
ORIGINAL ARTICLE**Adherence to antihypertensive medications and its determinants among adult hypertensive patients***Sindu Punna^{1*}, Sudhakar Kodudula¹, Vineela Karthik N¹**¹Department of Pharmacology, Bhaskar Medical College Moinabad, Ranga Reddy, Hyderabad-500075 (Telangana) India*

Abstract

Background: Hypertension is an important noncommunicable disease and is one of the major but modifiable risk factors of cardiovascular disease. There are multiple reasons for the poor Blood Pressure (BP) control rates of which, lack of adherence is an important factor. *Aim and Objectives:* To assess antihypertensive medication adherence in hypertensives. To identify factors associated with adherence. *Material and Methods:* A cross-sectional observational study was conducted among 400 hypertensive patients. Morisky Medication Adherence Scale (MMAS-4) was administered on them for assessing adherence to medications. *Results:* Fifty two point five percent of study participants had high adherence to antihypertensive medications. Statistically significant association to adherence was found among patients below 60 years, educated, married, high socioeconomic status, without co-morbidities and recent onset hypertensives. *Conclusion:* High adherence was associated with better control of blood pressure. Treatment of hypertension should be holistic and treating clinician should check for adherence especially in uneducated, low socioeconomic status, single, alcoholics, smokers and patients with co-morbidities. Public awareness campaigns should be conducted on the importance of hypertension control.

Key words: Hypertension, Adherence, Morisky Medication Adherence Scale

Introduction

Hypertension is an important non communicable disease. Majority of patients (90 to 95%) have essential or primary hypertension [1]. It is the commonest cardiovascular disorder and is one of the major risk factors for cardiovascular mortality [2]. In the year 2019, it was estimated that 626 million women and 652 million men suffered from hypertension worldwide [3]. Increase in the prevalence of hypertension was noticed, especially in low and middle-income countries. In Asia, overall estimated prevalence of non-adherence to anti-hypertensive medication was 48%. It was higher among females (49%), compared to males (47%) [4]. The prevalence of hypertension among

adults in India was 29.8% and there is significant difference in prevalence of hypertension between rural (27.6%) and urban (33.8%) areas. Of these 25% rural and 42% urban Indians are aware of their hypertensive status. Only 25% rural and 38% of urban Indians are treated for hypertension. In spite of having safe and effective antihypertensives, only one tenth of rural and one fifth of urban Indian hypertensives have their Blood Pressure (BP) under control [5].

Hypertension significantly increases the risks of heart, brain, kidney, and other diseases. It is a major cause of premature death. Case control studies have reported that hypertension is the most

important risk factor for Cardiovascular Disease (CVD) in India. Global Burden Disease (GBD) study estimated that hypertension led to 1.6 million deaths and 33.9 million disability adjusted life years in 2015. It is the most important cause of disease burden in India [6]. Efficacy, safety, convenience, cost are vital in selection of anti-hypertensive agents. In addition, the level of patient involvement in formulating the treatment regimen seems to be essential in obtaining target BP [7].

Though there are multiple reasons for the poor control rates, most physicians agree that “lack of patient compliance”, as the major contributing factor. The World Health Organization (WHO) defines adherence to long term therapy as “the extent to which a person's behaviour taking medication, following a diet and/or executing lifestyle changes corresponds with the agreed recommendations from a health care provider”. Lack of adherence to the prescribed drug regimen is around 50%; leading to poor control rates [8]. Dosing frequency, complex medication regimens and side effects of treatment are the multiple factors which are the barriers for drug adherence [9].

There are limited studies done in rural South India to assess adherence to medications in hypertensive individuals. Therefore, this study is done to assess medication adherence, and factors associated with adherence to antihypertensive medication.

Material and Methods

This was a cross-sectional observational study conducted at Department of General Medicine, MediCiti Institute of Medical Sciences, Telangana from October 2018 to June 2019. Study subjects were recruited from those attending the out-

patient department of General Medicine for treatment of hypertension. Institutional Ethics Committee approval was obtained. An informed consent was obtained from all the participants enrolled in the study prior to the commencement of the study.

Sample size estimation: Since there is no data regarding adherence to medication in this study population, the below given estimate for sample size to yield maximum numbers was used to calculate the number of subjects to be recruited for this study. Sample size for cross sectional study is given by the formula = $4.p.q / l^2$; where p= Prevalence, q=1-p, l= allowable error (Precision). Here, we took prevalence (p) as 50% due to lack of previous data on adherence, assuming an allowable error of 5% the sample size required = $4 \times 0.5 \times 0.5 / (0.05) \times (0.05) = 400$. Hence, 400 patients were enrolled into the study.

Patients who were on antihypertensive medication for the past 6 months, aged 18 years or above and those who spoke Telugu, English or Hindi were included in the study. In-patients (patients admitted in the hospital) and pregnant women were excluded.

Data were collected using a structured questionnaire. Sociodemographic and socioeconomic data (age, gender, marital status, type of family, average number of family members, educational status, social class, alcohol consumption and smoking) of patients were recorded. Social class was categorized according to Modified BG Prasad Socio-economic Classification-2019 [10]. Hypertension and its treatment related characteristics like duration of hypertension, family history of hypertension, co-morbidities and present BP status, were

obtained. [9,11-12]. Four item Morisky Medication Adherence Scale (MMAS-4) was administered for the assessment of adherence to medications and categorized into - high, intermediate and low. Intermediate and low were together grouped into low adherence and analyzed accordingly.

Blood pressure was measured thrice during the study procedure using a mercury sphygmomanometer and a stethoscope. The first measurement was taken immediately after the visit to OPD, second after obtaining informed consent and the third measurement after obtaining data as per proforma. Blood pressure was measured in all subjects in sitting position in the right arm placed at the level of the heart. An appropriate-sized cuff (cuff bladder encircling at least 80% of the arm) was used to ensure accuracy.

Statistical analysis

All the data collected was entered into Excel spreadsheets of Microsoft Office 2003. Chi-square test and Fisher's exact test were used to test statistical significance using social science statistics calculators. Fisher's exact test was used for socioeconomic status; and for the remaining factors, chi square test was used. Odds ratios [with 95% Confidence Intervals (CI)] were calculated using SPSS version 17 for windows. A p-value of less than 0.05 was considered to be statistically significant.

Results

In the present study, out of 400 patients, majority (58%) participants were aged <60 years. Most of the participants were males (70.5%), married (81%), educated (73%) and living in nuclear families (85%). The average number of family members was 4.5. According to modified BG Prasad Socioeconomic Classification (2019), majority of participants belonged to social class I (61%) and II (22%). It was observed that 42% participants consumed alcohol and 22% were smokers (Table 1). Family history of hypertension was seen in 26% participants while 33% of the population had a history of coexisting illness, mostly diabetes.

Adherence was assessed by using the 4 item MMAS and 52.5% of participants showed high adherence which was significantly associated with age <60 years, being married, educated and belonging to high socio-economic status, having positive family history of hypertension, and without having any comorbidity, alcohol use or smoking. No significant relationship was found with gender, type of family and number of family members. (Tables 1 and 2). "Blood pressure control" was the only factor which showed significant relationship in multivariate regression analysis (Table 3).

Table 1: Adherence according to socio-demographic characteristics

Variables		High Adherence No (%)	Low Adherence No (%)	Total No (%)	p
Age in years	≤ 60 years	137(59)	94(41)	231(58)	0.00143
	> 60 years	73(43)	96(57)	169(42)	
Gender	Male	151(54)	131(46)	282(71)	0.517
	Female	59(50)	59(50)	118(30)	
Marital status	Unmarried	2(67)	1(33)	3(1)	<0.0001
	Married	191(59)	131(41)	322(81)	
	Divorced	1(14)	6(86)	7(2)	
	Widow	16(24)	52(76)	68(17)	
Type of family	Joint	36(58)	26(42)	62(16)	0.339
	Nuclear	174(51)	164(49)	338(85)	
Number of family members	≤ 4 members	126(51)	123(49)	249(62)	0.329
	> 4 members	84(56)	67(44)	151(38)	
Education	Uneducated	49(45)	61(55)	110(28)	0.049
	Educated	161(56)	129(44)	290(73)	
Alcohol consumption	Yes	62(37)	105(63)	167(42)	<0.0001
	No	148(64)	85(36)	233(58)	
Smoking	Yes	19(22)	68(78)	87(22)	<0.0001
	No	191(61)	122(39)	313(78)	

Table 2: Adherence according to hypertension related characteristics

Variables		High Adherence	Low Adherence	Total	p
Duration of hypertension	≤5 years	138(63)	82(37)	220(55)	<0.001
	>5 years	72(40)	108(60)	180(45)	
Family history of hypertension	Present	66(65)	36(35)	102(26)	0.004
	Absent	144(48)	154(52)	298(75)	
Co-morbidities	Present	40(29)	97(71)	137(34)	<0.001
	Absent	170(65)	93(35)	263(66)	
Hypertension status	Controlled	193(91)	18(9)	211(53)	<0.001
	Uncontrolled	17(9)	172(91)	189(47)	

Table 3: Multivariate logistic regression analysis between variables and medication

Variables	Odds ratio	95% C.I. for exp (b)		p
		Lower	Upper	
Age	1.863	0.708	4.906	0.208
Education	0.473	0.192	1.166	0.104
Marital status				
Married	0.179	0.001	58.303	0.56
Divorced	3.549	0.001	8570.466	0.75
Widow	1.662	0.005	596.344	0.866
Socioeconomic status				
Socioeconomic status 2	0.142	0.044	0.453	0.001
Socioeconomic status 3	0.506	0.119	2.156	0.357
Socioeconomic status 4	0.077	0.013	0.462	0.005
Socioeconomic status 5	3.011	0.103	87.703	0.522
Alcohol	0.672	0.267	1.693	0.399
Smoking	0.523	0.162	1.687	0.278
Duration of hypertension	0.62	0.013	28.587	0.807
Duration of treatment	2.541	0.054	119.09	0.635
Family history	0.527	0.19	1.458	0.217
Co-morbidities	0.621	0.231	1.669	0.345
BP Control	0.003	0.001	0.011	0

Discussion

In developed countries such as Scotland, adherence was found to be (91%) whereas in developing countries like Gambia and the Seychelles, adherence was 27% and 26%, respectively [11]. This difference could be due to

difference in health care facilities and patient care, among different countries. In the present study, about half of the participants (52.5%) had high adherence to antihypertensive medications. This was better compared to the study conducted by

Venkatachalam *et al.* in Tamil Nadu, where adherence was only (24.1%) [12]. Study conducted by Venkatachalam *et al.* was a community-based study whereas the participants of the present study were enrolled from a tertiary care hospital. The difference in the levels of awareness, and accessibility to care could have contributed to the difference in the levels of adherence. The studies done by Lee *et al.* (52%), Hossain *et al.* (52%) and Ramli *et al.* (53%) reported adherence similar to that of present study [9,13-14].

In the present study adherence was found to be higher among people aged below 60 years. However, most of the other studies such as Rao *et al.*, and Hashmi *et al.* showed high adherence among the participants aged ≥ 60 years [11,15]. This difference could be possibly due to difference in the demographic locations, sample sizes across the studies.

No significant association was found between adherence and gender ($p>0.05$). This is in line to the study by Venkatachalam *et al.* who reported the same [12]. There is a substantial increase in women education which could be the reason for them having health awareness similar to men.

High adherence was seen in those who were married than in single ($p<0.01$). High adherence in the married population may be due to the support given by the spouse. This is similar to the study by Hossain *et al.* who reported that married people are twice more adherent than divorced and widowed [13].

There was no significant association with type of family and number of family members. ($p>0.05$), which is in line to the study by Bhandari *et al.* High adherence was seen in educated and high socio-economic status participants. This contrasts with the studies done by Bhandari *et al.* and

Mallya *et al.* who did not find any significant association [16-17]. Cost of medication is an important factor for adherence. Educated and high socioeconomic status individuals generally could afford the medications which could have improved the adherence.

Non-alcoholics showed high (64%) adherence which was similar to the study by Ahmad *et al.* [18]. People tend to forget their medication while being intoxicated which could be the reason for low adherence among alcoholics. High adherence was seen in non-smokers (61%) similar to Rao *et al.* who reported that high (74.8%) adherence was observed in non-smokers and non-tobacco users [11].

In the present study there was a negative association between medication adherence and duration of antihypertensive treatment. Participants receiving antihypertensive medication for ≤ 5 years, had high (63%) adherence compared to other participants. This is in line with the study conducted in Nepal by Hossain *et al.*, who found similar observation [13].

Participants with positive family history had high (65%) adherence than other participants. This finding is consistent with other study by Ahmad *et al.*, where people with presence of family history exhibited high (65.5%) adherence [18]. People with positive family history may have better awareness regarding the complications of uncontrolled hypertension which could be the reason for high adherence.

The participants without co-morbidities had high (65%) adherence. Extra pill burden, additional side effects may lead to low adherence among participants with co-morbidities. Mekonnen *et al.* also reported the same [19] while in Mangalore,

Kumar *et al.* reported that there was no significant association between adherence and co-morbidities [20].

Ninety percent of participants having high adherence achieved blood pressure control. Whereas in participants with low adherence the blood pressure control was only 10%. This is the only factor which showed significant relationship in multivariate regression analysis (Table 3). In Kolkata, Bhandari *et al.* reported that the adherent patients were two times more likely to achieve adequate control of hypertension compared to those who were not adherent [16].

Apart from several factors affecting the adherence to medications, difference in the methods used for assessment of adherence in various studies across the world could potentially contribute to the wide differences in the observed adherence.

Conclusion

Hypertension treatment should be holistic and individualized. Adherence to medication is crucial for hypertension control. So, the treating clinician should periodically check for adherence especially in uneducated, low socioeconomic status, single, alcoholics, smokers, and patients with co-morbidities.

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References

1. Oparil S, Acelajado MC, Bakris GL, Berlowitz DR, Cifková R, Dominiczak AF, *et al.* Hypertension. *Nat Rev Dis Primers* 2018;4:18014.
2. George R, D'silva F, D'souza JL. Perceived barriers and effectiveness of planned teaching programme on life style modification practices of persons with hypertension- A study in Dakshina Kannada, Mangalore. *JKrishna Inst Med Sci Univ* 2012; 1(2): 117-123.
3. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet* 2021;398(10304):957-980.
4. Mahmood S, Jalal Z, Hadi MA, Khan TM, Haque MS, Shah KU. Prevalence of non-adherence to antihypertensive medication in Asia: a systematic review and meta-analysis. *Int J Clin Pharm* 2021;43(3):486-501.
5. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, Prabhakaran D. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *J Hypertens* 2014;32(6):1170-1177.
6. Gupta R, Xavier D. Hypertension: The most important non communicable disease risk factor in India. *Indian Heart J* 2018;70(4):565-572.
7. Neutel JM, Smith DH. Improving patient compliance: a major goal in the management of hypertension. *J Clin Hypertens (Greenwich)* 2003;5(2):127-132.
8. Brown MT, Bussell JK. Medication adherence: WHO cares? *Mayo Clin Proc* 2011;86(4):304-314.
9. Lee GKY, Wang HXH, Liu KQL, Cheung Y, Morisky DE. Determinants of medication adherence to antihypertensive medication among a Chinese population using Morisky medication adherence scale. *Indian J Community Health* 2013; 8(4):150-152.
10. Pandey VK, Aggarwal P, Kakkar R. Modified BG Prasad Socio-economic Classification, Update-2019. *Indian J Comm Health* 2019; 31(1): 123-125.
11. Rao BB, Kabra PR, Sreedhar M. Factors associated with adherence to antihypertensive treatment among hypertensive persons in an urban slum area of Hyderabad. *Indian J Basic Applied Med Res* 2014;4(1):471-477.

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12. Venkatachalam J, Abraham SB, Singh Z, Stalin P, Sathya GR. Determinants of patient's adherence to hypertension medications in a rural population of Kancheepuram district in Tamilnadu, South India. *Indian J Comm Med* 2015; 40(1): 33-37.
 13. Shrestha B, Ferdoush Z, Rabbi F, Hossain A. Adherence to Medications among Nepali Hypertensive Population: A Hospital-Based Cross-Sectional Study. *Biomed J Sci Tech Res* 2018; 3(1): 1-4.
 14. Ramli A, Ahmad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. *Patient Prefer Adherence* 2012; 6:613-622.
 15. Hashmi SK, Afridi MB, Abbas K, Sajwani RA, Saleheen D, Frossard PM, et al. Factors associated with adherence to antihypertensive treatment in Pakistan. *PLoS One* 2007; 2(3): e280.
 16. Bhandari S, Sarma PS, Thankappan KR. Adherence to antihypertensive treatment and its determinants among urban slum dwellers in Kolkata, India. *Asia Pac J Public Health* 2015; 27(2): NP74-84.
 17. Mallya SD, Kumar A, Kamath A, Shetty A, Mishra S. Assessment of treatment adherence among hypertensive patients in a coastal area of Karnataka, India. *Int J Comm Med Public Health* 2017; 5(3):1998-2003.
 18. Ahmad S. Assessment of adherence to antihypertensive treatment among patients attending a health care facility in North India. *Int J Res Med* 2015; 4(1):117-124.
 19. Mekonnen HS, Gebrie MH, Eyasu KH, Gelagay AA. Drug adherence for antihypertensive medications and its determinants among adult hypertensive patients attending in chronic clinics of referral hospitals in Northwest Ethiopia. *BMC Pharmacol Toxicol* 2017; 18:27.
 20. Kumar N, Unnikrishnan B, Thapar R, Mithra P, Kulkarni V, Holla R et al. Factors associated with adherence to antihypertensive treatment among patients attending a tertiary care hospital in Mangalore, South India. *Int J Cur Res Rev* 2014; 6(10):77-85.
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***Author for Correspondence:**

Dr Sindhu Punna, Department of Pharmacology, Bhaskar Medical College, Yenkapally, Moinabad, Ranga Reddy, Hyderabad-500075 Telangana Email: dr.punnasindhu@gmail.com Cell: 09010452523

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