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Profile of Newly Diagnosed Hypertensive Patients at a Tertiary Care Hospital in Himachal Pradesh

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Abstract

***Background and Aim:** Hypertension is an important public health problem in India and one out of every five adults has hypertension. It's continuously rising incidence and prevalence emphasises the need for studying factors contributing to this pandemic. The consequences of hypertension can be devastating for the patient, healthcare provider and the country as a whole.*

***Material and Methods:** This was an observational, cross-sectional study done in 70 patients aged 18 years and above with newly detected hypertension at a tertiary care institute in North India. A pre-designed proforma was used to collect data, like socio-demographic factors with the various clinical parameters, investigations and biochemical parameters.*

***Results:** Most subjects (42.9%) were in the age group of 40 - 59 years. Majority of the patients (58.6%) presented with systolic blood pressure (SBP) 140 - 179 mmHg. Family history of hypertension was present in nearly one-third (35.7%) and most of the patients (51.4%) had a sedentary lifestyle. Increased Waist to hip ratio (WHR) was seen in 61.4 % and 27.1% of the females and males, respectively. Overall, on ECG, 25.7% had evidence of LVH. Deranged serum protein level was seen in 18.6%, dyslipidaemia in 47.1% and HbA1c was in the diabetic range in 22.9% of our subjects.*

***Conclusion:** This study reinforces the importance of regular screening to alter the natural history of hypertension, permit more effective treatment and thus help in reducing the morbidity and mortality.*

***Key words:** Newly diagnosed hypertensive, clinical profile, biochemical profile.*

Introduction

It is estimated that hypertension affects one-third of the world's population[1,2]. It is an important public health problem in India and one out of every five persons has hypertension, while 50% of people above 50 years have hypertension. Ultimately by the age of 78 years, 90% people develop hypertension[3]. Around 7.7 - 10.4 million annual deaths are attributable to elevated blood pressure (BP) levels. It is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India. Research also shows that each 10 millimeters of mercury (mmHg) rise of systolic BP is associated with 45% higher risk for ischaemic heart disease (IHD) and 65% higher risk of cerebrovascular accident (CVA) in those aged 55 - 64 yrs[4,5]. Complications of hypertension are either due to atherosclerosis leading to coronary artery disease (CAD), peripheral artery disease (PAD) and aortic disease or due to pressure changes like left ventricular failure (LVF), intracerebral haemorrhage (ICH) and hypertensive encephalopathy[6].

In the last twenty years prevalence of hypertension in urban locations has stabilised to about 25 - 30%, but it has increased in rural populations from 15 to 25%. This is due to rapid urbanisation of rural populations with consequent changes in lifestyles and increase in overweight and obesity[7,8]. Most research suggests a common pattern, i.e., increasing prevalence of hypertension and strong association with various risk factors.

Himachal Pradesh is rapidly climbing up the hypertension ladder. Various studies report a prevalence of hypertension from 11.3% in adolescents with additional 22.3% pre-hypertensives and 35.9% in rural communities[9,10]. Above all, the Longitudinal Ageing Study of India (LASI), says that a whopping 54.1% of the population (above 45 years) suffers from hypertension and 42.1% are in pre hypertension stage in the state. These figures are much higher than the national average of 44.9% (hypertension) and 39.7% (pre-hypertension)[11,12]. This worrisome and rapidly rising incidence and prevalence of the disease in our state as well as in India emphasises the need for studying factors contributing to this pandemic. On extensive literature review, we could not find any studies from Himachal Pradesh on clinical and biochemical profile of "newly diagnosed" hypertensive patients. Therefore, we

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conducted this study on newly diagnosed hypertensive patients presenting in a tertiary care hospital in Himachal Pradesh.

Material and Methods

This was an observational, cross-sectional study conducted in the Medicine department of Indira Gandhi Medical College and Hospital (IGMCH), Shimla, a tertiary care institute in North India, from August 2023 to February 2024, with the primary objective of studying the clinical and biochemical profile of newly diagnosed hypertensive patients. The sample size consisted of all the consecutive patients who presented to the department of Medicine, IGMCH, Shimla during the study period. All patients aged 18 to ≥90 years were included in the study. Written informed consent was obtained from all participants. In patients who were unconscious, consent was obtained from the next of Kin.

A pre-designed proforma was used to collect data of all newly diagnosed hypertensive patients. All relevant information including personal and demographic details, clinical parameters including vitals, Body Mass Index (BMI), Waist Hip Ratio (WHR), Electrocardiogram (ECG), Chest X-ray (CXR), 2-Dimensional echocardiography (2D-ECHO), fundoscopy and Ankle Brachial Pressure Index (ABPI) were recorded. The lab parameters including, complete haemogram (CHG), liver function test (LFT), Renal Function Test (RFT), high-sensitivity C-reactive protein (hs-CRP), Calcium, Phosphorus, Lipid profile, Haemoglobin A1c (HbA1c), fasting plasma glucose (FPG), serum proteins, Uric acid, Thyroid profile, Vitamin D3, and urine albumin creatinine ratio (UACR) for degree of albuminuria were also collected.

Newly diagnosed hypertension was defined as the average of two consecutive measurements with a 5 minutes gap on the dominant arm with patient sitting (feet touching the ground) and supine, with blood pressure (BP) apparatus at the level of heart, as per Joint National Committee VIII (JNC VIII) guidelines (systolic BP ≥140 mmHg and/or diastolic BP ≥90 mmHg). Before measuring the BP, it was ensured that the patient had taken rest for at least 10 minutes, and did not smoke, or had any tea/coffee, exercise, and other stimulants for at least 30 minutes beforehand. We used the BMI cut-offs as per the Asia-Pacific classification[13] and abdominal obesity, i.e., waist-hip ratio (WHR) cut-offs used were >0.90 in males and >0.85 in females. The cut-offs taken for Ankle Brachial Pressure Indices (ABPI) were given by Qasi *et al* in their study on Society for Vascular Technology's interpretation of resting ABPI measurements[14].

Statistical analysis

The data of all enrolled subjects was collected on a pre-designed proforma and entered in Microsoft Excel 2007 (Microsoft Corp, Redmond, WA) software spreadsheet. It was further cleaned and checked for any transcription errors. The results are presented as means, standard deviations, frequencies and percentages along with their 95% confidence intervals. The statistical software Epi Info version 7.2.6.0 (Centre for Disease Control (CDC), Atlanta, USA)[15]; was used for statistical analysis.

Results

A total of 70 patients were included in the study. Male subjects account for about two-third, i.e., 46 (65.7%) of the total study population. The mean (Standard deviation) age of the study participants was 58.4 (16.4) years. Maximum subjects, i.e., 30 (42.9%), were in the age group of 40 - 59 years. According to the Census 2011, in Himachal Pradesh, 10.03% of the population lived in urban areas while 89.9% lived in rural areas. Although this might have changed since the past 13 years due to increasing urbanisation, but this still may have an impact on the findings of our study population as we had majority of patients, i.e., 48 (68.6%) from rural areas. A family history of hypertension was present in nearly one-third, i.e., 25 (35.7%) of our study population. We found that 36 (51.4%) patients had a sedentary lifestyle or light activity levels. Only 13 (18.6%) had moderate to vigorous activity levels. Mixed diet was consumed by 38 (54.3%), disturbed sleep was present in 16 (2.9%), and alcohol use disorder was reported by 20 (8.6%), while 37.1% of the study participants were smokers. Most of the patients had neurological complaints 24 (34.3%) in the form of acute stroke, 23 (32.8%) presented with cardiovascular complaints such as symptoms of heart failure or myocardial infarction and 10 (14.3%) presented with respiratory symptoms. Surprisingly, 13 (18.6%) patients also presented with gastrointestinal complaints (Table I).

Majority of the patients, i.e., 41 (58.6%) presented with systolic blood pressure (SBP) 140 - 179 mmHg and surprisingly 29 (41.4%) directly arrived with a SBP of 180 mmHg or more. Diastolic blood pressure of most subjects (54.3%) was in the category 90 to 120 mmHg. Thirty six (51.4%) study subjects were found to be either overweight 15 (21.4%) or obese 21 (30%). Only eight (11.4%) had a normal WHR, while out of the remaining 89.6%, increased WHR was seen in 19 (27.2%) males and 43 (61.4%) females. On ECG, 14 (25.7%) had evidence of left ventricular hypertrophy (LVH), 10 (18.6%) had left axis deviation and only two patients had asymmetrical ST-T changes. Most subjects, i.e., 46 (65.7%) had a normal 2D ECHO, 17 (24.3%)

had mild-to-moderate left ventricular systolic dysfunction (LVSD), 6 (8.5%) had severe LVSD and only one patient had concentric LVH. Hypertensive retinopathy of grade I, II and III was present in 16 (22.9%), 11 (15.7%) and three (4.3%) participants, respectively. On chest X-rays, around 15 (21.4%) had cardiomegaly while two (2.9%) presented with fluid overload secondary to heart failure. The Ankle Brachial Pressure Indices (ABPI) detected in our study was normal in 55 (78.6%) participants. Eight (11.4%) study subjects had ABPI above 1.3, which was suggestive of calcification of arteries (Table II).

Laboratory investigations revealed deranged serum protein levels in 13 (18.6%), dyslipidaemia in almost half, i.e., 33 (47.1%), hypothyroidism in 10 (14.3%), deranged fasting plasma glucose level in 24 (34.3%), HbA1c in prediabetic range in 19 (27.1%) and in diabetic range in 16 (22.9%) of our subjects. Micro albuminuria was seen in 15 (21.4%) and macro albuminuria in six (8.6%) of our total study subjects (Table III).

Table I: Socio-demographic profile and presenting complaints of the study participants (N = 70).

Variable	Classification	n (%)
Gender	Male	46 (65.7)
	Female	24 (34.3)
Age Group	18 - 39 years	8 (11.4)
	40 - 59 years	30 (42.9)
	60 - 79 years	24 (34.3)
	80 years and above	8 (11.4)
Residence	Rural	48 (68.6)
	Urban	22 (31.4)
Family history of Hypertension	Absent	45 (64.3)
	Present	25 (35.7)
Level of Physical activity	Low	36 (51.4)
	Moderate	21 (30.0)
	Vigorous	13 (18.6)
Dietary History	Vegetarian	32 (45.7)
	Mixed	38 (54.3)
Sleep	Adequate	54 (77.1)
	Disturbed	16 (22.9)
Alcohol intake	No	50 (71.4)
	Yes	20 (28.6)
Smoking	No	44 (62.9)
	Yes	26 (37.1)
Presenting Complaints	Gastrointestinal	13 (18.6)
	Neurological	24 (34.3)
	Cardiovascular	23 (32.8)
	Respiratory	10 (14.3)

Table II: Clinical parameters and investigations of study participants (N = 70).

Investigation	Classification	n (%)
Systolic BP	≥140 - 179	41 (58.6)
(mmHg)	≥180	29 (41.4)
Diastolic BP	80 - 89	20 (28.6)
(mmHg)	>90 - 119	38 (54.3)
	≥120	12 (17.1)
BMI	Underweight (<18.5)	5 (7.1)
(Kg/m^2)	Normal (18.5 - 22.9)	29 (41.4)
	Overweight (23 - 26.9)	15 (21.4)
	Obese (≥27)	21 (30.0)
WHR	Normal (Both males and females)	8 (11.4)
	Females >0.85	43 (61.4)
	Males >0.90	19 (27.1)
ECG	Normal	44 (62.9)
	Left axis	10 (14.3)
	LVH	14 (20.0)
	ST-T changes	02 (2.9)
ECHO	Normal	46 (65.7)
	Mild-to-moderate LVSD	17 (24.3)
	Severe LVSD	6 (8.6)
	Concentric LVH	1 (1.4)
Fundoscopy	Normal	40 (57.1)
	Hypertensive Retinopathy Grade I	16 (22.9)
	Hypertensive Retinopathy Grade II	11 (15.7)
	Hypertensive Retinopathy Grade III	3 (4.3)
	Hypertensive Retinopathy Grade IV	0 (0)
Chest X-Ray	Normal	53 (75.7)
	Cardiomegaly	15 (21.4)
	Fluid Overload	2 (2.9)
Ankle Brachial	Likely normal (>1.3)	55 (78.6)
Pressure Indices	Probable calcification (1 to 1.3)	8 (11.4)
(ABPI)	Mild disease (0.9 - 1.0)	4 (5.7)
	Claudication (0.5 - 0.9)	3 (4.3)
	Severe occlusive disease or critical limb ischaemia (<0.5)	0 (0)

Table III: Lab Parameters of study participants (N = 70).

Lab parameter	Range	n (%)	95% CI
Haemoglobin (g/dL)	>12	52 (74.3)	62.4 - 84.0
	10-11.9	18 (25.7)	16.0 - 37.6
	<10	0 (0)	-
TLC (per microlitre)	<4,000	58 (82.9)	71.9 - 90.8
	4000 - 11000	02 (2.9)	0.4 - 9.9
	>11000	10 (14.3)	71. - 24.7
Platelet count (per micro litre)	<150000	61 (87.1)	76.9 - 93.9
	150000 - 300000	9 (12.9)	6.1 - 23.0
	>300000	0 (0)	-
hs-CRP (mg/dL)	<1	39 (55.7)	43.3 - 67.6
	1 - 3	10 (14.3)	7.1 - 24.7

	>3	21 (30.0)	19.6 - 42.1
RFT	Normal	54 (77.1)	-
	Deranged	16 (22.9)	-
Electrolytes	Normal	53 (75.7)	-
	Deranged	17 (24.3)	-
Calcium	Normal	38 (54.3)	-
	Deficiency	32 (45.7)	-
Phosphorus	Normal	59 (84.3)	-
	Hyperphosphataemia	11 (15.7)	-
Vit D3 (ng/dL)	≥ 20	27 (38.6)	21.2 - 50.9
	≤ 20	43 (61.4)	49.0 - 72.8
LFT	Normal	59 (84.3)	-
	Deranged	11 (15.7)	-
Serum Protein	Normal	57 (81.4)	-
	Deranged	13 (18.6)	-
Lipid Profile	Normal	37 (52.9)	-
	Deranged	33 (47.1)	-
Thyroid Profile	Normal	60 (85.7)	-
	Hypothyroidism	10 (14.3)	-
FPG	Normal	46 (65.7)	-
	Deranged	24 (34.3)	-
HbA1C (%)	<5.7	35 (50.0)	37.8 - 62.2
	5.7 - 6.4	19 (27.1)	17.2 - 39.1
	>6.4	16 (22.9)	13.7 - 34.5
Urine ACR	Normal	49 (70.0)	-
	Microalbuminuria	15 (21.4)	-
	Macroalbuminuria	06 (8.6)	-

Discussion

The mean (SD) age of our newly diagnosed hypertensive patients was 58.4 (16.4) years. Similar studies by Varghese *et al* and Kaur *et al* found that mean age was lower at 41.6 and 47 years respectively[16,17]. Our study found that the largest proportion of patients (42.9%) were in the age group of 40 - 59 years; similarly Pokkuluri *et al* in Telangana also found that 69.8% patients belonged to 30 - 60 years age group[18]. This implies that most of the population lying in this age group is negligent about their health and arrive in hospital due to development of complications secondary to newly diagnosed hypertension. Gender-wise distribution is suggestive of male dominance (65.7%) in newly diagnosed hypertensive patients. Contrary to this, Varghese *et al* found that females (52.6%) were more than males in their study[16]. Referring to the level of physical activity in our study subjects, 51.4% were sedentary or had low physical activity, i.e., they avoided any kind of exertion. A similar study in Telangana[18] found that 29.1% study subjects had no physical activity. These results highlight the association of hypertension with physical inactivity, indirectly suggesting the importance of physical activity in avoiding the development of hypertension. On enquiring about the patients' personal history, more than half, i.e., 54.3%, consumed mixed diet, nearly one fourth, i.e., 22.9% had disturbed sleep habit, 28.6% consumed alcohol and more than one third, i.e., 37.1% were smokers. Almost similar findings were seen by Pokkuluri *et al*[18]. These are suggestive of significant impact of one's personal choices on his/her predisposition to develop hypertension.

Most patients presented with neurological symptoms, primarily stroke (34.3%) and cardiovascular complaints, mainly myocardial infarction, and heart failure. Similar findings were seen by Vinayak *et al*[19] in South India. Contrary to this, Singh *et al*[20] in North India found headache (58%) and giddiness (44%) to be the commonest presenting complaints. We also found respiratory symptom, mainly dyspnoea in 14.3% patients, which was less than 20.5% seen by Vinayak *et al* (20.5%) in their study[18]. However, we saw gastrointestinal symptoms in 18.6% of our patients, which were not seen in both of the above studies[19,20].

41.4% of our study subjects presented with hypertensive crisis, which was lower than 66% found by Singh *et al*[20] in Haryana. Considering the BMI, a significant chunk of our patients, i.e., 51.4% were either overweight or obese. Moderate increases in BMI have been shown to be associated with diastolic hypertension in men[21]. Discussing about waist hip ratio, only 11.8% of the subjects had a normal waist hip ratio. Canada Fitness Survey data for people aged 20 to 69 years were analysed by White *et al* in 1986, in which they found waist hip ratio to be in close association in hypertensive men of age 40 - 59 years, and women of age 40 - 69 years[21].

Nearly one-fifth of our study participants (21.7%) were found to have left ventricular hypertrophy changes as diagnosed by the Sokolow Lyon criteria. In 2019, Cao *et al* studied ECG-LVH and cardiovascular disease (CVD) mortality. They found that ECG-LVH prevalence rates (2.40%, 4.45%, 5.75%, 8.51%, 14.38%) increased exponentially as systolic blood pressure increased from 120 to 160 mmHg in individuals with a positive family history of hypertension[22].

Nearly one third of patients, i.e., 30%, were found to have CRP levels in the high-risk range, highlighting the role of inflammation in the development of hypertension. Published literature has also shown that raised CRP levels are associated with development of hypertension[23,24]. RFT's were found to be deranged in about one fourth, i.e., 22.9% of our study subjects which is suggestive of either renal aetiology of hypertension or renal parameters derangement because of hypertension itself and this has also been corroborated in a study done by Adamczak *et al*[25]. Serum calcium levels were found to be deficient in 45.7% patients and even higher number of subjects (61.4%) had vitamin D deficiency. Siddiqee *et al* in their systematic review and

meta-analysis from five South Asian countries also found an overall 68% pooled prevalence of vitamin D deficiency. The highest prevalence of vitamin D deficiency was found in Pakistan (73%) followed by Bangladesh (67%), India (67%), Nepal (57%) and Sri Lanka (48%) respectively[26]. Contrary to this, another study[27] found a higher prevalence of vitamin D deficiency among school children in Himachal Pradesh. This can be explained by inadequate sun exposure due to work profile of study subjects.

Lipid profile was found to be deranged in nearly half (47.1%) of our study subjects implying that dyslipidaemia has a strong association with hypertension. Studies in United States and Taiwan have also concluded the same[28,29]. Both these studies also concur with our findings that prevalence of high blood pressure and mean levels of systolic and diastolic blood pressure increased as BMI increased. Effect of thyroid disorder was also studied in our subjects and only 14.3% were found to have hypothyroidism. This was contrary to findings of Åsvold *et al*[30] and Berta *et al*[31] which demonstrated that elevated diastolic and systolic blood pressure is present in around one-third of patients with overt hypothyroidism. Fasting plasma glucose was found to be deranged in nearly one third, i.e., 34.3% of our study participants. Prediabetic or diabetic range of HbA1c was found in 50% of the subjects. A significant proportion of the population is unaware of their diabetic status and is aware of it once incidentally newly diagnosed with hypertension. Alderman *et al*[32] found an even higher percentage with 54% having elevated baseline plasma glucose, giving no history of diabetes. Urine ACR is an indicator of relative speed of progression to chronic kidney disease. Glomerular hyperfiltration initiates a cycle of progressive increases in intraglomerular pressure and repetitive renal injury. In our study, 21.4% of our patients were found to have macroalbuminuria and 8.6% had microalbuminuria. Wang *et al* in their study have also supported the premise that microalbuminuria is an early finding in individuals with a predisposition to hypertension[33].

Conclusion

This study results highlight the fact that one or more co-morbidities like diabetes mellitus, dyslipidaemia, hypothyroidism etc., may exist in patients newly diagnosed with hypertension, suggesting that multifactorial interplay leads to the development of cardiovascular disease in these patients. A large proportion of the population presented with sequelae of hypertension like stroke, heart failure, renal failure and myocardial infarction showing that they were unaware of their hypertension status or did not know about its complications. They came to know about these co-morbidities or complications incidentally when work up was done for hypertension.

The study reinforces the importance of making the population aware about hypertension and holding regular screening camps in rural as well as urban areas so that we can diagnose hypertension and intervene at a point where permanent damage has not been done. Early intervention and treatment offer a chance to alter the natural history of the disease, permit more effective treatment and thus help in reducing the morbidity and mortality from the disease.

Ethical considerations

The study ensured that ethical considerations were met by obtaining approval from the Institutional Ethics Committee of Indira Gandhi Medical College Shimla, Himachal Pradesh vide their letter no. IEC/IGMC/83/2023-24, dated 9th June 2023. Before enrollment, written and informed consent was taken for the study from each participant. Privacy and confidentiality of all the study participants were maintained as per the ethical principles for medical research involving human subjects as mentioned in the Indian Council of Medical Research (ICMR) as well as those in the Declaration of Helsinki guidelines.

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