

## Clinical And Biochemical Profile of Newly Detected Hypertensives And Assessment of End Organ Status At The Time of Diagnosis

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**Abstract:** Hypertension is leading cause of morbidity and mortality in India, End organ damage is most common cause of morbidity leading to mortality. Strokes, myocardial infarction, renal failure are the commonest manifestation of end organ damage in patients with hypertension. Early detection and treatment of hypertension and tight control will help to reduce this morbidity and mortality. Hypertension goes asymptomatic in most of the patients. Very few studies are available to assess the end organ damage at the time of detection or diagnosis of hypertension. Hence an attempt to study the status of end organ damage (EOD) in newly detected hypertensive individuals.

**Method and Material:** A cross sectional study of 200 newly detected Hypertension patients were studied clinically and biochemically and assessed with respect to end organ damage.

**Results:** Of the 200 newly detected hypertensive patients, 76% were males and 24% females. 70% were in age group 40-65 years. Hypertension was incidentally detected in 62% cases. 48% of patients were having some form of EOD. Renal involvement was most common followed by Heart, CNS and Retinal involvement.

**Conclusions:** There is high incidence of EOD in newly detected Hypertension patients, early detection, education, treatment and tight control with regular follow up will help to reduce the burden of EOD and thus the morbidity and mortality due to Hypertension.

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### I. Introduction

Hypertension affects individuals of all classes and across all age groups. The prevalence of hypertension increases with advancing age to the point where more than half of people of 60–69 years of age and approximately three-fourths of those 70 years of age and older are affected<sup>[1]</sup>. Hypertension is the leading risk factor for morbidity and mortality throughout the world<sup>[2]</sup>. In India, one out of every five has hypertension and 50% of people above 50 years have hypertension. Epidemiological studies in India show that hypertension is present in 25% urban and 10% of rural subjects<sup>[3]</sup>. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India<sup>[3]</sup>.

The classic manifestations of hypertensive end organ damage includes the following: ischemic and hemorrhagic stroke, retinopathy, coronary heart disease/myocardial infarction and heart failure, proteinuria and renal failure and in the vasculature, atherosclerotic change including the development of stenosis and aneurysms<sup>[2]</sup>. Most patients with Hypertension are unaware of the high blood pressure (BP) for a long time so that a large number of hypertensive patients have target/end organ damage (EOD) when first admitted to hospital. The higher the BP, the greater is the chance of myocardial infarction, heart failure, stroke, and kidney disease<sup>[4]</sup>. The early detection and severity of typical end organ damage and secondary diseases are key determinants of cardiovascular prognosis in patients suffering from arterial hypertension<sup>[1]</sup>. The main goal of treating hypertension is to reduce hypertension-related complications. The prevention and detection of preclinical hypertension related EOD is becoming increasingly important in the stratification of cardiovascular risks. The assessment of target organ damage is important in the evaluation of all hypertensive patients as it provides important information on the severity of the hypertension, the cardiovascular risk and guide management of individual patient. Accurate detection requires specific tests to detect early end organ damage<sup>[4]</sup>. As population ages the prevalence of hypertension will increase even further unless broad and effective preventive measures are implemented<sup>[1]</sup>.

## II. Aims And Objectives

Clinical and biochemical evaluation of adults with newly detected hypertension and to correlate stages of hypertension and biochemical parameters with end organ damage.

## III. Methodology

The present study was a cross sectional study of 200 newly detected hypertensive patients, at a tertiary care centre after obtaining Institutional Ethics committee's permission. All adult patients diagnosed with hypertension (essential or isolated systolic) by the investigator or other medical practitioner within the previous 6 months with valid and clear records (having systolic blood pressure  $\geq$  140 mmHg irrespective of diastolic blood pressure based on average of two or more seated blood pressure readings during each of two or more outpatients visits), irrespective of treatment status were included. Only patients with Pregnancy induced hypertension were excluded. Patients who consented for study were enrolled and their history, clinical examination, relevant biochemical and radiological investigation were done and noted to assess end organ damage and to identify the aetiology of hypertension. Management of each patient was also noted. Two BP measurements were taken at 2 minutes intervals using sphygmomanometer with appropriately sized cuff, after the participant had been seated for 2 minutes. The average of the two measurements was used in the analysis<sup>[5]</sup>. A patient was considered to have uncontrolled blood pressure if he/she had elevated SBP  $\geq$  140 mmHg and/or DBP  $\geq$  90 mmHg on physical examination.

End organ damage-refers to the damage caused in the following organs due to effects of sustained rise in blood pressure-

1. Heart- left ventricular hypertrophy as detected by ECG and or Echocardiography.
2. Kidney- Calculated eGFR  $<$ 60 ml/min/1.73 m<sup>2</sup>.
3. Eyes- features of hypertensive retinopathy on fundoscopic examination.
4. Brain-features of stroke/intracerebral hemorrhage on clinical examination or on radiological investigation.

The data processing solution employed was SPSS (statistic program for social science), version 16, which enabled us to statistically analyze the data and transfer it into graphical representations.

## IV. Observations And Results

A total of 200 patients who were newly detected hypertensives were studied for a period of 1 year. All the above mentioned patients did not have any clinical, biochemical or radiological detection of hypertension or end organ damage before this study period.

**Table No. 1: Age and Sex Distribution**

Age(years)	Total	Male		Female	
		No.	%	No.	%
<40	44	42	95.5	02	04.5
40-65	136	96	70.6	40	29.4
>65	20	14	70.0	06	30.0

The above analysis shows that 95.5% of the cases among <40yrs age group were male which was more as compared to other age groups. The age of the patients was ranging from 19 to 80 years with average of 49.32 yrs. There was a male predilection with 152 cases (76%) and female 48 cases (24 %). Majority of the patients were nonsmokers (61%), while smokers were (39%).14% patients were diabetics while 78 patients (39 %) were prediabetic and 94 patients (47%) were nondiabetic.24% were alcoholic and rest non alcoholics.65% patients had normal lipid profile and 35% had deranged lipid profile. 26% patients with obesity had higher Body mass index for their respective age group.63% were living sedentary lifestyle and 37% non sedentary lifestyle. Incidental detection of HT was the commonest finding (62%), followed by headache(16%), chest pain(10%) and dyspnoea(4%).Pedal oedema, decreased urine output and convulsions were the least common manifestations and constituted 2 % each. 16 % had LVH on ECG and 35% had LVH on echocardiography, while no LVH was seen on ECG of 84 % and on echocardiography of 65 %. 118 cases (59 %) had eGFR  $>$ 60 ml and 82 cases (41 %) had eGFR  $<$ 60 ml.194 cases(97%) had no evidence of hypertensive retinopathy on funduscopy, while 6 cases(3%) showed evidence of hypertensive retinopathy on fundoscopic examination with 2 cases each having Grade I, II, and III retinopathy respectively, however no case with grade 4 retinopathy detected.

**Table 2:** Presentation: Signs and symptoms

Symptom/sign	No. of cases
Incidental finding	124 (62 %)
Headache	32 (16 %)
Chest pain	10 (5%)
Hemiplegia	8 (4%)
Dyspnoea	8 (4%)
Loss of consciousness	6 (3%)
Convulsion	4 (2%)
Decreased urine output	4 (2%)
Pedal Oedema	4 (2%)

**Table 3:**Prevalence of End organ damage

Number of target organ damage	No. of cases
0	104 (52%)
1	36(18%)
2	46(23%)
3	14(7%)
4	0

Of the 200 hypertensive patients recruited in this study, 36 patients (18%) had at least one of the four hypertensive end organ damage (left ventricular hypertrophy by echocardiogram, hypertensive retinopathy, renal insufficiency and stroke).46 patients (23 %) had two organ damage while 14 patients (7%) had three target organ damage and no cases were observed which had all four target organ damage. The organ most affected was the kidney presenting as renal failure 82 patients (41%) followed by heart 70 patients (35%) diagnosed by Echocardiography as left ventricular failure, followed by stroke seen in 6 % patients (CNS).

As per analysis 48.7% of the smokers showed end organ damage which was comparable to 45.9% of non-smokers and the difference was statistically not significant. 42.9% of Diabetic cases showed end organ damage which was more as compared to 36.2% of non-diabetic and less among prediabetes but the difference was statistically not significant.

Data shows that 51.4% of the cases having deranged lipid profile had end organ damage which was more as compared to 44.6% who had normal lipid profile but the difference was statistically not significant. As per analysis 73.1% of obese showed total organ damage which was significantly more as compared to 37.8% of non-obese. Accordingly 52.4% leading sedentary lifestyle, showed end organ damage which was more as compared to 37.8% among non-sedentary lifestyle but the difference was statistically not significant. 50% of alcoholics had end organ damage which was more as compared to 46.1% of non-alcoholics, but statistically non significant. 4.5% of these cases had age<40 years showed target organ damage which was significantly less as compared to 54.4% of the cases had age 40– 65 years and 90% of the cases had age >65years.It can be analysed that females (70.8%) have a higher incidence of end organ damage than males (40.7%).31.3% of the cases among stage 1 hypertension showed total organ damage which was significantly less as compared to 78.8% of the cases among stage 2 hypertension.

## V. Discussion

### Analysis of age and sex distribution innwly detected hypertensives and end organ damage.

In our study the age group of the patients ranged from 19 to 80 years with average of 49.32 years. The youngest patient was 19 years and the eldest was 80 years. The maximum number of hypertensives (68 %) was in the age group of 40 – 65 years. The higher incidence of hypertensives in the 40-65 years age group may be due to the higher hospital attendance rate of this age group. In the present study there is a male predilection with 134 cases (76%) and female 48 cases (24%). However the end organ damage was found to be higher in females 70.8% and males had EOD in 40.7%. The higher EOD in females can be attributed to the fact that the females had lower attendance rate in the present study resulting in delay in the detection of hypertension leading to higher EOD in females.

Ayodele OE et al <sup>[9]</sup> observed that 44.2 % of the hypertensives in his study population were males and 55.8 % were females .The mean age in this study was 55.78 years. The larger population of females in this study reflected the hospital’s female to male hospital attendance rate which was 1.3-1.4:1.

In a study done by Meenakshisundaram R et al <sup>[10]</sup> ,a total of 147 patients were studied, out of which there were 79 (53.7%) males and 68(46.2%) females with mean and median ages were 55 (SD = 9.90) and 54 years,

respectively.

In the present study 4.5% of the cases had organ damage in the age group <40 years, while 54.4% of the cases with end organ damage had age 40 – 65 years and 90% of the cases with end organ damage had age >65 years. Similar to the present study, Abdulrehman IB et al<sup>[6]</sup> also observed a higher incidence of end organ damage (85%) in patients with age group >60 years as well also had a higher predilection of EOD in females (55.3%). Chowta KN et al<sup>[7]</sup> study showed higher prevalence of target organ damage in elderly hypertensives (>60 years) as compared to the young hypertensives (40 years) (79% vs. 46%, p=0.001). Addo J et al<sup>[8]</sup> studied target organ damage in hypertensives and found that the most common age group affected in this study was 35-44 years comprising 58.1 % and higher incidence of EOD in males 59.3% while females showed EOD in 36% cases.

#### **Analysis of smoking in newly detected hypertensives and end organ damage**

In our present study majority of the patients were nonsmokers (61%), while (39%) were smokers . As per analysis in the present study 48.7% of the smokers showed end organ damage which was comparable to 45.9% of non-smokers and the difference was not statistically significant. Addo J et al<sup>[8]</sup> studied newly detected hypertensives with end organ damage and observed that 66.6 % were smokers, although the odds for having hypertension among smokers was almost three times that of nonsmokers, this finding were also statistically not significant.

#### **Analysis of diabetes in newly detected hypertensives and end organ damage.**

In our present study we had 14 % patients were diabetic and 42.9% of diabetic cases showed end organ damage which was more as compared to 36.2% of non-diabetics which is statistically non significant. Addo J et al<sup>[8]</sup> studied newly detected hypertensives with end organ damage and observed that 49.7 % were diabetics similar to our present study and also observed that hypertension tended to be higher in participants with diabetes compared to nondiabetic subjects. Sowers J et al<sup>[11]</sup> observed hypertension is approximately twice as frequent in patients with diabetes compared with patients without the disease.

#### **Analysis of alcoholism in newly detected hypertensives and end organ damage.**

In the present study alcoholic intake was noted in 48 cases (24%) while non alcoholics constituted the majority of 152 cases (76%). Analysis reveals that 50% of alcoholic cases showed end organ damage which was more as compared to 46.1% of nonalcoholic cases which is statistically significant .Hu N et al<sup>[12]</sup> studied newly detected hypertensives with end organ damage and observed that chronic alcohol intake is considered as an independent lifestyle factor that may influence the risk of a number of cardiovascular diseases including hypertension. Klatsky AL et al<sup>[13]</sup> reported high risk of cardiovascular complications due to alcohol .

#### **Analysis of lipid profile, obesity and lifestyle in newly detected hypertensives and end organ damage**

In our present study lipid profile was deranged in 35% and 26 % patients were obese .51.4% of the cases having deranged lipid profile showed end organ damage which was more as compared to 44.6% having normal lipid profile. Analyzing it further showed 73.1% of obese had at least single end organ damage which was significantly more as compared to 37.8% non-obese. Cuspidi C et al<sup>[14]</sup> observed that hypertension reveals an association between metabolic syndrome and organ damage. Approximately 53% of patients with deranged lipid profile and obesity had two or three markers of TOD compared with 33% without deranged lipid profile and obesity. Mule et al<sup>[15]</sup> found that when compared hypertensive subjects with metabolic syndrome to hypertensive subjects without Metabolic syndrome, hypertensive patients with metabolic syndrome exhibited more elevated left ventricular (LV) mass (either normalized by body surface area or by height elevated by a power of 2.7), higher myocardial relative wall thickness, albumin excretion rate (AER) and a greater prevalence of LV hypertrophy (57.7% vs. 25.1%; P < 0.00001), of microalbuminuria (36.2% vs. 19.3%; P = 0.002) and of hypertensive retinopathy (87.7% vs. 48.4%; P < 0.00001). These results held even after correction for age, 24h blood pressures, and duration of hypertension, previous antihypertensive therapy, and gender distribution.

Chaves G et al<sup>[16]</sup> studied hypertensives and found that the overall prevalence of obesity and overweight was 79.6%; the rates of prehypertension and systemic hypertension were 39% and 25%, respectively. It has been shown that, in overweight and obese hypertensive patients Metabolic Syndrome maintains its role as risk factor for LVH, independently of age, Systolic BP, resulting in a useful predictor of target organ damage in clinical practice<sup>[17]</sup>.

We had 126 cases (63%) having sedentary lifestyle and 74 cases (37%) having non sedentary lifestyle. 52.4% among sedentary lifestyle cases showed end organ damage which was more as compared to 37.8% of non sedentary lifestyle. Addo J et al<sup>[8]</sup> also observed by his study that hypertension prevalence was significantly higher in those who were overweight and obese as well as those involved in less physical activity and 69.2 % of the hypertensives had sedentary lifestyle in his study. In present study LVH was observed in 35 % cases which

was similar to study done by Peer N et al<sup>[18]</sup> (35 %) and Addo J et al<sup>[8]</sup> (33.3 %) ,while a higher prevalence rate was observed by other authors as mentioned above. In the present study lower prevalence can be attributed to presence of young age group of newly detected hypertensives.

In the present study we had 3 % cases having hypertensive retinopathy, 1 % in grade 1, 1 % in grade 2 and 1 % in grade 3 respectively. While in a study by Addo J et al<sup>[8]</sup>, he found 56.5 % hypertensives with grade 1 retinopathy, 12.9 % with grade 2 and 1 % cases with grade 3 retinopathy respectively. Abdulrahman IB et al<sup>[6]</sup> observed prevalence of 67% and Ayodele et al<sup>[9]</sup> reported prevalence of 70% retinopathy in Nigeria, high prevalence may be due to racial factor. Lower prevalence of retinopathy in present study as compared to mentioned studies is because above mentioned studies contained high proportion of blacks and prevalence of retinopathy is higher among blacks than Caucasians. The high prevalence is explained in large part by the higher levels of hypertension among blacks. In the present study lower prevalence of hypertensive retinopathy can be attributed to the higher population of young hypertensives .

In the present study it was observed that 41% cases had GFR <60 mL/min/1.73 m<sup>2</sup>. It was analyzed that 56.1% of the cases among <60 eGFR showed presence of proteinuria which was significantly less as compared to 1.7% of the cases among ≥60 eGFR. This prevalence of the present study is comparable to prevalence of nephropathy in studies done by Abdulrahman IB et al<sup>[6]</sup> and Meenakshisundaram R et al<sup>[10]</sup>.

#### **Analysis of Central nervous system involvement as end organ damage in newly detected hypertensives**

In the present study 6 % cases had stroke. Addo J et al<sup>[8]</sup> observed 2.8 % cases with stroke. Ayodele OE et al<sup>[9]</sup> reported stroke in 8.9 % in his study. Stroke is reported to be a major public health problem in SSA (Sub Saharan Africa) where it is reported to be associated with a higher case fatality and to occur at younger ages compared to developed countries.

#### **Analysis of number of end organ damage in newly detected hypertensives**

Of the 200 hypertensive patients recruited in this study, 18% had at least one of the four hypertensive end organ damage studied (left ventricular hypertrophy by echocardiogram, hypertensive retinopathy, renal insufficiency and stroke). 23 % had two organ damage while 7 % had three end organ damage and no cases were observed which had all four end organ damage. The organ most affected was the kidney presenting as renal insufficiency in 41 %, followed by heart in 35 % diagnosed by Echocardiography as left ventricular hypertrophy, followed by cerebrovascular accident seen in 6 % patients and hypertensive retinopathy 3 %.

#### **Analysis of stage of hypertension and end organ damage**

In present study 31.3% of the cases among stage 1 hypertension showed end organ damage which was significantly less as compared to 78.8% of the cases among stage 2 hypertension. Addo J et al<sup>[8]</sup> observed that mean systolic and diastolic blood pressures were higher among those with any end organ involvement compared to those without any damage. In present study, end organ damage was more prevalent among patients who had uncontrolled blood pressure measured on the day of study, with statistical significant difference in prevalence of LVH, retinopathy and renal insufficiency. Although the design of this study cannot allow assessing blood pressure control, it has been shown in other studies by Peer et al<sup>[18]</sup> Shirfkan et al<sup>[19]</sup> ,found that patients with uncontrolled blood pressure have high prevalence of end organ damage as compared to those with controlled blood pressure.

#### **Incidence of number of organs involved in newly detected hypertensives**

In present study there were 48 % of our patients with some form of target organ damage, this finding is comparable to prevalence of target organ damage in hypertensive patients in studies by Ayodele OE et al<sup>[9]</sup> and Addo J et al<sup>[8]</sup>, Abdulrahman et al<sup>[6]</sup> were 60.1%, 47.5%, 68.7% respectively were reported to have at least one organ involved. All three studies showed a high prevalence of the target organ damage among patients with hypertension. These studies concluded that, tight control of blood pressure will reduce the prevalence of target organ damage among hypertensive patients

## **VI. Conclusions**

Most of the studies done were on known hypertensive patients without any mention of duration of hypertension. We have come across very few studies of EOD in newly detected hypertensive patients. The commonest age group affected was 40-65 years. Most were asymptomatic for hypertension and detected as hypertensive incidentally. Females had higher risk of end organ damage than males. Higher incidence of end organ damage was observed among elderly age group. End organ damage was higher in smokers, alcoholics, obese, subjects with non-sedentary lifestyle and deranged lipid profile but their correlation with other groups (nonsmoker, nonalcoholic, nonobese, sedentary and normal lipid profile) was non significant. The most common end organ damage was renal insufficiency and least common was hypertensive retinopathy. Severity of hypertension on diagnosis is a risk factor for end organ damage. Approximately half of the patients had end

organ damage when diagnosed as hypertensive. Dual end organ damage was more common than single end organ damage. This study was limited by the sample size which was relatively small and may have affected the conclusions. Early detection of hypertension and strict control should help in reducing end organ damage in hypertensive population thus help to reduce the morbidity and mortality.

**Table 4:Co-relation of Various Studies with respect to EOD**

Name of authors	LVH	Retinopathy	Nephropathy	Stroke/CNS	age > 60yrs
Addo J et al <sup>[8]</sup> n =219	33.3%	71.2%	4.1%	2.8%	-----
Ayodele OE et al <sup>[9]</sup> n = 147	62 %	70%	18.2%	8.9%	-----
Abdulrahman et al <sup>[6]</sup> n=150	57.3%	68.7%	36.7%	-----	85%
Peer N et al <sup>[18]</sup> ,n=403	35%	---	26%	-----	-----
Meenakshisundaram R et al <sup>[10]</sup> ,n=147	68 %	69%	35%	-----	-----
Salalo et al <sup>[66]</sup> , n= 54	-----	71 %	89.9 %	-----	-----
Chowta KN et al <sup>[7]</sup> ,n=	42.5	32.5%	19%	9.2%	79%
Present study, n= 200	35 %	3%	41%	-----	90%

**Table 5:Association with End Organ Damage**

Diabetes	No. of cases	End Organ Damage				P value
		Yes		No		
		No.	%	No.	No.	
Yes	28	12	42.9	16	57.1	0.006 (NS)
No	94	34	36.2	60	63.8	
Prediabetes	78	48	61.5	30	38.5	
Alcoholic status	No. of cases	Yes		No		P value
		No.	%	No.	%	
		Yes	48	24	50%	
No	152	70	46.1	82	53.9	
Stages of Hypertension	No. of cases	Yes		No		P value
		No.	%	No.	%	
		1	134	42	31.3	
2	66	52	78.8	14	21.2	
Sex	No. of cases	Yes		No		P value
		No.	%	No.	%	
		Males	152	62	40.7	
Females	48	34	70.8	14	29.2	
Age in years	No. of cases	Yes		No		P value
		No.	%	No.	%	
		40	44	02	04.5	
40-65	136	74	54.4	62	45.6	
>65	20	18	90.0	02	10.0	
Lipid Profiles Deranged	Number of cases	Yes		No		P value
		No.	%	No.	%	
		Yes	70	36	51.4	
No	130	59	44.6	72	55.4	

Obesity	No. of cases	Yes		No		P Value
		No.	%	No.	%	
Yes	52	38	73.1	14	26.9	*0.002 NS
No	148	56	37.8	92	62.2	
Lifestyle	No. of cases	Yes		No		P value
		No.	%	No.	%	
Sedentary	126	66	52.4	60	47.6	0.159 (NS)
Non Sedentary	74	28	37.8	46	62.2	
Smoking Status	No. of cases	Yes		No		P Value
		No.	%	No.	%	
Yes	78	38	48.7	40	51.3	0.783 (NS)
No	122	56	45.9	66	54.1	

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