

Original Research Article

Silent but not harmless: asymptomatic hypertension, medication non-adherence and complications in a rural Punjab outreach population

Mansimrat Singh^{1*}, Anureet Kaur², Gaganjyot Kaur³, Mandeep Singh⁴, Prabhnoor Kaur¹

¹College of Nursing, Punjab, India

²College of Nursing, Ludhiana, Punjab, India

³Mehlan, Punjab, India

⁴PAU (KVK Kheri), Punjab, India

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*Correspondence:

Dr. Mansimrat Singh,

E-mail: mansimrat007@gmail.com

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ABSTRACT

Background: Hypertension is often symptomless and consequently can go diagnosed until it accelerates and causes medical emergencies. This study determined the prevalence of hypertension, presence of symptomless cases, adherence to antihypertensive medications, complications and awareness among adults residing in outreach camps in two rural villages in Sangrur, Punjab.

Methods: This was a descriptive cross-sectional study undertaken between 2024 to 2026, to evaluate adults 18 years and above, residing in outreach camps in Mehlan and Kheri. Descriptive statistics and chi-square/Fisher's exact test were done. In a univariate analysis, lack of adherence was assessed against other variables. Logistic regression was done to evaluate the effect of independent variables. A p value of less than 0.05 was taken as significant.

Results: Of the 300 participants, 182 (60.7%) had hypertension. Of these, 90 (49.5%) were previously undiagnosed. Of the 92 hypertensive patients, 27 (29.3%) were non-adherent to their medication. Of the 92 hypertensive patients, 106 (58.2%) had at least one medical complication. In the univariate analysis, lack of adherence was not significant (OR=2.29, 95% CI=0.92, 5.74). After controlling for other variables (AOR=3.16, 95% CI=1.04, 9.59), lack of adherence and old age (≥ 60 years) were significantly associated with medical complications.

Conclusions: The study participants were largely hypertension diagnosis and medication adherence. As such, there is justification for large scale hypertension diagnosis and medication adherence interventions in similar rural setups. The findings are applicable to other rural areas of Punjab. The study revealed inadequate diagnosis and treatment of hypertension among outreach camp participants.

Keywords: Hypertension, Medication adherence, Rural health, Punjab, Community screening, Complications

INTRODUCTION

Blood pressure can be considered 'silent' because often times a person will show no signs or symptoms with an increase or change in their blood pressure.

Over time, high blood pressure can damage the brain and kidneys as well as the heart and blood vessels.¹

Almost one-third of Indian adults is in transition towards becoming hypertense and the burden of hypertension is steadily increasing: all the recently released survey data from the country show a nearly 30% prevalence of hypertension among adults and there were significantly higher rates of hypertension in certain states and age groups.² The situation is leaky though and only a small part of the indigenously existing HT population knows that

they have hypertension and a minority of them if they did know are under good control.^{3,4} The analysis of the recent National Family Health Survey (NFHS) using a nationally representative sample revealed a high disparity between the prevalence of undiagnosed hypertension in rural areas compared to urban areas, with the overall prevalence rate in rural areas being lower, even though the blood pressure of urban areas residents was above the diagnostic criteria for hypertension.³ Similarly, in a study on opportunistic screening of public health facilities in 18 districts in India, nearly 1 child in 6 outpatients on visiting a public health facility for some routine health checkup was not eligible for screening because their blood pressure was never taken while they were there.⁴

Hypertension (high blood pressure) is found in high levels in both rural and urban areas of Punjab. There is inadequate awareness of hypertension and poor control over it. The Government of India has initiated several projects and one of them is to provide treatment for hypertension at the health and wellness centers. These centers provide treatment for hypertension and other chronic conditions using standard treatment procedures.^{3,5,6}

Strategies to control blood pressure are very difficult, especially if blood pressure is diagnosed and treatment is begun, but not adhered to. This systematic review of Indian studies published recently shows that there was an alarming lack of adherence to antihypertensive therapy in Indian population with a high degree of heterogeneous level of adherence across states/individual populations, with less than 20% of some areas.⁷ All the above mentioned factors, 'unawareness of the illness itself', 'forgetfulness/s', 'cost of medicines', 'polypharmacy' and 'lack of family support and health literacy' were cited in the literature in India as factors associated with lack of adherence. However, in a few who were both community and hospital-based studies, patients were reported as stopping their anti-hypertensive drugs when they felt "fine" even though they had had no complaints initially, as hypertension generally doesn't cause symptoms unless complications have occurred, later in life.⁸⁻¹⁰

Hypertension is most dangerous because it is often without symptoms. Because of this, many people are unaware that they suffer from it. Unmanaged hypertension leads to stroke, heart attack, kidney failure, and many more complications. Community screenings identify hypertension, thus stopping potential medical emergencies.¹¹⁻¹³

METHODS

Design and context of a study

A descriptive cross-sectional study was conducted at medical outreach camps in villages Mehlan and Kheri in the Sangrur district of Punjab from 2024 to 2026. Sangrur district is mostly rural and agricultural. Medical outreach

camps in the study villages were taken up under the India Hypertension Control Initiative and the National Programme for the Prevention and Control of Non-Communicable Diseases (NCDs). Routine screening of NCDs by the primary health center in the study area was not available.

Study population and sampling

All the permanent residents (age ≥ 18) attending the outreach camp in the 2 villages who volunteered to participate in the voluntary consented to be the subject of the outreach camp. There was no outlining sampling frame that was recorded in the attached document and the participants were recruited as adults who attended an outreach camp. There was exclusion of persons with a known secondary cause of hypertension, persons refusing consent and pregnant women. The sample size has been calculated with two set of parameters of 95% confidence interval and an anticipated prevalence of 30% hypertension as recently suggested by some authors in case of Indian community.^{3,6} This involved 300 individuals, towards the end of the analysis.

Data collection tools and procedures

The above mentioned pre-tested structured statements (interviewer administered questionnaire) were used to gather the sociodemographic information (age, sex, education, occupation, socioeconomic status, history of tobacco and alcohol abuse/use, dietary pattern salt, physical activity, BMI and known co morbidities). Two blood pressures were obtained, at least 1 minute apart, after 5 minutes of resting for the subject(s) using a calibrated blood pressure device (not included in the materials provided). The materials provided did not include any specification as to the type of blood pressure that was being measured nor did it include information regarding the type of blood pressure device being used to measure the blood pressure. For convenience, hypertension was defined as either a named guideline would classify it as an elevated blood pressure (systolic BP ≥ 140 mmHg, or diastolic BP ≥ 90 mmHg); or use of an antihypertensive drug.^{2,6} People who met the conditions for hypertension who had not been previously diagnosed with hypertension but didn't show any symptoms they could've associated with hypertension at screening were deemed to have asymptomatic (previously unknown) hypertension.

Participants who had a previous diagnosis of hypertension and were medication treated, had adherence assessed using the MMAS-8 scale. High, moderate and low/non-adherence were defined based on the scoring system of the study. In addition, participants were asked to explain their non-adherence and a range of other factors such as, forgetfulness, feeling well, symptomatic status, cost and side effects of the medication, availability of the medication, family and social support were also assessed and were comparable to the Indian studies reviewed.⁷⁻⁹

Statistical analysis

Data are in excel and analyses are in Python. Proportions and percents are reported for categorical variables and means and SDs are reported for continuous variables. To assess the level of association of two categorical variables, chi-square test or Fisher's exact test was done.

The logistic regression was performed to know the hypertension complications' risk factors that are not confounders. Results are expressed as adjusted odds ratios with 95% confidence intervals. For this analysis, a $p=0.05$ or less was considered to be statistically significant.

Ethical considerations

The study did not include materials containing information about ethics. The following information was taken from the included documents: Description of written informed consent and confidentiality of process.

RESULTS

As shown in Table 1, the largest age group (52.3%) was 40-59, the sample was 52.7% male, 46.7% were in the middle socioeconomic status, and 47.7% were overweight or obese.

As shown in Table 2, 182 (60.7%) of the 300 participants had hypertension. Of the total sample, 90 (13.3% of the total sample and 49.5% of the participants with hypertension) were newly identified and previously walked around with undiagnosed hypertension. The average of the systolic and diastolic blood pressures was 136.4 ± 14.7 mmHg and 82.9 ± 7.9 mmHg respectively.

Low-adherent/non-adherent hypertensive participants were 27 (29.3%), and the remainder 24 (26.1%) were high adherent, and the rest 41 (44.6%) were moderate adherent, out of the 92 participants under study.

Table 4 indicates that respondents reported forgetfulness as the reason for non-adherence (74.1%). Stopping medication because of feeling asymptomatic or well was the second most common reason (55.6%). The cost and

side effects of the medication were reported by 29.6% of the participants each.

Table 5 shows that 106 of 182 hypertensive participants (58.2%) had at least one complication or abnormal screening finding. Proteinuria was the most frequent listed target-organ finding (33.5%), followed by clinical left ventricular hypertrophy/cardiomegaly (20.9%) and hypertensive retinopathy (19.2%).

Table 6 demonstrates participants over the age of 60, were nearly 6 times more likely to have the complications of hypertension as compared to participants under the age of 60 (OR=5.91, 95% CI=2.81-12.43, $p<0.001$). Among the study participants who reported being non-adherent to their antihypertensive medication, 20.2% of them developed complications of hypertension. Non-adherence to antihypertensive medication was not significantly associated with the development of complications of hypertension (OR=2.29, 95% CI=0.92-5.74, $p=0.076$).

In multivariable analysis, non-adherence to antihypertensive medications was significantly associated with complications of hypertension (AOR=3.16, 95% CI=1.04-9.59). Age 60 years and above was also significantly associated with complications of hypertension (AOR=6.30, 95% CI=2.90-13.66). Other independent variables included in the final multivariable model were male sex, duration of hypertension, diabetes mellitus, low education, new (asymptomatic) hypertension and other cardiovascular co-morbidities.

Multivariate logistic regression showed increasing age (≥ 60 years) and proxy for nonuse of medicines to be independent risk factors for complications. Medication non-adherence was associated with higher odds of complications (AOR 3.16, 95% CI=1.04-9.59; $p=0.042$), while age ≥ 60 years showed a stronger association (AOR 6.30, 95% CI=2.90-13.66; $p<0.001$). Although diabetes was earlier mentioned, it was not found to be part of the list of statistical significance anymore as were education and newly detected hypertension. Other recently identified variables were excluded from this list of variables for which duration of high blood pressure (or hypertension) (≥ 5 years) and male was not significant among the cases.

Table 1: Sociodemographic characteristics of the study population, (n=300).

Characteristics	Category	N
Age group (in years)	18-39	59 (19.7%)
	40-59	157 (52.3%)
	≥ 60	84 (28.0%)
Sex	Male	158 (52.7%)
	Female	142 (47.3%)
Village	Mehlan	155 (51.7%)
	Kheri	145 (48.3%)
Education	Illiterate	87 (29.0%)
	Primary or middle	121 (40.3%)
	Secondary and above	92 (30.7%)

Continued.

Characteristics	Category	N
Occupation	Agriculture/allied	112 (37.3%)
	Non-agricultural labour	52 (17.3%)
	Homemaker	81 (27.0%)
	Other/unemployed/retired	55 (18.3%)
Socioeconomic status (e.g., modified BG Prasad)	Upper/Upper-middle	54 (18.0%)
	Middle	140 (46.7%)
	Lower-middle/lower	106 (35.3%)
Tobacco use (any form)	Yes	63 (21.0%)
Alcohol use	Yes	28 (9.3%)
Body mass index	Overweight/obese (≥ 25 kg/m ²)	143 (47.7%)
Family history of hypertension	Present	300 (100.0%)

Table 2: Blood pressure classification and hypertension status of the study population.

Category	N
Normotensive	118 (39.3%)
Not hypertensive / below dataset hypertension threshold	0 (0.0%)
Stage 1 hypertension	160 (53.3%)
Stage 2 hypertension	22 (7.3%)
Total hypertensive (Stage 1 + Stage 2 + known/on treatment)	182 (60.7%)
Previously diagnosed (known hypertensive)	92 (30.7%)
Newly detected / previously undiagnosed (asymptomatic)	90 (30.0%)
Mean systolic BP (mmHg), overall $\pm$ SD	136.4 $\pm$ 14.7
Mean diastolic BP (mmHg), overall $\pm$ SD	82.9 $\pm$ 7.9

Table 3: Medication adherence among known hypertensive participants on treatment, (n=92).

Adherence category	N
High adherence	24 (26.1%)
Moderate adherence	41 (44.6%)
Low adherence / non-adherent	27 (29.3%)
Overall non-adherence rate	27 (29.3%)

Table 4: Reasons cited for medication non-adherence among non-adherent participants (n=27, multiple responses possible).

Reason for non-adherence	N
Forgetfulness	20 (74.1%)
Felt asymptomatic / “feeling well”, stopped medicine	15 (55.6%)
Cost of medicines	8 (29.6%)
Non-availability of medicines locally	4 (14.8%)
Side effects	8 (29.6%)
Lack of family/social support or reminder	3 (11.1%)
Belief in alternative/traditional remedies	1 (3.7%)
Long distance to health facility / follow-up difficulty	4 (14.8%)

Table 5: Complications and target-organ findings among hypertensive participants, (n=182).

Complication/ finding	N
Any complication/abnormal finding	106 (58.2%)
Proteinuria on dipstick (renal involvement)	61 (33.5%)
Hypertensive retinopathy (any grade)	35 (19.2%)
History of prior stroke / TIA	5 (2.7%)
History of ischemic heart disease / angina	24 (13.2%)
Clinical left ventricular hypertrophy / cardiomegaly	38 (20.9%)
Prior hospitalization for hypertension-related event	18 (9.9%)
Comorbid diabetes mellitus	33 (18.1%)

Table 6: Association between selected factors, non-adherence, and hypertension-related complications.

Factors	Complication present, n (%)	Complication absent, n (%)	χ^2 /OR (95% CI)	P value
Non-adherent to medication	20 (74.1%)	7 (25.9%)	OR 2.29 (95% CI=0.92-5.74)	0.076
Duration of hypertension ≥ 5 years	35 (55.6%)	28 (44.4%)	OR 0.85 (95% CI=0.46-1.57)	0.593
Age ≥ 60 years	53 (82.8%)	11 (17.2%)	OR 5.91 (95% CI=2.81-12.43)	<0.001
Male sex	63 (58.9%)	44 (41.1%)	OR 1.07 (95% CI=0.59-1.94)	0.835
Illiteracy / low education	29 (56.9%)	22 (43.1%)	OR 0.92 (95% CI=0.48-1.78)	0.814
Comorbid diabetes mellitus	20 (60.6%)	13 (39.4%)	OR 1.13 (95% CI=0.52-2.43)	0.761
Newly detected (asymptomatic) hypertension	52 (57.8%)	38 (42.2%)	OR 0.96 (95% CI=0.53-1.74)	0.900

DISCUSSION

The study identified three gaps in the management of hypertension in rural populations. First, there were cases of hypertension that had not been previously identified. Second, some patients with hypertension did not comply with treatment. Third, there were cases with complicated hypertension and hypertension-related conditions. As systematic sampling was not used to select study participants, findings of this study do not represent all rural populations in Punjab. Of the 182 participants, 90 (49.5%) of cases of hypertension were previously undiagnosed and asymptomatic. Findings from the study were corroborated by various studies that indicated a high prevalence of undetected cases of hypertension in the country and lack of blood pressure screening in public health facilities. Researchers of the study agree with previously published studies that in the absence of a structured and systematic approach to the identification of cases of hypertension in the general population, cases will remain undetected.

The researchers concluded that, compared to other countries, a relatively greater number of rural Indian residents is affected by hypertension. However, the study participants, who were predominantly adult residents of rural areas, may not represent other residents of rural India. Because controlling hypertension is a major public health concern in the state of Punjab, the researchers of the current study suggest that the failure to manage and prevent hypertension appropriately is a major public health concern in the state, and therefore, is worthy of public health research. Concurrently, the researchers note that inconsistent treatment adherence and behavioral and system-related problems with hypertension management are major public health issues in India. Previous studies in North India and rural Tamil Nadu have reported that counseling and health education increase medication adherence.⁸⁻¹⁰

The study reported that 58.2% of study participants with hypertension had complications and abnormal findings. Some of the cardiac abnormalities, and retinopathy and proteinuria were reported. Hypertension is a risk factor for developing cardiac, renal, cerebral and other medical conditions. However, the health screening methodology

during this outreach service was not adequate to confirm a clinical diagnosis.¹¹⁻¹³

This analysis investigated the impact of medication non-adherence on the occurrence of adverse events separately. The odds of developing an adverse event due to non-adherence was 2.29 (95% CI=0.92, 5.74) and the p value was 0.076. Therefore, non-adherence increased the odds of developing an adverse event by 2.29 times; however, this relation was not significant. Accounting for other variables, non-adherence increased the odds of developing an adverse event by 3.16 (95% CI=1.04, 9.59). The analysis showed that non-adherence increased the odds of developing an adverse event for the 60 years and older age group by 6.30 (95% CI=2.90, 13.66). The analysis showed that medication non-adherence increased the odds of developing an adverse event. Due to the nature of this study as cross-sectional, it was limited to drawing conclusions regarding non-adherence and developing adverse events. One of the delinked hypertension service packages was also assessed. It was published that the India Hypertension Control Initiative has undertaken protocol-based services at Health and Wellness Centers in the states of Maharashtra and Punjab. It was published that several other districts also have inadequate services and control for hypertension. It was also assessed that improving adherence to hypertension management through an inexpensive intervention, involving education and behavior change communication, improved blood pressure levels. The reviewed literature and evidence suggested that hypertension screening should be accompanied by prompt and continued support for access of the medication and for assistance in follow up of the client.¹⁴⁻¹⁶

Strengths and limitations

This study's main strength is designing a system to assess blood pressure, awareness, adherence, and some complications at the village level. There are also several limitations. The main limitation is cross-sectional nature of the study. Therefore, it is not possible to determine the reasons for the observed phenomena. The assessment of blood pressure is open to several valid interpretations. It was possible that environmental conditions affected the true pressure at the time. The assessment of blood pressure

does not provide a true picture of the ambulatory blood pressure of an individual over a long period. Some of the complications of hypertension such as heart failure may not have been assessed adequately and some cases may have been missed. Participants were recruited at an outreach camp. It is therefore, possible that people who were recruited are not representative of the entire population. This reduces the scope of generalizing the study findings.

CONCLUSION

Of the screened adults in the study conducted in rural Punjab, 60.7% had hypertension of which 49.5% had no previous symptoms of hypertension. Among treated hypertensive patients, 29.3% had poor/no adherence to treatment. The 58% of this group had hypertension related complications and among the remaining screened adults, 58.2% had complications. Upon removing the effects of medication non-compliance, it was seen that adults 60 years and older also had complications of hypertension. The result of this study shows that there is a need for enhancement of the existing screening process and engagement of primary health care services. Because of the nature of this study, especially outreach and cross-sectional nature of the study, results presented in this report reflect the study and the participants engaged rather than the rural Punjab.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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