

ORIGINAL RESEARCH

Comparison of Blood Pressures, Pulse Rate, Pulse Pressure between prehypertensive and normotensive subjects

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Abstract

Arterial stiffness is a state of stiff arteries, due to thickening of the arterial wall leading to loss of its elasticity reflected in the form of reduced compliance and expansibility. Acute increase in the arterial stiffness, which can be corrected through lifestyle modification in the form of daily routine of exercise, improved dietary habits, increased physical activity, reduced junk food, can be reduced. Subjects with Prehypertensives (SBP between 120-139 mmHg and DBP between 80-89 mmHg), Group consist of (N=45) age-matched prehypertensive subjects belonging to the age group 40-60 yrs. Subjects with Normotensives, (SBP <120 and DBP <80 mmHg) Group consist (N=45) age-matched normotensive subjects belonging to the age group 40-60 yrs. In our study; Pulse Rate- PR (P=0.007)*, Systolic Blood Pressure- SBP (P=0.001)*, Diastolic Blood Pressure- DBP (P=0.001)* Mean Arterial Pressure- MAP (P=0.001)* and Pulse Pressure- PP (P=0.001)* was significantly correlated with Prehypertensive and Normotensive subjects and it is statistically significant.

Keywords: Pulse pressure, prehypertensive, normotensive subjects

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Introduction

Due to increasing prevalence of hypertension, its management since the time of diagnosis, assumes paramount importance. Therefore, many studies were conducted to ascertain and stabilize the treatment options of the same. One of these is the assessment of AS, according to recently emerging studies, which can be used as a potential target for its management. However, no concrete evidence exists establishing a risk factor level of association between AS & BP level. But, of course it's very important to assess the condition of AS in an individual to get a brief idea of BP control. It was also found that not only the impaired BP control, but also increased AS levels in the body are associated with adverse cardiovascular outcome. It was also found that both the variables act independently and affect the same.^{1,2}

There is no concrete evidence in the form of values of PWV interacting with appropriate levels of BP, at

which adverse cardiovascular outcomes occur like stroke, Coronary artery disease, Angina, Myocardial infarction etc. Moreover, BP plays a significant role in determining vessel wall structure, with remodelling occurring to compensate for changes in wall stress. There is a complex relationship between AS and high BP, such that increased AS can augment the BP level, however, conversely, even elevated BP can contribute to vessel wall structure in cases of extreme wall stress, without any evidence in the form of RCTs to use it as a strategy against elevated BP level.^{3,4}

Arterial stiffness is a state of stiff arteries, due to thickening of the arterial wall leading to loss of its elasticity reflected in the form of reduced compliance and expansibility. Acute increase in the arterial stiffness, which can be corrected through lifestyle modification in the form of daily routine of exercise, improved dietary habits, increased physical activity, reduced junk food, can be reduced. However, chronic

increase in the same can be hazardous due to its adverse effect on the principal organs like heart, kidney and brain. It affects the heart due to its effect of increased afterload, which over a period of time, becomes a long-standing stress, affecting their ventricular performance, so that it results in inadequate cardiac output, which may not be sufficient in case of high-demand situation.⁵

Due to increased arterial stiffness, redistribution of blood all over the body happens such that there is hypoperfusion of the kidney which may lead to activation of Renin-Angiotensin-Aldosterone System(RAAS) in the body, leading to a permanent state of slightly elevated BP in the body. If not corrected soon enough, it may also can lead to hypoperfusion of the kidney without any compensatory mechanisms rescuing the kidney. There are various deleterious effects of increased AS on the brain, culminating in the cognitive decline and increasing the risk of cerebrovascular disease like small vessel disease, stroke etc., due to altered blood flow in the brain leading to reduced or increased rate of blood flow. Both hypoperfusion and increased rate of blood flow exert harmful effects on the brain. If hypoperfusion of the brain brings about decreased cognitive function as a consequence, the increased rate of blood flow can be harmful to the small vessels of the microcirculation leading to their rupture.⁶

Methodology

Source of Data

Group-P: subjectswith Prehypertensives (SBP between 120-139 mmHg and DBP between 80-89 mmHg),Group consist of(N=45) age-matched prehypertensive subjects belonging to the age group 40-60 yrs.

Group-N: Subjectswith Normotensives, (SBP <120 and DBP <80 mmHg) Group consist (N=45) age-matched normotensive subjects belonging to the age group 40-60 yrs.

Sample size

The present study included a total sample size of 90.

Inclusion criteria

1. Belonging to age group 40-60 years.
2. Persons who give informed written consent for participation in study.
3. Normotensive.
4. Prehypertensives.

Exclusion criteria

1. Patient refusal.
2. Patients with secondary hypertension.
3. Diabetes Mellitus.
4. Stroke.
5. Dementia.
6. Head injury/ Patients with any Trauma.
7. CHD-congenital heart disease.
8. CAD-coronary artery disease.
9. VHD-valvular heart disease.
10. Cardiac arrhythmias.
11. Patients with PVD-Peripheral vascular disease.
12. Patients on any psychiatric medication.
13. Patients with any Kidney disorders.
14. Patients with any Liver disease.
15. Patients onmedications –antihypertensive, anticoagulants

Results

Table 1:Gender distribution in prehypertensive and normotensive subjects

	PrehypertensiveGroup PN(%)	NormotensiveGroup NN (%)	N (%)
Male	36(80)	30(33)	66(73)
Female	9(20)	15(67)	24(27)
Total	45(100)	45(100)	90(100)

In this study overall following gender distribution was noted with male to female ratio in group P -80% were

males compared to 20% of females. In group N-33% were males compared to 67% females.

Table 2: Comparison of demographic variables (Age, BMI)between prehypertensive and normotensive subjects

Variables	Prehypertensive	Normotensive	Unpaired t test
	Mean ± SD	Mean ± SD	
Age	48.47±6.63	48.16±5.96	P=0.815NS
BMI	25.58±2.91	25.63±3.36	P=0.942NS

Table2. Comparison of Demographic variables: (Age, BMI) between Prehypertensive and Normotensive subjects Demographic variablesAge (P=0.815), BMI

(P=0.942) was not significantly correlated with Prehypertensive and Normotensive subjects

Table: 3 Comparison of BSA between prehypertensive and normotensive subjects

Variables	Prehypertensive	Normotensive	Unpaired t test
	Mean ± SD	Mean ± SD	
BSA	1.69±0.13	1.63±0.15	P=0.027*

Table 3 Comparison of BSA between Prehypertensive and Normotensive subjects.

BSA ($P=0.027^*$) was significantly correlated with Prehypertensive and Normotensive subjects.

Table 4: Comparison of blood pressures, pulse rate, pulse pressure between prehypertensive and normotensive subjects

Variables	Prehypertensive	Normotensive	Mann Whitneytest/Unpaired t test
	Mean \pm SD	Mean \pm SD	
PR(per Minute)	76.20 \pm 9.84	70.93 \pm 9.05	P=0.007*
SBP (mmHg)	129.11 \pm 6.38	114.89 \pm 3.26	P=0.001*
DBP (mmHg)	76.22 \pm 8.51	65.33 \pm 7.79	P=0.001*
MAP (mmHg)	91.901 \pm 9.28	81.84 \pm 5.29	P=0.001*
PP(mmHg)	54.03 \pm 11.03	49.42 \pm 8.59	P=0.001*

Table 4 shows. Comparison of Blood pressure (SBP, DBP, MAP, PR, and PP) between Prehypertensive and Normotensive subjects

In our study; Pulse Rate- PR ($P=0.007^*$), Systolic Blood Pressure- SBP ($P=0.001^*$), Diastolic Blood Pressure- DBP ($P=0.001^*$) Mean Arterial Pressure- MAP ($P=0.001^*$) and Pulse Pressure- PP ($P=0.001^*$) was significantly correlated with Prehypertensive and Normotensive subjects and it is statistically significant.

Discussion

According to some studies, it was found that there was achievement of same target BPs in different individuals, who were put on different types of antihypertensive medications, making one ponder over its differential effect on AS, necessitating the conductance of further studies in order that AS becomes the target of therapeutic intervention. The parameter of AS which showed significant reduction is Central Pulse Pressure (CPP), not PWV. The combination of antihypertensive agents which brought this authentic effect is that of the Angiotensin Converting Enzyme Inhibitors (ACE inhibitors) & Thiazide diuretics. However, AiX did not show any marked alteration.⁷

We have yet to show, whether agents that reduce AS also reduce cardiovascular events independent of any of their other effects on recognized risk factors, such as BP. Therefore, because certain section of antihypertensive medications can indirectly reduce the onset of adverse cardiovascular outcomes, it remains enigmatic, whether it happens so through its effect on BP management or AS separately or both in combination. Though there can be an increase in AS as part of normal aging, it can be affected by various factors, like insulin resistance, smoking and hypertension (HTN) also. Generalised narrowing in the smaller arteries (arteriosclerosis) has long been recognised as the major pathophysiological change in essential hypertension. In contrast, the contribution of decreased elasticity in large to medium-sized arteries in the development of HTN has not been well documented.⁸

We can now say that the main pathophysiological change responsible for high BP being reduced arterial

elasticity in the large and medium-sized vessels, cannot be authentically established, according to few studies. According to few other studies, link has been established between AS & BP. Due to contradictory findings, concrete relationship in the form of cause & effect or risk factor level of association has not been established. Therefore, due to dearth of studies questioning this relationship between AS & elevated BP, my study tries to investigate this equation between the two for betterment in the management of hypertension without any cardiovascular outcomes & ill-effects on the brain health.

Conclusion

In our study; Pulse Rate- PR ($P=0.007^*$), Systolic Blood Pressure- SBP ($P=0.001^*$), Diastolic Blood Pressure- DBP ($P=0.001^*$) Mean Arterial Pressure- MAP ($P=0.001^*$) and Pulse Pressure- PP ($P=0.001^*$) was significantly correlated with Prehypertensive and Normotensive subjects and it is statistically significant.

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