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Original Research Article

Evaluation of Blood Pressure in Different Age Groups- Single Centre Original Study

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Abstract

Background: With the advancement in medical facilities and sudden drop in mortality rate, the elderly are the most rapidly growing population group in the world. On contrary in industrialized societies, blood pressure increases with age, and blood pressure at one age is directly related to blood pressure at an earlier age. Blood pressure is also related to weight, weight change, and maturation. This study is to correlate the association of growth and maturation with blood pressure and the evidence for blood pressure "tracking" with age. Additional longitudinal studies are required to determine if blood pressures before puberty are related to blood pressures of sexually mature young adults. ***Materials and method:*** Prospective randomized sampling was done to include all the patients who came for the dental treatment and their systolic and diastolic blood pressure were recorded. Patients were then divided in 5 groups: group A (21 -30), group B (31 -40), group C (41- 50), group C (51 -60) and group D (61 -70) years of age. Patients who had gestational hypertension, patients already diagnosed with hypertension and on medication for same were excluded. All the five groups consisted of 20 patients each. ***Results:*** A total of 100 patients were evaluated pressure within 5 five groups for systolic and diastolic blood pressure. Over all mean blood pressure of 100 patients were 128/86 mmhg whereas among Group A, B, C, D, E and F mean blood pressure was 118/78, 122/84, 133/88, 130/84 and 138/94 mmhg. Results shows low mean blood pressure among Group A (age group of 21-30) patients that is 118/78mmhg and highest among group F (age group of 61- 70) that is 138/94 mmhg. ***Conclusion:*** With the advancement of age blood pressure also raises up which can be alarming for other progressive systemic diseases. One should have regular check-up, changes in diet and behaviour life style as age advances.

Keywords: Blood Pressure, Age, Variations, Epidemiology.

INTRODUCTION

Twenty years ago, Thompson and Todd published an article entitled "Old age and blood pressure problems." They recorded the blood pressure in a hundred and two Chelsea pensioners over the age of seventy-five, noting that forty-six of them had systolic figures over 150 mm. and twenty-three over 170 mm. They also found that apparently similar men in normal health showed great differences in blood pressure without obvious cause [1]. Several other writers have published figures of blood pressure readings in old age and these show considerable variation in their estimate of the normal. For example, Thewlis quotes Saller as stating that the average figures for men and women between the ages of sixty and sixty-seven are 173/93 and 216/102 respectively, and between sixty-seven and eighty-nine 186/80 and 222/112 respectively [2]. Age is a powerful risk factor for hypertension, death, and cardiovascular death [3]. In this regard, high blood pressure in the elderly confers a three- to fourfold increase in risk for cardiovascular disease, compared to younger individuals [4]. New guidelines have tried to provide evidence-based treatment algorithms in which control of hypertension is just one aspect of general risk factor control, with the aim of decreasing the total risk. According to the World Health Organization, hypertension is the commonest cause of preventable death in developed countries, and it is increasingly significant in developing countries.

Data obtained during the Framingham Heart Study, which followed patients for 30 years, agreed that systolic blood pressure (SBP) shows a continuous increase between the ages of 30 and 84 years or over. Diastolic blood pressure (DBP), however, has a varying pattern with ageing, increasing until the fifth decade and slowly decreasing from the age of 60 to at least 84 years of age. This leads to a steep rise in pulse pressure (PP) with ageing [5]. Isolated systolic hypertension (ISH) (or simply systolic hypertension as some authors prefer, as the term isolated systolic hypertension may minimise the perceived health risk [6] is consequently most prevalent in those aged 50 or over. Large number of studies has revealed that patterns of hypertension change with age. In this regard, systolic blood pressure increases, while diastolic blood pressure decreases after the age of 60. These different patterns indicate us diverse etiologic and hemodynamic mechanisms for hypertension in the elderly population [7]. Several mechanisms involved in hypertension in the elderly have been described in the scientific literature as endothelial dysfunction, increased oxygen delivery to tissues, increased concentration of active metabolites or increased myogenic constriction.

MATERIALS AND METHOD

Study Population

A total of 100 adults aged 21 to 70 years who visited the health centre for dental treatment participated in the study. There systolic and diastolic blood pressure was recorded. Patients who were known hypertensive and were on medication were excluded. 100 Patients were then divided in 5 groups: group A (21 -30), group B (31 -40), group C (41- 50), group C (51 - 60) and group D (61 -70) years of age.

SBP and DBP were measured on the right arm by trained physicians. Patients were supine for 20 minutes before measurements.

All of the hypertensive readings were repeated after _30 minutes to confirm preliminary diagnoses. No participant has ever taken medication to control hypertension. We use the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure classification scheme to define BP categories as hypertensive (SBP _140 mmHg or DBP _90 mmHg), prehypertensive (120–139 mmHg SBP or 80–89 mmHg DBP), and normotensive (SBP _120 mmHg and DBP _80 mmHg).

RESULTS

Mean blood pressure value were calculated within the entire five groups group A: mean systolic blood pressure was 118 mmhg and diastolic 78 mmhg. Group B: mean systolic and diastolic blood pressure was 122/84 mmhg. Group C: mean systolic and diastolic blood pressure was 134/88 mmhg. Group D: mean systolic and diastolic blood pressure was 130/84 mmhg. Group E: mean systolic and diastolic blood pressure was 138/94 mmhg.

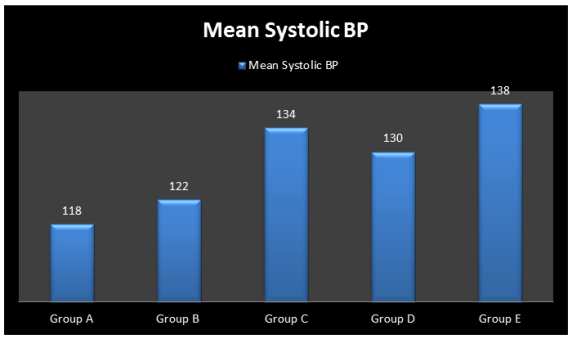

Fig-1

Maximum systolic blood pressure among 100 participants was 170 mmHg whereas minimum systolic blood pressure was 100 mmHg mean systolic blood pressure was 128 mmHg.

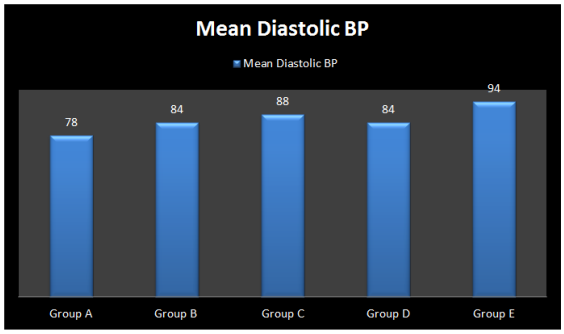

Fig-2

Maximum diastolic blood pressure among 100 participants was 100 mmHg whereas minimum diastolic blood pressure was 60 mmHg mean diastolic blood pressure was 86 mmHg.

Highest blood pressure systolic and diastolic was recorded in group E with the age group of 61- 70 years which was 170/100 mmhg with the mean value of 138/98. And group A had lower range of mean blood pressure among the entire group 118/78.

DISCUSSION

An age-related increase in blood pressure (BP) is viewed as a universal feature of human aging [8-10].

Special definitions of hypertension

White-coat hypertension: A term reserved for those not on antihypertensive medications but with persistently elevated office BP (≥ 140/90 mmHg) together with a normal daytime ambulatory BP (≤ 135/85 mmHg), is also more common in the elderly [11].

Masked hypertension: It is defined as normal BP at office associated with high BP at home, has been

shown to be associated with an increased risk of cardiovascular events [12]. Masked hypertension is frequent in the elderly and is associated with a high vascular profile [13].

Pseudohypertension: It is a falsely increased SBP caused by atherosclerotic and other vascular changes associated with age. The Osler maneuver (i.e. the presence of radial artery pulse that is still palpable after the cuff is inflated above the systolic pressure) should be performed if pseudohypertension is suspected, though it has low sensitivity and specificity [14]. Confirmation of pseudohypertension requires direct intraarterial measurement of BP [15].

Resistant hypertension: It is defined as BP that remains above normal in spite of the concurrent use of 3 antihypertensive agents of different classes. Resistant hypertension is prevalent across all ages, but is more prevalent in elderly patients [16].

Several factors have been identified as contributors to resistant hypertension. Poor patient adherence, physical inertia, inadequate doses or inappropriate combinations of antihypertensive drugs, excess alcohol intake and sleep apnea are some of the most common causes of resistance. Secondary forms of hypertension represent another important contributor to drug resistance.

Epidemiological surveys show a progressive increase in systolic blood pressure (SBP) with age, reaching an average of approx 140 mmHg by the eighth decade [17]. Diastolic BP (DBP) also increases with age but at a lower rate than SBP; DBP may even fall at late ages [18]. Understanding the conditions affecting age-related BP increase is of obvious clinical importance. Higher BP is associated with cardiovascular and renal disease across diverse populations, even controlling for other factors [17]. Hypertension is the leading cause of cardiovascular mortality, and age-related BP increase is a high-priority target for intervention [19]. Results from many studies suggest that "modernization" results in changes in diet, adiposity, activity, and psychosocial stress, leading to higher BP and greater age related increases in BP [20–22].

PATHOPHYSIOLOGY

Arterial stiffness

Elastic arteries show few key physical changes with age. They dilate and become rigid. Aorta and the proximal elastic arteries dilate by approximately 10% with each beat of heart in youth, while the muscular arteries dilate by only 3% with each beat [23]. Such difference in degree of stretch can explain differences in aging between proximal and distal arteries on the basis of fatigue [23]. Fracture of elastic lamellae is seen in the aorta with aging and can account for both dilation and for stiffening (through transfer of stresses to the more rigid collagenous components of the arterial wall) [23]. Autopsy studies of perfusion-fixed human arteries have shown that thickening is mostly confined to intimal layer leading to hyperplasia [24]. The result is a inflexible artery that has decreased capacitance and limited shrink back and is thus unable to accommodate the changes that occur during the cardiac cycle. In addition, during systole the arteriosclerotic arterial vessel exhibits limited expansion and fails to buffer effectively the pressures generated by the heart causing an increase in systolic BP (SBP). Moreover, the loss of recoil during diastole results in reduction in diastolic BP (DBP) [25]. Thus, aging even in normotensive individuals is characterized by an enhance pulse pressure, creating greater pulsatile stress on the arterial system [25]. Arterial stiffness is not only a product of structural changes in the arterial wall, but is also induced by endothelium-derived vasoactive mediators such as endothelin 1 and decreased bioavailability of nitric oxide (NO), which plays a key role in endothelial dysfunction [26, 27]. In contrast to younger patients with hypertension in whom elevated BP is determined primarily by increased peripheral arterial resistance, the isolated systolic hypertension seen in elderly is due to increased arterial stiffness [28].

Neurohormonal mechanisms

Renin-angiotensin- aldosterone system declines with age. Plasma rennin activity at age of 60 years is 40% to 60% of the levels found in younger individuals [29]. This has been accredited to the effect of age-associated nephrosclerosis on the juxtaglomerular apparatus.

Plasma aldosterone levels also decreases with age. Subsequently, elderly patients with hypertension are more prone to drug-induced hyperkalemia [30].

In contrast, net basal sympathetic nervous system activity increases with advancing age. Peripheral plasma norepinephrine concentration in the elderly is double the level found in younger subjects [31]. The age-associated rise in plasma norepinephrine is reflected to be a compensatory mechanism for reduction in β-adrenergic responsiveness with aging [31]. Decreased baroreflex sensitivity with age causes orthostatic hypotension in the elderly [32, 33].

CONCLUSION

The criteria used to define hypertension have changed with time, but although the cut-off points are not agreed by all physicians, it is certain that the elderly have predominantly systolic hypertension and that its treatment can reduce the risk of cardiovascular events. Systemic problems and the increased burden of side effects and comorbidities with ageing need to be taken into consideration when treating elderly and particularly very elderly hypertensive patients, in whom the balance

of risk and benefit from anti-hypertensive treatment remains to be determined.

REFERENCES

1. Thompson, R. J. C., and Todd, R. (1922). Lancet, 2, 503.
2. Thewlis, M. W. (1941). The Care of the Aged (Kimpton).
3. Elliott, W. J. (2004). Management of hypertension in the very elderly patient. *Hypertension*, *44*(6), 800-804.
4. Ooi, H. H., Coleman, P. L., Duggan, J., & O'Meara, Y. M. (1997). Treatment of hypertension in the elderly. *Current Opinion in Nephrology and Hypertension*, *6*(5), 504-509.
5. Franklin, S. S. (1999). Ageing and hypertension: the assessment of blood pressure indices in predicting coronary heart disease. *Journal of hypertension. Supplement: official journal of the International Society of Hypertension*, *17*(5), S29-36.
6. Chaudhry, S. I., Krumholz, H. M., & Foody, J. M. (2004). Systolic hypertension in older persons. *JAMA*, *292*(9), 1074-1080.
7. Izzo, J. L., Sica, D. A., & Black, H. R. (Eds.). (2008). *Hypertension primer*. Lippincott Williams & Wilkins.
8. Finch, C. (2007). The Biology of Human Longevity. San Diego, CA: Academic Press.
9. O'Rourke, M. F., & Nichols, W. W. (2005). Aortic diameter, aortic stiffness, and wave reflection increase with age and isolated systolic hypertension. *Hypertension*, *45*(4), 652-658.
10. Baksi, A. J., Treibel, T. A., Davies, J. E., Hadjiloizou, N., Foale, R. A., Parker, K. H., ... & Hughes, A. D. (2009). A meta-analysis of the mechanism of blood pressure change with aging. *Journal of the American College of Cardiology*, *54*(22), 2087-2092.
11. Wiinberg, N., Høegholm, A., Christensen, H. R., Bang, L. E., Mikkelsen, K. L., Nielsen, P. E., ... & Bentzon, M. W. (1995). 24-h ambulatory blood pressure in 352 normal Danish subjects, related to age and gender. *American journal of hypertension*, *8*(10), 978-986.
12. Angeli, F., Reboldi, G., & Verdecchia, P. (2010). Masked hypertension: evaluation, prognosis, and treatment. *American journal of hypertension*, *23*(9), 941-948.
13. Cacciolati, C., Hanon, O., Alpérovitch, A., Dufouil, C., & Tzourio, C. (2011). Masked hypertension in the elderly: cross-sectional analysis of a population-based sample. *American journal of hypertension*, *24*(6), 674-680.
14. Wright, J. C., & Looney, S. W. (1997). Prevalence of positive Osler's manoeuver in 3387 persons screened for the Systolic Hypertension in the Elderly Program (SHEP). *Journal of human hypertension*, *11*(5), 285.
15. Spence, J. D. (1997). Pseudo-hypertension in the elderly: still hazy, after all these years. *Journal of human hypertension*, *11*(10), 621-623.
16. Calhoun, D. A., Jones, D., Textor, S., Goff, D. C., Murphy, T. P., Toto, R. D., ... & Ferdinand, K. (2008). Resistant hypertension: diagnosis, evaluation, and treatment: a scientific statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research. *Circulation*, *117*(25), e510-e526.
17. Whelton, P. K. (1994). Epidemiology of hypertension. *Lancet (London, England)*, *344*(8915), 101-106.
18. Franklin, S. S., Gustin IV, W., Wong, N. D., Larson, M. G., Weber, M. A., Kannel, W. B., & Levy, D. (1997). Hemodynamic patterns of age-related changes in blood pressure: the Framingham Heart Study. *Circulation*, *96*(1), 308-315.
19. Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo Jr, J. L., ... & Roccella, E. J. (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. *Jama*, *289*(19), 2560-2571.
20. Waldron, I., Nowotarski, M., Freimer, M., Henry, J. P., Post, N., & Witten, C. (1982). Cross-cultural variation in blood pressure: a quantitative analysis of the relationships of blood pressure to cultural characteristics, salt consumption and body weight. *Social Science & Medicine*, *16*(4), 419-430.
21. Steffen, P. R., Smith, T. B., Larson, M., & Butler, L. (2006). Acculturation to Western society as a risk factor for high blood pressure: a meta-analytic review. *Psychosomatic medicine*, *68*(3), 386-397.
22. Young, J. H., Chang, Y. P. C., Kim, J. D. O., Chretien, J. P., Klag, M. J., Levine, M. A., ... & Chakravarti, A. (2005). Differential susceptibility to hypertension is due to selection during the out-of-Africa expansion. *PLoS genetics*, *1*(6), e82.
23. O'rourke, M. F., & Hashimoto, J. (2007). Mechanical factors in arterial aging: a clinical perspective. *Journal of the American College of Cardiology*, *50*(1), 1-13.
24. Dao, H. H., Essalihi, R., Bouvet, C., & Moreau, P. (2005). Evolution and modulation of age-related medial elastocalcinosis: impact on large artery stiffness and isolated systolic hypertension. *Cardiovascular research*, *66*(2), 307-317.
25. Millar, J. A., & Lever, A. F. (2000). Implications of pulse pressure as a predictor of cardiac risk in patients with hypertension. *Hypertension*, *36*(5), 907-911.
26. McEniery, C. M., Hall, I. R., Qasem, A., Wilkinson, I. B., Cockcroft, J. R., & Acct Investigators. (2005). Normal vascular aging: differential effects on wave reflection and aortic pulse wave velocity: the Anglo-Cardiff

Collaborative Trial (ACCT). *Journal of the American College of Cardiology*, *46*(9), 1753-1760.

27. Walsh, T., Donnelly, T., & Lyons, D. (2009). Impaired endothelial nitric oxide bioavailability: a common link between aging, hypertension, and atherogenesis?. *Journal of the American Geriatrics Society*, *57*(1), 140-145.
28. Wallace, S. M., Yasmin, McEniery, C. M., Mäki-Petäjä, K. M., Booth, A. D., Cockcroft, J. R., & Wilkinson, I. B. (2007). Isolated systolic hypertension is characterized by increased aortic stiffness and endothelial dysfunction. *Hypertension*, *50*(1), 228-233.
29. Epstein, M. (1996). Aging and the kidney. *Journal of the American Society of Nephrology*, *7*(8), 1106-1122.
30. Fleg, J. L. (1986). Alterations in cardiovascular structure and function with advancing age. *American Journal of Cardiology*, *57*(5), C33-C44.
31. Seals, D. R., & Esler, M. D. (2000). Human ageing and the sympathoadrenal system. *The Journal of physiology*, *528*(3), 407-417.
32. Davis, B. R., Langford, H. G., Blaufox, M. D., Curb, J. D., Polk, B. F., & Shulman, N. B. (1987). The association of postural changes in systolic blood pressure and mortality in persons with hypertension: the Hypertension Detection and Follow-up Program experience. *Circulation*, *75*(2), 340-346.
33. Kario, K., Eguchi, K., Nakagawa, Y., Motai, K., & Shimada, K. (1998). Relationship between extreme dippers and orthostatic hypertension in elderly hypertensive patients. *Hypertension*, *31*(1), 77-82.