

## How Silent is the Silent Killer Hypertension?: A Study of Blood Pressure and its Components as Predictors of Geriatric Mortality in A Tertiary Care Hospital

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### Abstract

It is a well known fact that hypertension is a silent killer. Is it too silent or can we identify some underlying predictors of mortality? Isolated systolic hypertension, isolated diastolic hypertension and the difference of systolic and diastolic pressure i.e. pulse pressure, each have their role to play in affecting the outcome of hypertension - the most common cardiovascular disease. The present case-control study was planned to determine the effect of these parameters as predictors of all cause mortality in patients aged 60 yrs and above who were either discharged or expired after at least one week of inpatient care at a tertiary level hospital of north India. We conclude that undiagnosed hypertension, isolated systolic hypertension and wide pulse pressure ( $>60.3 \pm 16.2$  mm of hg) are associated with increased mortality in the hospitalized elderly patients.

**Keywords:** Mortality; Hypertension; Isolated Systolic; Pulse Pressure.

### Introduction

Hypertension has been identified as one of the most important risk factor contributing to morbidity and

mortality in any age group and more so in the elderly. Isolated systolic hypertension, isolated diastolic hypertension and the difference of systolic and diastolic pressure i.e. pulse pressure, each have their role to play in affecting the outcome of hospital stay in the elderly. There have been a number of studies to correlate the mortality with these parameters and majority of the studies show that the risk of stroke and cardiovascular events positively correlate to presence of isolated systolic hypertension. Similarly increased pulse pressure has been found to be positively correlated to all cause mortality in patients undergoing haemodialysis. High pulse pressure has also been found to be associated with increased all cause mortality in elderly suffering with any disease [1, 2]. Global Burden of Disease study (GBD-2010) clearly mentioned as few of its important conclusions that "The world has grown considerably older" and "Blood pressure is the biggest global risk factor for disease followed by tobacco, alcohol and poor diet." Here it cannot be overemphasised that screening and treating our population for hypertension that increases in prevalence with age is the single most important step that can have drastic effect on reducing the morbidity-mortality burden in the elderly.

Keeping this in mind, the present case-control study was planned to study the effect of isolated systolic hypertension, undiagnosed hypertension and pulse pressure on all cause mortality in patients aged 60 yrs and above who were admitted in a tertiary care hospital.

### Materials and Methods

This is a one-time retrospective study in which cases (n=50) and controls (n=50) were randomly selected from past medical records of SS Hospital,

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#### *Inclusion Criteria*

*Cases:* Patients aged  $\geq 60$  yrs who died during course of hospital stay

*Controls:* Patients aged  $\geq 60$  yrs who were discharged after treatment

#### *Exclusion Criteria*

1. Among the cases as well as controls, the patients who were diagnosed or suspected to have septicaemia or shock due to any cause since admission, aortic valve stenosis, congestive heart failure or cardiac tamponade were excluded as these are states known to lower blood pressure and/or pulse pressure.
2. The patients who died or were discharged before

seven days since their admission were also excluded.

Three of the systolic and diastolic blood pressure values as on the treatment chart on day 1, 3 and 6 were recorded and the data was put in excel sheet. The difference between systolic and diastolic pressures i.e. pulse pressure was entered. Mean values for all three - systolic, diastolic and pulse pressures were determined. Patients with (i) Isolated Systolic Hypertension (i.e. SBP  $\geq 140$  with DBP  $< 90$  mm of Hg) (ii) Undiagnosed Hypertension (blood pressure  $\geq 140/90$  mm of Hg) on the basis of no past history of hypertension or no treatment history of using antihypertensive medications in the past as entered on the case sheet and (iii) High Pulse Pressure (i.e. mean of SBP-mean of DBP  $\geq 50$  mm of Hg), were identified for both the groups and the data were analysed for means, difference of the means and statistical significance of the difference using SPSS and MS excel.

## Observations and Results

**Table 1:** Group statistics

Parameters	Cases (n=50)	Controls (n=50)	p-value
Age	66.0 $\pm$ 5.8	67.5 $\pm$ 5.9	>0.05 (0.211)
Gender	34 M 16 F	32 M 18 F	>0.05 (0.672)
Mean of SBP	143.9 $\pm$ 20.9	125.5 $\pm$ 15.8	<0.05 (0.0001)
Mean of DBP	83.6 $\pm$ 11.6	79.3 $\pm$ 6.9	<0.05 (0.027)
Mean of PP	60.3 $\pm$ 16.2	46.1 $\pm$ 10.9	<0.05 (0.0001)

**Table 2:** Undiagnosed hypertension and isolated systolic hypertension

Parameters	Cases (n=50)	Controls (n=50)	p-value
Isolated Systolic Hypertension	15 (30%)	3 (6%)	<0.05 (0.001)
Past h/o Hypertension	7 (14%)	6 (12%)	>0.05 (0.766)

## Discussion

In our study the difference in the mean of age and gender of the cases and controls was statistically insignificant ( $p > 0.05$ ) thereby indicating that the cases were well controlled regarding age and gender.

World Health Organization and the Global Burden of Disease Study-2010 have identified Hypertension as one of the major problem of public health. Left untreated, it results in increased cardiovascular disease, cerebrovascular accidents, hypertensive kidney disease, retinopathy, myocardial infarction and is associated with increased all cause mortality [3, 4]. And a continuous increase in prevalence of hypertension along with its complications resulting in increased morbidity and mortality reflects a lack of effective screening, early detection and adequate treatment of this disease at the level of primary health

care [5]. The magnitude of undiagnosed hypertension is as high as 25% of the adult population in some countries [6]. In our study there were only 14% (7/50) cases with past history of hypertension while the number of cases with isolated systolic hypertension were 30% (15/50). So there were at least 16% cases without any prior knowledge of having hypertension. The figures in the control group was 12% (6/50) with past h/o hypertension and 6% (3/50) with isolated systolic hypertension, rest of the 3% might be having hypertension or isolated diastolic hypertension or any type of hypertension on treatment.

The difference in  $p$ -value between the cases and controls was insignificant with regard to past h/o hypertension, thereby implying that the difference in mortality becomes negligible once hypertension is diagnosed and the patients are put on lifestyle modification with or without pharmacological

treatment. In our study we found that the cases i.e. elderly patients who died during their course of hospitalization for various illnesses had their mean systolic blood pressures higher than the controls i.e. those who were discharged after their treatment in hospital and the difference of this mean was statistically significant ( $143.9 \pm 20.9$  mm of hg v/s  $125.5 \pm 15.8$  mm of hg,  $p < 0.05$ ). This is in accordance with many studies done earlier that have found an increased association of systolic hypertension with inpatient mortality in elderly.

The difference in mean diastolic pressures in the two groups was statistically significant ( $83.6 \pm 11.6$  mm of hg v/s  $79.3 \pm 6.9$  mm of hg,  $p = 0.027$  i.e.  $< 0.05$ ) although the significance had a narrow margin when compared with systolic blood pressure or pulse pressure. This is not in accordance with few studies done earlier which have found a statistically significant result only with pulse pressure and systolic pressure and not with diastolic pressure<sup>[7]</sup>. This is due to the fact that increased arterial stiffness in old age is a common denominator for increased systolic and thus wider pulse pressure. Increase in the arterial stiffness with aging is due to intima media calcification in the arterial wall with or without atherosclerosis. Majority of the deaths in hospital are ultimately due to a cardiovascular event and this might be contributing to the observations the earlier investigators got in their studies.

In recent years, more stress has been given to the difference of SBP and DBP i.e. pulse pressure than the DBP and in our study too we found a statistically significant difference in the means of pulse pressure of two groups ( $60.3 \pm 16.2$  mm of hg v/s  $46.1 \pm 10.9$  mm of hg,  $p < 0.05$ ). This is in accordance with a number of studies done earlier, the conclusions of which have established pulse pressure as an important parameter affecting mortality in the elderly [8]. In this study wider pulse pressure was associated with a higher hazard ratio of cardiovascular mortality independent of traditional cardiovascular risk factors without overt coronary heart disease.

### Summary and Conclusions

1. The elderly population of eastern Uttar Pradesh and nearby regions of Bihar, Uttar Pradesh, Madhya Pradesh, Chhattisgarh and Jharkhand needs to be screened for early detection of hypertension.
2. Undiagnosed hypertension, isolated systolic hypertension and wide pulse pressure ( $> 60.3 \pm 16.2$  mm of hg) are associated with increased mortality in the hospitalized elderly patients.

### Limitations of the Study

One limitation of the study is that persistently elevated blood pressures on different occasions during hospital stay though likely to correlate with the diagnosis of hypertension but may deviate from it due to some illnesses that transiently affect blood pressure. Secondly, the cases were not strictly controlled for the speciality of admission because of random selection but it was found that most of the cases as well as their controls belonged to same specialities.

### References

1. Benetos A, Safar M, Rudnicki A, Smulyan H, Richard JL, Ducimetière P, Guize L. Pulse pressure: a predictor of long-term cardiovascular mortality in a French male population. *Hypertension*. 1997 Dec; 30(6): 1410-5. PMID: 9403561.
2. Weiss A, Boaz M, Beloosesky Y, Kornowski R, Grossman E. Pulse pressure predicts mortality in elderly patients. *J Gen Intern Med*. 2009 Aug; 24(8): 893-6. doi: 10.1007/s11606-009-1008-7. [Epub 2009 May 27]. PMID 19472017.
3. Duprez D. Treatment of isolated systolic hypertension in the elderly. *Expert Rev Cardiovasc Ther*. 2012 Nov; 10(11): 1367-73. doi: 10.1586/erc.12.117. PMID 23244357.
4. Abdulle AM, Nagelkerke NJ, Abouchacra S, Pathan JY, Adem A, Obineche EN. Under-treatment and under diagnosis of hypertension: a serious problem in the United Arab Emirates. *BMC Cardiovasc Disord*. 2006 Jun 6; 6: 24. PMID 16753071.
5. Marinković M, Ilić N, Djokić D, Andrejević V, Damjanović G, Samardžić G, Tufegđić S, Vučić-Janković M. Prevalence of hypertension in adults in the Sumadija district, Serbia - a cross-sectional study. *Vojnosanit Pregl*. 2014 Mar; 71(3): 245-50. PMID 24697010.
6. Arhami Dolatabadi A, Motamedi M, Hatamabadi H, Alimohammadi H. Prevalence of undiagnosed hypertension in the emergency department. *Trauma Mon*. 2014 Feb; 19(1): e7328. doi: 10.5812/traumamon.7328. [Epub 2014 Jan 25]. PMID 24719832.
7. Strandberg TE, Salomaa VV, Vanhanen HT, Pitkälä K, Miettinen TA. Isolated diastolic hypertension, pulse pressure, and mean arterial pressure as predictors of mortality during a follow-up of up to 32 years. *J Hypertens*. 2002 Mar; 20(3): 399-404. PMID 11875306.
8. Palmieri V, Devereux RB, Hollywood J, Bella JN, Liu JE, Lee ET, Best LG, Howard BV, Roman MJ. Association of pulse pressure with cardiovascular outcome is independent of left ventricular hypertrophy and systolic dysfunction: the Strong Heart Study. *Am J Hypertens*. 2006 Jun; 19(6): 601-7. PMID 16733232.