

# Determinants of Patient's Adherence to Hypertension Medications in a Rural Population of Kancheepuram District in Tamil Nadu, South India

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## ABSTRACT

**Context:** Non-communicable diseases, no longer a disease of the rich, impose a great threat in the developing nations due to demographic and epidemiological transition. This increasing burden of non-communicable diseases and their risk factors is worrisome. Adherence to hypertension (HT) medication is very important for improving the quality of life and preventing complications of HT. **Aim:** To study the factors determining adherence to HT medication. **Settings and Design:** A community-based cross-sectional study was conducted in a rural area of Kancheepuram district, Tamil Nadu, with a total population of around 16,005. **Materials and Methods:** This study was carried out over a period of 6 months (February-July) using a pre-structured and validated questionnaire. All eligible participants were selected by house-to-house survey and individuals not available on three consecutive visits were excluded from the study. The questionnaire included information on demographic characteristics, lifestyle habits, adherence to HT medication, blood pressure, and body mass index (BMI). Caste was classified based on Tamil Nadu Public Service commission. **Statistical Analysis:** Data were entered in MS Excel and analyzed in SPSS version 16. *P* value <0.05 was considered statistically significant. Ethical Consideration: Informed verbal consent was obtained prior to data collection. The patient's adherence to HT medication was assessed using the Morisky 4-Item Self-Report Measure of Medication-taking Behavior [MMAS-4]. **Results:** We studied 473 hypertensive patients of which 226 were males and 247 were females. The prevalence of adherence was 24.1% (*n* = 114) in the study population. Respondents with regular physical activity, non-smokers and non-alcoholics were more adherent to HT medication as compared with respondents with sedentary lifestyle, smoking and alcohol intake (*P* < 0.005). Based on health belief model, the respondents who perceived high susceptibility, severity, benefit had better adherence compared with moderate and low susceptibility, severity, benefit.

**Keywords:** Health belief model, hypertension, non-adherence, rural area

## Introduction

Non-communicable diseases (NCDs), no longer a disease of the rich, impose a great threat in the developing nations

due to demographic and epidemiological transition. Increasing burden of NCDs and their risk factors are a cause of concern and one of the most dreaded situations being faced now by India and other nations are the increasing prevalence of Hypertension (HT). HT is one of the most important treatable causes of mortality and morbidity. The CURES cohort suggested that every fifth person in India is hypertensive.<sup>(1)</sup> The World Health Organization (WHO) has estimated that about 62% of cerebrovascular disease and 49% of ischemic heart disease burden worldwide are attributable to suboptimal blood pressure levels. High blood pressure is estimated

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to cause 7.1 million deaths annually, accounting for 13% of all deaths globally.<sup>(2)</sup> Uncontrolled HT has been attributed to patients' failure to follow properly a prescribed drug regimen in approximately half the cases.<sup>(3,4)</sup> It is usual to consider patients to be sufficiently compliant with their treatment when they take at least 80% of their prescribed anti-hypertensive drugs.<sup>(5,6)</sup> In 2003, the WHO emphasized that "increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments". Poor treatment adherence is a roadblock to better quality of life. Most health promotion interventions seek in some way to change health behavior by changing health-related knowledge, attitudes, barriers and facilitators. So this study was carried out to find out the causes for non-adherence to HT medication.

## Materials and Methods

A community-based cross-sectional study was conducted among the rural population of Chunampet, Kancheepuram district, Tamil Nadu, covering a total population of around 16,005. All eligible participants were selected by house-to-house survey. The eligibility criteria for the study participants were a) known case of HT residing in the study area for at least 6 months duration; b) duration of the diagnosed disease for more than one year; c) not suffering from any acute conditions such as myocardial infarction (MI), stroke, acute renal failure (ARF). All adults in the age group of 20 years or more fulfilling the above-said eligibility criteria and consenting to partake were included in the study. The data were collected over a period of 6 (February-July) months by interview method through house-to-house visit. In case of non-availability during the first visit, additional three visits were done. All the study participants were interviewed by postgraduates and interns using a structured questionnaire in the local Tamil language after obtaining informed verbal consent. For standardization of the data collection, all the interns and postgraduates were trained by the investigators prior to initiation of the study. The questionnaire was pretested and modified accordingly. The study domains included were patient's adherence, sociodemographic factors, subjective health status, lifestyle factors, medication-related variables, perceived susceptibility, severity, benefit, barriers, cue to action, and self-efficacy using the health belief model. The patient's adherence to diabetic medications was assessed using the Morisky 4-Item Self-Report MEASURE of Medication-taking behavior [MMAS-4], which included (a) Do you ever forget to take your medicine? (b) Are you careless about taking your medication at times? (c) When you feel better sometimes do you stop taking your medication? (d) Sometimes if you feel worse while taking medication do you stop

taking it?. Adherence Definition: Any respondent with history of HT for more than 6 months, who failed to fulfill any one of the four criteria in Morisky scale is said to be non-adherent.

Statistical Analysis: Data were entered in MS Excel and analyzed in Statistical Package for the Social Sciences software (SPSS version 16.0). *P* value < 0.05 was considered statistically significant. Proportions were calculated, chi-square test was applied to compare the two proportions, and univariate regression was used to measure the risk of non-adherence among study population.

## Results

We contacted 2007 households out of the total 2667 households in our study area. Among these 2007 households, we enumerated 505 hypertensive individuals, of whom 473 individuals participated in the study, whereas the remaining 32 individuals did not consent to participate in the study. Among 473 individuals interviewed, 226 (47.8%) were males and 247 (52.2%) were females. Maximum individuals, 152 (32.1%), were in the age group 30-39 years followed by 134 (28.3%) in 40-49 years age group and 93 (19.7%) in 50-59 years. Also, 70 (14.8%) and 24 (5.1%) individuals were in >60 years and <30 years age group, respectively.

Association between Adherence and SocioDemographic Variables: Adherence was found to be higher in age groups 30-39 years (27%) and above 60 years (27.1%) as compared with other age groups. Adherence was slightly higher among female (25.5%) respondents than male respondents (22.6%). Similarly, the married (24.8%) respondents have more adherences to hypertensive medication compared with unmarried (21.1%). With respect to caste, the adherence was higher in forward caste (29.1%) compared with other caste [Table 1]. Adherence and Health care facility-Related Factors: This study found that respondent using private health facility were less adherent than those who were using public facility (OR = 1.32). Our study also showed that if the distance of health facility was less than 5 km, adherence was better (OR = 0.98) [Table 2]. Association between Adherence and Lifestyle Factors: The respondents exhibited poor adherence with lifestyle factors like unrestricted meal habits (OR = 4.8), alcohol consumption (OR = 3.1), smoking (OR = 12.9), and salt intake >5 gm (OR = 3.6). Our study also found the following factors to be protective for adherence oil consumption of <500 ml/month (OR = 0.72), those who perceived themselves as healthy (OR = 0.07) and those who did regular physical exercise (OR = 0.01). [Table 3] Association between Adherence with respect Number and Frequency of Medication: Adherence was significantly higher among respondents

taking only one medication 102 (90%), once daily 92 (81%) compared with individuals taking four types of medication 25 (21.5%) and as frequent as three or more times a day 23 (20.6%). Thus, adherence increased with decrease in number and frequency of medication. Adherence with respect to Health Belief Model: Study population who perceived very high susceptibility 71 (55.9%) have good adherence compared with those who perceived moderate susceptibility 38 (27.5%) and low susceptibility 5 (2.4%). Respondent who perceived very high severity 63 (49.2%) showed better adherence than those perceived moderate severity and low severity.

**Table 1: Association between adherence and sociodemographic variables (n = 473)**

Variables	Non-adherence N (%)	Adherence N (%)	Total N (%)	P value
Age (years)				
<30	20 (83.3)	4 (16.7)	24 (100.0)	0.54
30-39	111 (73.0)	41 (27.0)	152 (100.0)	
40-49	107 (79.9)	27 (20.1)	134 (100.0)	
50-59	70 (75.3)	23 (24.7)	93 (100.0)	
>60	51 (72.9)	19 (27.1)	70 (100.0)	
Sex				
Male	175 (77.4)	51 (22.6)	226 (100.0)	0.45
Female	184 (74.5)	63 (25.5)	247 (100.0)	
Marital status				
Single	71 (78.9)	19 (21.1)	90 (100)	0.49
Married	288 (75.2)	95 (24.8)	383 (100)	
Caste				
OC	39 (70.9)	16 (29.1)	55 (100)	0.44
BC	222 (74)	78 (26.0)	300 (100)	
MBC	98 (83.1)	20 (16.9)	118 (100)	
Religion				
Hindu	284 (74.5)	97 (25.5)	381 (100)	0.215
Christian	62 (78.5)	17 (21.5)	79 (100)	
Muslim	13 (100)	0 (0)	13 (100)	
Total	359 (75.9)	114 (24.1)	473 (100)	

Chi-square test was applied, degree of freedom-1, P value <0.05 statistically significant

Respondent who perceived low benefit are 24.5 times more prone for non-adherence compared with those who perceived high benefits. Respondents with very high cue to action 68 (28.6%) and very high self-efficacy 62 (33.5%) had significantly higher adherence than those with moderate and low cue to action and self-efficacy. Those who perceived barriers to be very high 16 (12.3%) had lower adherence than those perceived high 12 (12.7%) and moderate barriers 81 (38.8%). [Table 4]

### Status of compliance among study population based on Morisky scale

As per the Morisky scale, out of the 473 respondents, 51.6% forget taking medicines regularly, 59.8% were careless about taking their medications, 53.6% stop medication on feeling better, and 55.2% stop medication on feeling worse.

### Discussion

Adherence to medication is always a matter of concern especially in chronic diseases and identification of the factors affecting adherence since it will help to improve the treatment outcomes. The overall adherence to medication in our study was 24.1% as compared with a study done in Malaysia where the adherence was 48.7%. This variation may be due to difference in sociodemographic profile of two countries.<sup>(7)</sup> In our study, adherence was found to be higher among people above 60 years of age (27.1%) and 30-39 years (27%), with females (25.5%) being more compliant than the males (22.6%). Similarly in a study from Iraq, the compliance was highest among patients aged 70 years and more (78%) followed by those less than 30 years old (64%), and females were significantly more compliant than males.<sup>(8)</sup> Another study done in Pakistan among 460 hypertensive's, showed that adherence increases with age and highest mean adherence rate was in the age group of 70-80 years.<sup>(9)</sup> This might be

**Table 2: Association between adherence and health care facility-related factors (n = 473)**

Variables	Non-adherent (N = 359) (%)	Adherence (N = 114) (%)	Total (N = 473) (%)	P value*	Odds ratio**
Caregiver					
Self	315 (76.8)	95 (23.2)	410 (100)	0.22	1.01
Others	44 (69.8)	19 (30.2)	63 (100)		
Person paying Fees					
Self	301 (76.2)	94 (23.8)	395 (100)	0.178	1.01
Others	58 (74.4)	20 (25.6)	78 (100)		
Type of Medical Facility					
Private	249 (77.6)	72 (22.4)	321 (100)	.010	1.32
Public	110 (72.4)	42 (27.6)	152 (100)		
Distance of Medical Facility (Km)					
Less than 5	206 (75.7)	66 (24.3)	272 (100)	0.004	0.98
More than 5	153 (76.1)	48 (23.9)	201 (100)		
Medicine's Cost					
Free	243 (82.6)	51 (17.3)	294 (100)	.002	2.59
Purchase	116 (64.8)	63 (35.2)	179 (100)		

\*Chi-square test was applied, degree of freedom-1, P value <0.05 statistically significant, \*\*univariate regression

**Table 3: Association between adherence and lifestyle factors (n = 473)**

Variables	Non-adherent (N = 359) (%)	Adherence (N = 114) (%)	Total (N = 473) (%)	Odds ratio**	P value*
Health status perceived					
Healthy	95 (50.0)	95 (50.0)	190 (100)	0.01	0.07
Not healthy	264 (93.3)	19 (6.7)	283 (100)		
Meal habits					
Unrestricted	177 (90.3)	19 (9.7)	196 (100)	0.00	4.86
Restricted	182 (65.7)	95 (34.3)	277 (100)		
Exercise					
Yes	58 (34.1)	112 (65.9)	170 (100)	0.00	0.01
No	301 (99.3)	2 (0.70)	303 (100)		
Alcohol intake					
Yes	164 (87.2)	24 (12.8)	188 (100)	0.00	3.15
No	195 (68.4)	90 (31.6)	285 (100)		
Smoking					
Yes	137 (83.5)	27 (16.5)	164 (100)	0.005	12.95
No	87 (28.2)	222 (71.8)	309 (100)		
Amount of salt					
>5 gm	359 (85.7)	30 (14.2)	389 (100)	0.003	3.64
<5 gm	179 (68.0)	84 (32)	263 (100)		
Amount of oil					
<500 ml	160 (72.7)	60 (27.3)	220 (100)	0.33	0.72
>500 ml	199 (78.7)	54 (21.3)	253 (100)		

\*Chi-square test was applied, degree of freedom-1, P value <0.05 statistically significant, \*\*univariate regression

**Table 4: Association between adherence and health belief model (n = 473)**

Variables	Non-adherence N = 359 N (%)	Adherence N = 114 N (%)	Total	Odds ratio**	P value*
Perceived susceptibility					
Very high	56 (44.1)	71 (55.9)	127 (100)	Reference	0.001
Moderate	96 (69.5)	38 (27.5)	138 (100)	2.0	
Low	207 (97.6)	5 (2.4)	212 (100)	52.49	
Perceived severity					
Very high	49 (44.0)	62 (56.0)	111 (100)	Reference	0.469
Moderate	88 (65.2)	47 (34.8)	135 (100)	2.0	
Low	222 (97.8)	5 (2.2)	227 (100)	56.18	
Perceived					
Very high	65 (50.8)	63 (49.2)	128 (100)	Reference	0.001
Moderate	141 (75.0)	47 (25.0)	188 (100)	2.91	
Low	153 (96.2)	06 (3.8)	159 (100)	24.72	
Perceived barrier					
Very high	114 (87.7)	16 (12.3)	130 (100)	4.51	0.001
Moderate	117 (87.3)	17 (12.7)	134 (100)	4.30	
Low	128 (61.2)	81 (38.8)	209 (100)	Reference	
Cue to Action					
Very high	170 (71.4)	68 (28.6)	238 (100)	1.00	0.003
Moderate	141 (77.9)	40 (22.1)	181 (100)	1.41	
Low	48 (88.9)	6 (11.1)	54 (100)	3.20	
Self-efficacy					
Very high	123 (66.5)	62 (33.5)	185 (100)	Reference	0.000
Moderate	165 (76.4)	51 (23.6)	216 (100)	1.73	
Low	71 (94.6)	4 (5.4)	75 (100)	8.95	

\*Chi-square test was applied, degree of freedom-1 P value < 0.05 statistically significant, \*\*univariate regression

due to the support rendered by care takers (wife, son, daughters, and daughter-in-law). In the present study, adherence was better among those, whose distance to health facility was <5 km (57.8%) than those with >5 km (18.9%). Similarly in a study from Ethiopia, distance

<0.5 h was significantly associated with adherence and showed that as the distance to health facility decreased adherence improved.<sup>(10)</sup> This shows that accessibility to health facility is an important factor influencing treatment adherence. In a cross-sectional study in Hong

Kong 725 (65.1%) of 1114 patients had good adherence to antihypertensive agents and younger age and poor self perceived health status were negatively associated with drug adherence. Similarly our study also showed that the adherence was not good in younger age group. Thus, our study found that the prevalence of adherence in our population was very low because of perceived susceptibility and severity were low among our study population.<sup>(11)</sup> This may be due to poor literacy and low socioeconomic status in villages of Kancheepuram district of Tamil Nadu. Mono therapy and once daily medication had positive role in adherence compared with poly therapy and more than once daily. Similarly in a study from Brazil among 231 hypertensive's, 36.2% of patients on mono therapy and 36.6% of patients taking two drugs had controlled blood pressure only 5.9% of patients using three or more antihypertensive drugs had the same outcome.<sup>(12)</sup> In the present study, 50% of the study respondents have forgotten to take medicines regularly, 50% stopped medication on feeling better and 60% have a neglected attitude about taking medication. Although in a cross-sectional study in Iraq, 34.9% had ever forgotten to take medicines, 37% were neglectful about their medications, 37.1% skipped medicine because of feeling well, and 25.7% of patients experienced bad feelings about their medication. These variations might be due to low awareness and lack of motivation among the hypertensive respondent in current study population.<sup>(6)</sup> Even though a systemic review showed that lifestyle factor have minimal role in adherence;<sup>(13)</sup> however, our study found there were significant influence of lifestyle factors like physical activity, low oil and salt consumption, have positive effect for adherence, but smoking and alcohol consumption had negative effect on adherence. This variation might be due to the fact that most of the systematic review studies were carried in urban setting, whereas our study was carried out in rural setting. Our study also found that (based on health belief model), those respondents who perceived very high (susceptibility, severity, benefit, and cue to action) have higher adherence compared to others, similarly a systemic review also showed that inadequate knowledge about cardiovascular disease impaired the adherence to medicine intake.<sup>(13)</sup>

## Conclusion

This study concludes the prevalence of adherence to HT management was low in study population due to inadequate perceived susceptibility, perceived, severity, perceived benefit, and perceived cue to action and poor lifestyle factor like alcohol and smoking habits. These barriers could be avoided by improving literacy of the study population, and also measures should be taken for effective health education and behavior change communication.

## Limitation of study

Since this was a cross-sectional design, there is a possibility of recall bias in our study. Although the postgraduates and interns were trained prior to data collection, there could be minimal chance of inter-observer variation in our study.

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