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Original Research Article

A Comparative Assessment of Various Hemodynamic Parameters between Urban and Rural Population: An Analytical Study

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Abstract

Aim: The aim of the present study was to assess systolic blood pressure, diastolic blood pressure, mean arterial pressure. pulse pressure, chronic kidney disease.

Methods: The present study was conducted in the Department of Physiology for nine months and involved 100 subjects both from urban and rural areas. The subjects were selected in the age group of 20 to 60 years this was done

Results: The systolic blood pressure of both rural and urban population was compared using F test and a p value of 0.48 was obtained. The diastolic blood pressure of both rural and urban population was compared and analyzed by using F test and we got a p value of 0.0028. The pulse pressure of both rural and urban population was compared by F test which shows a p value of 0.039. The mean arterial pressure of both rural and urban population was compared by using F test where we got a p value of 0.0007.

Conclusion: Obese and overweight population is significantly more in the urban area compared to the rural area. The urban population have a significantly higher S.B.P., D.B.P, M.A.P and P.P than the rural population. There is increased incidence of hypertension in the urban males and females compared to rural males and females. This clearly indicates that the urban populations are at increased risk of cardiovascular disease.

Keywords: Systolic blood pressures, diastolic blood pressure, mean arterial pressure, pulse pressure, chronic kidney disease.

Introduction

The positive association between either systolic blood pressure (SBP) or diastolic blood pressure (DBP) and the risk of cardiovascular disease (CVD) is well established. [1] Blood pressure is also characterized by its pulsatile and steady components. [2–4] The pulsatile component, estimated by pulse pressure (PP), represents blood pressure variation and is affected by left ventricular ejection fraction, large-artery stiffness, early pulse wave reduction, and heart rate. [5] The steady component, estimated by mean arterial pressure (MAP), is a function of left ventricular contractility, heart rate, and vascular resistance and elasticity averaged over time. [2,6]

Pulse pressure (PP), defined as the difference between systolic blood pressure (SBP) and diastolic blood pressure (DBP), is a pulsatile component of the blood pressure (BP) curve as opposed to mean arterial pressure (MAP), which is a steady component.7 In the past decade, PP and MAP are well-established markers of cardiovascular risk in different clinical settings. [7-10] In a general population study, PP predicted cardiovascular but not cerebrovascular mortality. [11] In a recent analysis of the Medical Research Council Mild Hypertension Trial, sphygmomanometric PP was a predictor of coronary events and MAP was a better predictor of stroke than PP. [12] A study of 24-hour BP monitoring also provided evidence that PP is the dominant predictor of cardiac events; MAP is the major independent predictor of cerebrovascular events, [13] whereas results from some epidemiological studies indicate that PP is a better predictor of fatal stroke than MAP. [14]

Some previous studies reported that there were continuous and independent associations between different blood pressure (BP) components and risk of CVD and death [15,16] and compared the performance of these components for incident CVD and mortality. Recent studies on the predictive power of systolic (SBP), diastolic (DBP) and mean arterial pressure (MAP), as well as pulse pressure

(PP), are relatively scarce. Some results reported that SBP is a stronger predictor of CVD than other BP components [17] or is similar to PP, defined as SBP minus DBP, for prediction of CVD or all-cause mortality [18], whereas several epidemiological studies showed that PP is stronger than SBP for prediction of CVD or mortality [19,20] apparently because of increased arterial stiffness, which increases by age and leads to elevated PP. [19]

The aim of the present study was to assess systolic blood pressure, diastolic blood pressure, mean arterial pressure. pulse pressure, chronic kidney disease.

Materials and Methods

The present study was conducted in the Department of Physiology, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India for nine months and involved 100 subjects both from urban and rural areas, the subjects were selected in the age group of 20 to 60 years this was done in accordance to Joint National Committee guidelines [21]

The subjects were supposed to be healthy with no history of any other relevant diseases and were not on any other therapy. The subjects whom we have selected are non- smokers, non-alcoholic and non-hypertensive. Data on demographic characteristics, medical history and habits was obtained with the use of standard questionnaire administered by a trained technologist. The subjects were put on a questionnaire regarding their life style ,food habits, salt intake alcohol, smoking, exercise, sleeping, drinking, education employment divorce was asked to each participant. The consent of the subjects was taken. The following parameters were measured; AGE, HEIGHT, WEIGHT, SBP, DBP, M.A.P. and P.P. Measurements were done between 10-11 AM and the blood pressure was recorded using Littman's stethoscope and mercury manometer in sitting posture. Measurements were taken three times. Care was taken to give five minutes rest to the subject prior to the first measurement. The second measurement was taken after 30 minutes. The average of the three readings was taken as the blood pressure of the individual. The PP is calculated as the difference of SBP and DBP. The MAP is calculated as DBP plus one third of PP. Statistical analysis was done and data obtained was analyzed for comparison of two groups urban and rural by using F test.

Results

Table 1: The test parameters of all subjects

	Rural SBP	Urban SBP	Rural DBP	Urban DBP	Rural PP	Urban PP	Rural MAP	UrbanMAP
N	50	50	50	50	50	50	50	50
MEAN	122.8	134.66	78.18	90.86	44.68	48.92	92.58	104.26
S D	10.15	9.98	5.69	7.93	8.64	8.32	6.44	9.77
S E	1.32	0.996	0.76	0.75	1.14	0.86	0.81	0.979
MAX	140	180	90	130	70	70	103.3	146.9
MIN	100	110	60	80	30	30	73.3	73.2

The test parameters of all subjects are shown.

Table 2: Systolic blood pressure of both rural and urban population

	Rural	Urban
Mean	121.0833333	136.69
Variance	102.450565	98.66050505
Observations	50	50
P(F<=f) one-tail	0.488004236	
F Critical one-tail	1.454002295	

The systolic blood pressure of both rural and urban population was compared using F test and a p value of 0.48 was obtained.

Table 3: Diastolic blood pressure of both rural and urban population

	Rural	Urban
Mean	77.18333333	88.84
SD	32.2539548	63.91353535
P(F<=f) one-tail	0.002811128	
F Critical one-tail	0.672974585	

The diastolic blood pressure of both rural and urban population was compared and analyzed by using F test and we got a p value of 0.0028.

Table 4: Pulse pressure of both rural and urban population

	Rural	Urban
Mean	43.66666667	47.79
SD	74.15819209	69.19787879
P(F<=f) one-tail	0.0395552940	
F Critical one-tail	1.454002295	

The pulse pressure of both rural and urban population was compared by F test which shows a p value of 0.039.

Table 5: Mean arterial pressure of both rural and urban population

	Rural	Urban
Mean	91.52166667	105.2547
Variance	41.14511582	94.57648173
P(F<=f) one-tail	0.000755224	
F Critical one-tail	0.672974585	

The mean arterial pressure of both rural and urban population was compared by using F test where we got a p value of 0.0007.

Discussion

The National High Blood Pressure Education Programme (NHBPEP) showed that high blood pressure was a major unsolved but solvable mass public health problem. The new WHO-ISH classification21 of hypertension is that between 130/80 -140/90 mm Hg above is considered a high blood pressure. The increase in cardiac output increases the systolic pressure, where as an increase in the peripheral resistance increases the diastolic pressure. An important cause of the systolic pressure rise is the decreased distensibility of the arteries and at the same level the cardiac output. The positive association between the systolic and the diastolic pressure [22] and the risk of cardiovascular disease is a well-established factor. The pulse pressure represents the blood pressure variation and is effect by large artery stiffness and left ventricular ejection which is estimated by mean arterial pressure. [23] There is a strong association between overweight and hypertension. [24] High fad diets leads to obesity. [25,26] Men who have waist circumference more than 102 cm have a strong likelihood of developing several disorders, including hypertension. [27] In obese persons plasma insulin and leptin concentrations increase and insulin is a determinant of hypertension. [28]

The systolic blood pressure of both rural and urban population was compared using F test and a p value of 0.48 was obtained. The diastolic blood pressure of both rural and urban population was compared and analyzed by using F test and we got a p value of 0.0028. The pulse pressure of both rural and urban population was compared by F test which shows a p value of 0.039. The mean arterial pressure of both rural and urban population was compared by using F test where we got a p value of 0.0007. Higher SBP levels may reflect the progressive stiffening of the arterial wall, changes in the vascular structure, and the development of atherosclerosis. [29] Decreased DBP may indicate poor coronary flow reserve and coronary perfusion of the myocardium. [30] Increases in PP reflect the stiffening of the conduit vessels. Such vessel stiffening increases pulse-wave velocity, which ultimately increases systemic load while decreasing coronary perfusion pressure. [31] MAP is the steady flow of blood through the aorta and its arteries and equals the cardiac output multiplied by vascular resistance. [2]

Physiologically, several mechanisms may explain the dominant prognostic impact of the steady component of BP (ie, mean BP) on the subsequent cerebrovascular events. The small penetrating end arteries, which supply the medial and basal portions of the brain and brainstem, seem to be particularly vulnerable to the adverse effects of high BP in as much as these arteries arise directly from the main arterial trunks. [32] However, the role of MAP as a surrogate of peripheral vascular resistance tends to become less reliable with aging. Because mean BP is twice as sensitive to diastolic than to systolic BP, the leveling off and the eventual fall in diastolic BP with aging, as opposed to the continued rise in systolic BP, lead to a progressive underestimation of peripheral vascular resistance by the mean BP equation. According to the WHO and ISH lifestyle measures for reducing hypertension include stopping of smoking [33], limiting alcohol consumption, reducing salt intake, eating healthier food, taking more exercise, and maintaining normal bodyweight as larger weight losses are associated with larger blood pressure reductions [34] and learning to cope with stress. Smoking cessation is single most powerful lifestyle measure for the prevention of cardiovascular diseases in hypertensive patients. Maintaining mental and functional abilities into older age is greatly facilitated by healthy habits. Active ageing is maintaining both health and creativity throughout the lifespan and especially into later years. Early detection and treatment will lead to a decrease in morbidity and mortality associated with hypertension. [35]

Conclusion

Obese and overweight population is significantly more in the urban area compared to the rural area. The urban population have significantly higher hemodynamic parameters than the rural population. There is increased incidence of hypertension in the urban males and females compared to rural males and females. This clearly indicates that the urban populations are at increased risk of cardiovascular disease. This shows the effect of westernization of dietary habits and life style on the blood pressure of individuals. The diet of people living in metros has undergone a tremendous change. They have shifted from traditional food to fast food, which has excess salt and less fiber. The urban people have better socioeconomic status, which is also responsible for their affluent lifestyle.

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