



Target Organ Damage in Adult Patients with Isolated Systolic Hypertension Attending a Tertiary Care Hospital in South India.

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Abstract

Background: Isolated systolic hypertension (ISH) is the most common form of hypertension in older adults and is a stronger predictor of cardiovascular morbidity and mortality than diastolic hypertension. Data on target organ damage (TOD) associated with ISH from Indian populations remain limited. Objective: To study systolic hypertension (systolic BP ≥ 140 mmHg with diastolic BP < 90 mmHg) and to assess associated target organ damage in adult patients attending a medical college hospital.

Methods: This prospective, cross-sectional, descriptive study was conducted in the Department of General Medicine, tertiary care centre, over one year. Fifty adult patients (> 18 years) with sustained systolic blood pressure > 140 mmHg and diastolic blood pressure < 90 mmHg were evaluated using a structured data collection form. Retinal, renal, cardiac and cerebrovascular target organ damage were assessed by fundoscopy, urine testing and serum creatinine measurement, electrocardiography, two-dimensional echocardiography and neuroimaging as indicated. Descriptive statistics, independent-samples t-test and ANOVA were applied using IBM SPSS version 22, with $p < 0.05$ considered statistically significant. **Results:** Fifty patients (28 men, 22 women; male-to-female ratio, 1.27:1) with a mean age of 64.88 ± 7.57 years (range 53–85) were studied; 48% were aged 60–69 years. Mean systolic and diastolic blood pressures were 160.04 ± 13.72 mmHg and 81.92 ± 3.98 mmHg, respectively. Risk factors identified included dyslipidaemia (38%), smoking (38%) and BMI > 25 kg/m² (36%); women had a significantly higher mean BMI than men. Hypertensive retinopathy was present in 46% of patients, raised serum creatinine (> 1.5 mg/dL) in 40%, left ventricular hypertrophy with or without myocardial infarction (LVH/MI) in 34%, and stroke including transient ischaemic attack in 22%. **Conclusion:** ISH, particularly when accompanied by smoking, dyslipidaemia and obesity, is associated with substantial retinal, renal, cardiac and cerebrovascular damage even in a resource-limited population. Systematic screening for target organ damage and early, sustained control of systolic blood pressure are warranted to reduce the associated morbidity and mortality.

Keywords: Isolated systolic hypertension; target organ damage; hypertensive retinopathy; left ventricular hypertrophy; India.



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INTRODUCTION

Until the 1980s, diastolic blood pressure (DBP) was regarded as the most relevant haemodynamic parameter for the prognosis of hypertensive patients, and elevated systolic pressure was often dismissed as an inevitable consequence of ageing. Epidemiological studies subsequently produced a radical shift in thinking, establishing that systolic blood pressure (SBP) rises progressively with age while DBP tends to plateau and even decline after the fifth decade of life. This divergence gave rise to the entity of isolated systolic hypertension (ISH), now recognised as the most prevalent form of untreated hypertension in persons over 60 years, as documented in the National Health and Nutrition Examination Survey (NHANES) III.

Severe or prolonged hypertension damages target organs — principally the cardiovascular system, brain, kidneys and retina — increasing the risk of coronary artery disease and myocardial infarction, heart failure, stroke (particularly haemorrhagic), renal failure and death. Despite the availability of numerous antihypertensive agents, blood pressure control remains inadequate, reflecting low awareness among healthcare professionals and patients, undertreatment, and tolerability problems with antihypertensive drugs. There remains a paucity of literature characterising target organ damage in ISH from geriatric populations in India, which prompted the present study.

Aims and Objectives

To study systolic hypertension (systolic blood pressure ≥ 140 mmHg with diastolic blood pressure < 90 mmHg) and to assess target organ damage in the adult age group attending a medical college hospital.

MATERIALS AND METHODS

Study design and setting: This was a prospective, descriptive, cross-sectional study conducted in the Department of General Medicine, tertiary care centre, a medical college hospital in South India from 2022-2023. Fifty consecutive patients satisfying the eligibility criteria were enrolled.

Assessment of target organ damage: Detailed fundoscopic examination was performed and hypertensive retinopathy was graded to assess retinal damage; findings were confirmed by an ophthalmologist blinded to the clinical and echocardiographic data. Renal involvement was assessed by urine microscopy for albuminuria and serum creatinine. Cardiac involvement was assessed by 12-lead electrocardiography (25 mm/s, 10 mm/mV standardisation) using the Sokolow–Lyon criteria ($SV_1 + RV_5$ or $V_6 \geq 35$ mm) for left ventricular hypertrophy (LVH), together with two-dimensional echocardiography and chest radiography. Cerebrovascular involvement (stroke and transient ischaemic attack) was assessed clinically and, where indicated, by computed tomography. Patients with haemoglobin < 12 g/dL were excluded from further routine assessment to reduce potential bias.

RESULTS

Fifty patients with isolated systolic hypertension were studied, comprising 28 men (56%) and 22 women (44%), yielding a male-to-female ratio of 1.27:1. The mean age was 64.88 ± 7.57 years (95% confidence interval 62.73–67.03), ranging from 53 to 85 years; the largest proportion of patients (48%) was in the 60–69-year age group, followed by 28% aged ≥ 70 years and 24% aged 50–59 years.

Table 1. Baseline demographic and clinical characteristics (n = 50)

Characteristic	Value
Mean age, years ($\pm$ SD)	64.88 ± 7.57 (range 53–85)
Age 50–59 years	12 (24.0%)
Age 60–69 years	24 (48.0%)
Age ≥ 70 years	14 (28.0%)
Male sex	28 (56.0%)
Female sex	22 (44.0%)
Mean systolic BP, mmHg ($\pm$ SD)	160.04 ± 13.72
Mean diastolic BP, mmHg ($\pm$ SD)	81.92 ± 3.98
ISH Stage 1	24 (48.0%)
ISH Stage 2	19 (38.0%)
ISH Stage 3	7 (14.0%)

Among modifiable risk factors, dyslipidaemia and smoking were each present in 19 patients (38%), and 18 patients (36%) had a BMI > 25 kg/m². Mean BMI was significantly higher in women than in men ($p < 0.05$).

Table 2. Target organ damage among the study population (n = 50)

Target organ damage	Frequency	Percentage
Hypertensive retinopathy	23	46.0%
Grade 1	5	10.0%
Grade 2	1	2.0%
Grade 3	10	20.0%
Grade 4	7	14.0%
Proteinuria	29	58.0%
Serum creatinine > 1.5 mg/dL	20	40.0%
Creatinine 1.6–2.5 mg/dL	7	14.0%
Creatinine 2.6–3.5 mg/dL	3	6.0%
Creatinine ≥ 3.6 mg/dL	10	20.0%
LVH or myocardial infarction (composite)	17	34.0%
ECG: LVH	10	20.0%
ECG: LVH with strain pattern	6	12.0%
ECG: ischaemic changes	6	12.0%
ECG: first-degree heart block	3	6.0%

Echocardiographic LVH	15	30.0%
Regional wall motion abnormality	6	12.0%
Ejection fraction <60%	6	12.0%
Stroke or TIA (composite)	11	22.0%
Stroke	10	20.0%
Transient ischaemic attack	1	2.0%
Ischaemic subtype	7	14.0%
Haemorrhagic subtype	4	8.0%

Overall, target organ damage was distributed across the four systems assessed: hypertensive retinopathy in 23 patients (46%), renal impairment (serum creatinine >1.5 mg/dL) in 20 patients (40%), cardiac damage (LVH with or without myocardial infarction) in 17 patients (34%), and cerebrovascular damage (stroke including TIA) in 11 patients (22%). These findings are summarised in Table 2 above and are broadly consistent with, though somewhat higher in ocular and renal involvement than, comparable studies from other Indian and international cohorts.

DISCUSSION

Isolated systolic hypertension was historically under-recognised because diastolic pressure was considered the dominant prognostic parameter until epidemiological evidence in the late twentieth century established that SBP continues to rise up to the seventh and eighth decades of life, while DBP plateaus after 50–60 years. Elderly patients with high blood pressure carry a three- to four-fold higher risk of cardiovascular disease compared with younger hypertensive patients, underscoring the clinical importance of characterising ISH-related organ damage in this age group.

The rate of hypertensive retinopathy (46%) and the frequency of advanced (grades 3–4) changes in over a third of affected patients highlights the retina as a sensitive and readily accessible marker of chronic pressure-related microvascular damage in this population. Renal involvement, with proteinuria in 58% and creatinine >1.5 mg/dL in 40% of patients, is higher than in many published series, and may reflect delayed presentation and the largely untreated hypertension typical of populations with limited access to regular screening. Cardiac target organ damage — electrocardiographic and echocardiographic LVH, ischaemic changes and reduced ejection fraction — was evident in roughly a third of patients, consistent with the recognised role of ISH as a driver of left ventricular remodelling through sustained pressure overload. Cerebrovascular events (stroke and TIA) in 22% of patients corroborate the well-documented tripling of stroke risk associated with ISH and reaffirm SBP, rather than DBP, as the principal determinant of cerebrovascular outcomes in older adults.

This study has some limitations. The sample size (n = 50) was modest and drawn from a single centre, limiting generalisability; the cross-sectional design precludes assessment of the temporal evolution of organ damage; and patients with diabetes mellitus and secondary hypertension were excluded, which may understate the burden of target organ damage in the broader hypertensive population. Larger, multicentre, longitudinal studies are needed to validate these findings and to define optimal screening intervals for target organ damage in ISH populations.

CONCLUSION

Isolated systolic hypertension is the most common cause of elevated blood pressure in older adults attending this medical college hospital, and its prevalence and associated organ damage increase with advancing age. In this cohort, ISH — frequently accompanied by smoking, dyslipidaemia and elevated BMI — was associated with substantial retinal (46%), renal (40%), cardiac (34%) and cerebrovascular (22%) damage. These findings support the view that ISH is at least as important a predictor of morbidity and mortality as diastolic hypertension, and that even small, sustained reductions in systolic blood pressure are likely to yield meaningful reductions in target organ damage. Routine screening for retinal, renal, cardiac and cerebrovascular involvement should be incorporated into the management of ISH, particularly in resource-limited settings where hypertension often goes undetected until complications arise.

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