

## ORIGINAL ARTICLE

# Adherence to treatment among hypertensive individuals in a rural population of North India

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## Abstract

**Background:** Hypertension affects nearly a quarter of adults in India. While there are issues related to diagnosis and treatment gap, even among those who received treatment, adherence is a problem resulting in poor control.

**Aim & Objective:** To study the adherence to treatment of hypertension and its determinants among rural population

**Methods and Material:** A community based cross-sectional study was carried out in twenty-eight villages in Ballabgarh block of Faridabad district of Haryana. Sample size of 300 was calculated. Adults ( $\geq 18$  years) with self-reported hypertension were recruited by simple random sampling at community level. Adherence to treatment was studied by both recall and pill count methods. Information about socio-demographic characteristic was also obtained. **Results:** In total 350 participants were recruited in the study. Adherence (100%) by recall method was reported among 27.4% subjects and by pill count among 18.9% subjects. Symptom-free period was identified as most common reason for non-adherence. Statistically significant poor adherence to treatment of hypertension was reported among subjects belonging lower social strata. **Conclusions:** Very low adherence to hypertension treatment was reported in rural community in northern India. There is urgent need for awareness generation about treatment adherence and developing adherence-monitoring mechanisms at community level

## Keywords

Hypertensive; Rural; Adherence, Community - Based

## Introduction

Hypertension (HT) is an important public health problem globally. As per estimates, 60% of adult population will suffer from HT by 2025. (1) Recent meta-analysis documented that 29.8 % of adult population is suffering from HT in India. (2) Burden of HT is reported higher in urban region as compared

to rural area. (2) Non-compliance to the medication is the most common cause of treatment failure leading to disease progression in chronic conditions. (3) Also, it adds to the financial burden to the patient. (4) Non-adherence to treatment of HT has been documented as limiting factor for prevention of complications. (5) Globally, various socio-demographic factors such as younger age, low

income, male gender were documented as determinants of adherence to HT treatment. (6) In India, lack of adherence to HT treatment was reported to be associated with poor blood pressure control. (7,8) Rao CR *et al* reported higher cost of medications, asymptomatic period, as important reasons for irregular treatment among hypertension. (9) Substance abuse such as alcohol and tobacco use were also documented as determinants of adherence to treatment among hypertensives in India. (10)

### Aims & Objectives

In this study, we aimed to document adherence to the treatment of hypertension in rural community of Haryana, north India and to identify the predictors of non-adherence in this population.

### Material & Methods

A community based cross-sectional study was carried out in 28 villages in Ballabgarh block of Faridabad district, Haryana. This study area was a part of Comprehensive Rural Health Services Project (CRHSP), Ballabgarh of All India Institute of Medical Sciences (AIIMS), New Delhi. Study area covered a population of about 94,000 through its two Primary Health Centres (PHCs) in 28 villages. Study area was also a demographic surveillance site under IDEPTH network. (11) Adults > 18 years of age, residing in the study area, with hypertension were recruited in the study. Information about the adults with known HT was obtained through annual demographic census in the study area. Annual census was done with help of field workers who made domiciliary visit and gathered information. In the annual census, total 1229 adults were identified with known hypertension. This information was maintained at Health Management Information System (HMIS) at CRHSP, Ballabgarh.

Sample size of 300, was calculated using 25% (7) expected prevalence of adherence to HT treatment, 20% relative error. Considering refusals, we decided to recruit 350 study subjects with known HT from the study area. Out of all individuals with hypertension in HMIS, we randomly sampled 350 subjects in this study. All sampled subjects were contacted in person at their household. Socio-demographic information included age, sex, social strata (caste) and presence of health facility in village of residence. Information about duration of HT, treatment regimen and likely factors affecting adherence were obtained.

Adherence to HT treatment was measured by both recall and pill count methods. In recall method, subjects were asked about missed drug doses in recent one week (7 days). In pill count method, previous one-week hypertension treatment record was checked for the completion of the findings. Subjects were excluded from the adherence estimation by pill count method if they had not able to show pills. Adherence to prescribed treatment of hypertension was measured by following formula

$$\text{Adherence to treatment} = \frac{\text{Pills taken in last 7 days}}{\text{Total number of pills prescribed for last 7 days}} \times 100$$

Adherence to the treatment was defined as 100% prescribed drug intake by the subject in last seven days before the interview.

Weight and height of the study subjects were measured and Body Mass Index (BMI) was calculated. Assessment of hypertension control was done by measuring current blood pressure (BP) using Mercury Sphygmomanometer (Diamond). BP was measured in right arm in sitting position. Two reading of BP were taken 10 minutes apart. Average of both the readings was taken as final. BP was categorized by using JNC 7 criteria into controlled and uncontrolled (BP > 140/90 mm of Hg). (12) Information about lifetime use and frequency of use of tobacco, type of tobacco (smokeless/smoking/hukka) and alcohol use was also sought from the subjects. Information about selected self-reported complaints in last one week suggestive of complication of HT was also collected from the subjects. This included chest pain, breathlessness, and diminution of vision, decreased urine output, giddiness and oedema feet. **Statistical analysis:** Data were entered into Microsoft excel and analysis was done using STATA Version 12.1 (Stata Corp 4905 lake way drive college station, Texas, USA). For comparison of means, t test was applied and for the comparison of proportions Chi square test was used. Crude odds ratios were calculated with 95% confidence level and 5% significance level. Adjusted odds ratio was calculated by using binary logistic regression analysis with adherence to treatment as dependent variable. Occupation status was categorized as dependent, currently working and homemakers (Females). Information on caste was used to classify subjects into lower (SC/ ST/backward caste) and upper social strata (General caste).

**Ethical Issues:** Informed written consent was obtained from all subjects. Ethical clearance for the study was obtained from Ethics Committee of the All India Institute of Medical Sciences, New Delhi.

## Results

Out of 350 study subjects, 272 (77.7%) were of age above than 45 years and 78 (22.3%) were below 45 years of age. Mean age of the study subject was 58.6 years (SD: 0.7). Of total, 268 (76.6%) were females and 82 (23.4%) were males. 213 (60.9 %) subjects belonged to lower social strata as compared to upper strata (137, 39.1%). More than half 199, (56.9%) subjects were illiterate, while 120 (34.3%) had completed secondary and above education. Of all the females, 263 (88.1%) were homemakers. Among males 20 (24.4%) were working. 114 (32.6%) of the subjects had HT diagnosed for more than 3 years, while remaining (67.5%) were diagnosed within last three years. 152(43.4%) subjects had normal BMI whereas, 163 (46.6%) were overweight (BMI  $\geq$  25 Kg/m<sup>2</sup>) and 35 (10%) were underweight (BMI  $<$  18 Kg/m<sup>2</sup>). Lifetime tobacco use was reported among 115 (32.9 %), and alcohol use in 19 (5.4%) study subjects.

Adherence to treatment among patients with HT ([Figure 1](#))

Out of 350 subjects with HT, 190 (54.3%, 95% CI 49 – 59) had not taken any anti- hypertensive treatment during one month prior to the interview, only 160 individuals took treatment in last one month. Out of these 160 subjects who were taking treatment for HT, 96 subjects (60% of those who are taking treatment, 95% CI 52 – 67) were adherent to the prescribed treatment by recall method. While among all 350 diagnosed and prescribed treatment, only 27.4% (96/350) (95% CI: 23.0 – 33.3) were found to be adherent by recall method, and 18.9% (95% CI: 14.5 – 22.7) by pill count method.

Among 160 subjects who were taking treatment for HT, highest adherence was reported with beta-blocker (52%) followed by Amlodipine (41%) and Losartan (27%). Dietary advice was given to 141(83.9%) subjects, of which 125(88.6%) were reported to adherence to these advices. Salt restriction was the most common dietary advice given by the treating physician as reported by the participants. Advice related to physical activities was given to 84 (52.5%) participants and this advice was followed by 52(61.9%) of subjects.

Symptom-free period was identified as major reason (50%) for non-adherence to the treatment, followed by non-availability of drugs (18.8%) and forgetfulness to take it (17.2%)

Factors associated with adherence to the treatment of HT.

We used adherence by recall method for bivariate analysis to study predictors of adherence due to higher numbers. Adherence to treatment was significantly low among subject belonging to lower social strata (OR = 0.4, 95% CI: 0.2 – 0.9). Association of other factors such as age, gender, use of tobacco and alcohol, education status, duration of treatment and BMI with adherence to treatment were not statistically significant ([Table 1](#)). When adjusted for age and gender, in multivariate analysis, belonging to lower social strata lost its statistical significance as predictor of adherence to treatment of hypertension.

Effect of treatment adherence on blood pressure control

Among 96 subjects, adherent to HT treatment, 42 (43.7%) had controlled hypertension as compared to subjects not adherent to the treatment in last one month, but this association was statistically not significant (43.7% Vs 43.3%) ( $p = 0.94$ ). Association of systolic blood pressure ( $p = 0.7$ ) and diastolic blood pressure ( $p = 0.8$ ) with adherence to the treatment was also statistically non-significant. Subjects adherent to HT treatment reported chest pain less likely as compared to non- adherent subjects. (OR = 0.4, 95% CI: 0.2-0.8). Diminution of vision as self-reported symptom was observed less among subject's adherent to treatment (OR = 0.4, 95% CI: 0.2-0.7). Associations of other self-reported symptoms such as breathlessness, loss of consciousness, oliguria, oedema feet, and giddiness with adherence to the HT treatment were statistically non-significant. On multivariate analysis of chest pain as self-reported symptom retained its statistical significance (OR - 0.4, 95% CI 0.2 – 0.9).

## Discussion

In the present study, only one fourth (27.4%) of subjects were adherent to HT in northern India. This was in line with study by Venkatachalam J *et al* (10) among rural population in south India. Similar self-reported adherence rates were reported by studies conducted at primary care setting in rural area by Gupta R *et al* (7) and Kale S *et al*. (8) Dennis T *et al* (5) and Joshi PP *et al* (13) in their respective hospital

based studies in rural setting reported higher prevalence of adherence to hypertension treatment as compared to present study. This might be attributed to hospital setting in these studies in which chances getting higher adherence rates are more likely. Study by Rao CR *et al* (9) reported very high prevalence of adherence to treatment among hypertensive population living in coastal area in South India. Lower cut-offs (80%) used in this study as compared to present study (100%) might be the contributing factor for wide variation in the self-reported adherence. Some community based studies in rural area reported higher adherence to HT treatment as compared to present study globally. (14,15) Adherence to advices related to lifestyle modifications such as salt restriction in diet, doing daily physical exercises was higher as compared to of medications. This might be attributed to tendency of subjects to give socially acceptable responses to such questions related to lifestyle modifications.

Lower social strata and educational qualification were not identified as independent determinants of adherence to treatment in this study. Similar findings were reported by Rao CR *et al* (9) in the rural population of southern India. Present study did not able to detect statistical significant difference of adherence among participants using tobacco or alcohol which is contrary to finding reported by Venkatachalam J *et al.* (10) We have obtained information on lifetime tobacco/ alcohol use instead of current substance use. Diagnosis of HT among study subject might have deterred the current substance and this might be contributed to its lack of statistical significance association with respect to adherence to medication. Though present study not able to detect statistically significant association of older age (> 45 years) and adherence, proportion of adherence was reported higher in these population. Similar findings were reported by few studies. (16-18) Present study was not able to detect association of uncontrolled hypertension with adherence to the treatment as documented in the study by Joshi PP *et al.* (13) This might be attributed some proportion of non- hypertensive subjects started on anti - hypertensive medication contributing the total sample size of the study.

Major reasons given by the patients for missing doses were symptom free period and non-availability of drugs due to lack of purchasing power. Similar findings were reported in the previous published studies. (9,10,14,19) Though this study did

not had sufficient power to identify effect of adherence on control of HT, chest pain considered as consequences of control hypertension was reported less by subjects who were found to be adherent to the treatment.

Short duration (seven days) of recall period provided robustness to adherence information in this study. Due to limitation of recall method, adherence measurement in this study was also done by pill count method, which showed almost similar results. Present study had certain limitations. First, this study had less power to document impact of adherence on hypertension. This might be attributed skewedness of sample with respect to gender as majority of subjects were females. Second, self-reported adherence and HT were used in this study, which was believed to overestimate the adherence to the treatment and might cause misclassification bias (20) Third, due to higher number of female subjects in the study, gender as a predictor of adherence was not observed in this study. (9, 10,13,15)

### Conclusion

This study documented very low adherence to treatment of hypertension in rural community of north India. Younger age, poor education status, and lower social strata were not found to be associated with low adherence to the treatment. Major reason for non-adherence was symptom free disease period. Further research in rural community based setting is needed with robust sample size to detect impact of non-adherence on blood pressure control.

### Recommendation

There is urgent need for awareness generation in this community about importance of drug adherence for hypertension. Also, capacity building of treating physicians about adherence and its monitoring among the patient is essential. There is also need to formulate intervention to monitor adherence among patient with hypertension. Technology in the form of mobile-based application or any patient tracking system can be explored for monitoring drug adherence.

### Limitation of the study

We acknowledge that gender distribution in sample population may not be true reflection of it in general population. There were higher number of females in the sampling frame i.e. individuals with hypertension identified in the study site. Hence, after random selection, sample also reflected skewed distribution



towards females. This could have been addressed by stratified random sampling in selection of study participants.

### Relevance of the study

Present study provides evidence from community based setting in northern India regarding very poor adherence to treatment of hypertension.

### Authors Contribution

PM, HRS, SK, AK conceived and designed study. PM, HRS, RS, carried out data collection. HRS prepared draft manuscript. All authors reviewed manuscript critically for technical content and finalized manuscript for publication.

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**Tables**

**TABLE 1 ASSOCIATION OF SELECTED VARIABLES WITH ADHERENCE TO THE TREATMENT OF HYPERTENSION**

Variable	Number (N)	Adherence to treatment (%)	Crude OR (95% CI)	p value
Age > 45 years	143	61.5	1.8 (0.6 – 5.3)	0.26
Female gender	108	63.9	1.6 (0.8 – 3.2)	0.15
Lower social strata	80	51.3	0.4 (0.2 – 0.9)	0.02
Higher secondary and more education	33	69.7	1.3 (0.9 – 1.9)	0.22
Overweight (BMI>=25)	61	52.5	1.0 (0.5 – 2.2)	0.96
Current Tobacco consumption	36	47.2	0.7 (0.3 – 1.6)	0.43
Current Alcohol consumption	8	50.0	0.6 (0.2 – 2.7)	0.56
Duration of treatment (in years) (mean, SD)	350	3.1 (0.1)	1.1 (0.7 – 1.4)	0.92
Chest pain reported	67	59.7	0.4 (0.2 – 0.8)	0.01
Diminution of vision reported	72	47.2	0.4 (0.2 – 0.7)	0.003

*\*OR-Odds Ratio, CI – Confidence Interval, Bold – statistically significant*

**Figures**

**FIGURE 1 ADHERENCE TO HT TREATMENT BY RECALL METHOD**

