy. Those with normal LV mass index and