Cross-Sectional Observational Study on Medication Adherence Levels among Patients with Hypertension in Community Settings of Coastal Districts of Andhra Pradesh

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ABSTRACT

Background: Poor medication adherence can significantly reduce treatment efficiency and impact clinical outcomes, ultimately hindering the effectiveness of patient care. Non-adherence to anti-hypertensive medication is a main cause of poor control of hypertension worldwide. The National Family Health Survey (NFHS 5) data from India revealed a significant proportion of individuals have had their blood pressure measured, with a national average of 66.7%. However, this rate has considerable regional variations, ranging from as low as 30.3% to as high as 98.5% across different districts. The southern region of India demonstrates the highest average prevalence of ever-measured blood pressure at 75.8% (Andhra Pradesh with 74.7%). The present study aims to assess the level of adherence and the reasons behind nonadherence in individuals with hypertension. Materials and Methods: A cross-sectional observational study was conducted using a questionnaire from October to December 2023. Results: A Total of 217 hypertensive individuals participated. Which had a predominance of females (n=119, 54.8%) and 98 (45.2%) were males. The mean age of respondents was 60.4 years, the majority aged 61-80 years (n = 125, 57.60%). In this study, 63.5% were low adherers, 34.1% were medium adherers, and 2.3% were high adherers. The study disclosed that forgetfulness (20.73%) is among the primary reasons for non-adherence in hypertensive patients. Conclusion: Based on this study's results, improving people's understanding of hypertension is necessary. Strategies such as patient education, patient counselling, and medication management programs could help the identified hurdles to adherence and reduce hypertension-related cardiac adverse outcomes.

Keywords: Adherence, Antihypertensive, Morisky medication adherence scale, Nonadherence, Quality of life.

INTRODUCTION

Hypertension is the leading cause of premature disease within a population and the death rate worldwide (Mills *et al.*, 2020). The number of individuals with hypertension increased twofold between 1990 and 2019 from 650 million to 1.3 billion (WHO, 2023). The global burden of Cardiovascular Disease (CVD) is heavily associated with elevated Blood Pressure (BP). In 2015, systolic BP \geq 110-115 mmHg contributed to 10.7 million deaths worldwide, and \geq 140 mmHg contributed to 7.8 million deaths.



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Ischemic Heart Disease (IHD), ischemic stroke, and hemorrhagic stroke were the leading causes of BP-related deaths (Chaudri, 2004). The incidence of hypertension is 1 in 3 adults worldwide. Over 75% of individuals with hypertension are living in low- and middle-income countries. Four out of every five people with hypertension are not adequately treated; 76 million deaths could be prevented between 2023 and 2050 if countries take proper education measures (WHO, 2023). The National Family Health Survey (NFHS 5) data from India revealed a significant proportion of individuals have had their blood pressure measured, with a national average of 66.7%. However, this rate has considerable regional variations, ranging from as low as 30.3% to as high as 98.5% across different districts. The southern region of India demonstrates the highest average prevalence of ever-measured blood pressure at 75.8% (Andhra Pradesh with 74.7%).

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Dr. Tedros Adhanom Ghebrevesus, the Director-General of the World Health Organization (WHO), Said "Hypertension can be controlled effectively with simple, low-cost medication regimens, and yet only about one in five people with hypertension have controlled it" (WHO, 2023). In improving the patient's health outcomes for chronic diseases, nonadherence results in an unwarranted escalation to more expensive therapies. It increases hospital visits, which places a heavy financial burden on the healthcare sector (Chaudri, 2004; Asche, LaFleur, and Conner, 2011; Han et al., 2014). However, only half the hypertensive patients globally comply with their treatment regimen ordered by the physician (Lee et al., 2018). "The extent of an individual's adherence to their prescribed medication provided by a healthcare professional" is termed Medication adherence (Chaudri, 2004). It is found that nonadherence is due to the treatment regimen complexity, improper communication, and concerns about the medication's adverse events and the impact on their health (Ho et al., 2006). Low adherence leads to poor treatment outcomes and increased mortality and morbidity rates (Chaudri, 2004; Nieuwlaat et al., 2014). So, medication adherence is essential to enhance the prognosis of the treatment (Brown and Bussell, 2011; Zhang and Meltzer, 2016).

Precisely assessing and measuring the degree to which people adhere to their prescribed drug regimens is crucial for improving medication adherence. It is currently measured based on testing serum drug levels in blood or urine, and indirect methods, such as pill counts, electronic monitoring devices, and large-scale dataset analysis like reviewing prescription records and claims (Lam and Fresco, 2015; Moon et al., 2017). Some evaluation techniques might not be helpful or efficient enough to be used regularly in clinical settings. Morisky Medication Adherence Scale (MMAS) and Hill-Bone Compliance and Several Patient-Reported Outcome Measures (PROMs) have been created to quantify self-reported medication adherence, including the Medication Adherence Rating Scale (MARS) (Kim et al., 2000; Thompson et al., 2000; Voils et al., 2011). Because these PROMs are simple to give, they might be helpful in therapeutic settings. Healthcare providers might be able to offer prompt feedback as per patients' PROM ratings (Kidd and Altman, 2000).

Studies showed that various factors influence adherence to the treatment regimen (Alonso, 2004). Psychosocial influences play a crucial role in illness, health, and related behaviours influencing medication adherence (Camus *et al.*, 2004). The term "psychosocial" compresses both psychological factors (such as beliefs) and sociological factors (such as social support) that impact adherence. Researchers are particularly interested in how psychosocial factors affect medication adherence (Hann *et al.*, 2002).

Patient behaviours and well-being are significant concerns in medication adherence (Hann *et al.*, 2002). Two pharmaceutical beliefs-beliefs regarding the medicine's importance for

preserving one's current and future health and worries about the medication's negative effects, are the most significant elements influencing adherence (Ciechanowski *et al.*, 2003). Four out of five hypertensive patients are reluctant to take their prescribed medication, Moreover, a patient is less likely to follow the instructions as directed when they are well and not experiencing any symptoms (Culos-Reed *et al.*, 2000; Chao *et al.*, 2005). Adverse impact on adherence appears due to the asymptomatic nature of hypertension (Croghan *et al.*, 1998; National Institute for Health and Care Excellence [NICE], 2004).

This study aims to assess the degree of medication adherence among patients with hypertension in community settings of coastal districts in Andhra Pradesh.

MATERIALS AND METHODS

Study design

A cross-sectional observational study was conducted in Andhra Pradesh's coastal districts for a duration of three months (October to December 2023), as this study will provide awareness on population characteristics. One can generate a hypothesis based on this study. All information was gathered via a one-toone questionnaire concentrating on antihypertensive medication adherence. The questionnaire included questions categorized into two sections: three demographics-related questions and 9 questions aimed at evaluating participants' adherence levels. As it is an Observational Study Ethical Considerations are not required.

Study Site and Population

Hypertensive patients (age group between 18-80 years) in the urban and semi-urban areas of the coastal districts (such as NTR, Krishna, Guntur, and West Godavari) of the Indian state of Andhra Pradesh were surveyed. The study included 217 individuals diagnosed with hypertension, all of whom were using antihypertensive medications. The sample size was determined based on the margin of error of \pm 5% and at a confidence level of 95%.

Study Tools

The sampling method is simple randomized sampling. Data was gathered by using an 8-item Morisky Medication Adherence (MMAS-8) validated questionnaire. It consists of eight questions about the patient's adherence history and demographics. Both local languages and English were offered for the questionnaire. The MMAS-8 is a high-reliability, validated survey tool to assess individuals' adherence to their chronic condition medications such as hypertension. The measure of medication adherence depends on the score of the subjects, which is >2 points, 1-2 points, and 0 points, which say low, medium, and high adherence, respectively.

Statistical Analysis

The responses were collected in predesigned Google Forms recorded in spreadsheets and double-checked for errors. All the categorical variables expressed in numbers (n) and frequencies (%) were analyzed descriptively, with Factor analysis, and correlation. Data were analyzed using the statistical package for social science (SPSS'statistics) program IBM SPSS Statistics 29.

RESULTS

In the current study, 217 hypertensive individuals participated. Which had a predominance of females (n=119, 54.8%) and 98 (45.2%) were males. The youngest respondent was 18 years old and the oldest was 80 years old. The mean age of respondents was 60.4 years (SD=11.2 years), the majority aged 61-80 years (n=125, 57.60%), individuals were between 15-30 years (n=2, 0.92%), individuals were between 31-45 years (n=20, 9.21%), of individuals were between 46-60 years (n=70, 32.25%) (Graph 1).

The medication adherence scale mean score was 2.5 (SD=1.5). A score"0" on the scale indicates highly adherent patients, a score "1 or 2" is medium adherence, and a score "> 2" is low adherence. Using these cut points approximately two third of the population are low adherers (63.5%), 34.1% medium adherers, and 2.3% high adherers (Graph 2). The study disclosed that forgetfulness (20.73%) is among the primary reasons why the chosen group of hypertensive patients doesn't follow their treatment plan.

Based on age and gender no significant differences were observed in the distribution of hypertension medication usage by duration (Table 1), Adherence to Medication Regimen (Table 2), Factors Affecting Medication Adherence (Table 3), and Adherence Levels among Hypertensive Patients (Table 4).

DISCUSSION

Chronic illnesses often require long-term medication, but these treatments are less effective when patients do not take their medicine as prescribed. Non-adherence to anti-hypertensive medication is a main cause of poor control of hypertension worldwide. Many factors contributing to poor medication adherence includes Patient-related (e.g., May struggle with understanding their health condition), related to physicians (e.g., Might prescribe complex treatment regimens, communication barriers ineffective communication regarding side effects, and provision of treatment by multiple physicians). The healthcare system itself can also be a barrier, with short appointments,



Graph 1: Bar Chart showing the Age Groups of Participants.

Table 1: Distribution of hypertension medication usage by duration and age. Duration of hypertension treatment differed significantly by age group
(p<0.001). Most patients (54.8%) had hypertension medication for 1-5 years (differences between age categories were statistically significant). There
was no difference in the duration of treatment between female and male patients (p =0.443).

	Since how many years has, he/she been using hypertension medication?								
(Years)	1-5	11-15	16-20	25-30	6-10	Below 1 year	Total		
Age	85(100)	48(100)	16(100)	5(100)	55(100)	8(100)	217(100)		
19-25	1(1.2)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(0.5)		
26-35	1(1.2)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(0.5)		
36-45	12(14.1)	0(0.0)	0(0.0)	0(0.0)	3(5.5)	3(37.5)	18(8.3)		
46-55	27(31.8)	4(8.3)	3(18.8)	0(0.0)	6(10.9)	4(50.0)	44(20.3)		
56-65	27(31.8)	21(43.8)	4(25.0)	1(20.0)	23(41.8)	1(12.5)	77(35.5)		
66-75	12(14.1)	23(47.9)	7(43.8)	4(80.0)	22(40.0)	0(0.0)	68(31.3)		
76-80	4(4.7)	0(0.0)	2(12.5)	0(0.0)	1(1.8)	0(0.0)	7(3.2)		
Below 18	1(1.2)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(0.5)		
<i>p</i> -value	0.001								
Gender	85(100)	48(100)	16(100)	5(100)	55(100)	8(100)	217(100)		
Female	47(55.3)	30(62.5)	6(37.5)	4(80.0)	28(50.9)	4(50.0)	119(54.8)		
Male	38(44.7)	18(37.5)	10(62.5)	1(20.0)	27(49.1)	4(50.0)	98(45.2)		
<i>p</i> -value	0.443								

Questions	ns Do you sometimes forget to take your medicine?		People sometimes miss taking their medicines for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your medicine?		Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?		When you travel or leave home, do you sometimes forget to bring along your medicine?		Did you take all your medicines yesterday?	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Age	160(100)	57(100)	184(100)	33(100)	175(100)	42(100)	170(100)	47(100)	27(100)	190(100)
19-25	1(0.6)	0(0.0)	0(0.0)	1(3.0)	0(0.0)	1(2.4)	1(0.6)	0(0.0)	1(3.7)	0(0.0)
26-35	0(0.0)	1(1.8)	1(0.5)	0(0.0)	1(0.6)	0(0.0)	1(0.6)	(0.0)	0(0.0)	1(0.5)
36-45	9(5.6)	9(15.8)	13(7.1)	5(15.2)	13(7.4)	5(11.9)	14(8.2)	4(8.5)	5(18.5)	13(6.8)
46-55	32(20.0)	12(21.1)	37(20.1)	7(21.2)	36(20.6)	8(19.0)	35(20.6)	9(19.1)	9(33.3)	35(18.4)
56-65	61(38.1)	16(28.1)	68(37.0)	9(27.3)	63(36.0)	14(33.3)	62(36.5)	15(31.9)	6(22.2)	71(37.4)
66-75	52(32.5)	16(28.1)	57(31.0)	11(33.3)	57(32.6)	11(26.2)	53(31.2)	15(31.9)	4(14.8)	64(33.7)
76-80	5(3.1)	2(3.5)	7(3.8)	0(0.0)	5(2.9)	2(4.8)	3(1.8)	4(8.5)	2(7.4)	5(2.6)
Below 18	0(0.0)	1(1.8)	1(0.5)	0(0.0)	0(0.0)	1(2.4)	1(0.6)	0(0.0)	0(0.0)	1(0.5)
<i>p</i> -value	0.080		0.177		0.171		0.507		0.006	
Gender	160(100)	57(100)	184(100)	33(100)	175(100)	42(100)	170(100)	47(100)	27(100)	190(100)
Female	83(51.9)	36(63.2)	98(53.3)	21(63.6)	94(53.7)	25(59.5)	92(54.1)	27(57.4)	19(70.4)	100(52.6)
Male	77(48.1)	21(36.8)	86(46.7)	12(26.4)	81(46.3)	17(40.5)	78(45.9)	20(42.6)	8(29.6)	90(47.4)
<i>p</i> -value	0.142		0.270		0.497		0.685		0.083	

Table 2: Adherence to Medication Regimen among Hypertensive Patients by Age and Gender. The adherence levels to medication regimens among hypertensive patients across different age groups and genders. No statistically significant differences were observed in responses to questions assessing medication adherence based on age (*p*-values ranging from 0.080 to 0.507) or gender (*p*-values ranging from 0.083 to 0.685).

limited access to care, and a lack of health information technology (Brown and Bussell, 2011).

Yassine *et al.*, (2016) and Al-Ramahi (2015) study results revealed that forgetfulness, a complex medication regimen, and adverse effects are other plausible causes of poor adherence which are compatible with our current study. Hence globally this is a common challenge to address and to initiate possible measures to overcome non-adherence related to forgetfulness.

Current study results revealed that nearly two-thirds (63.5%) of subjects had poor adherence to their medication therapy.

Our study findings are similar to the research by Munger, Van Tassell and Lafleur (2007), who observed that 20% of patients aged 65 years and older exhibited good adherence to their medication, with females showing more non-adherence compared to males. Similarly, our study reveals a gender disparity in adherence, with females demonstrating lower adherence rates compared to males across various age groups.

Allen's (1998) results showed that the incidence of adverse effects from antihypertensive treatment also contributes to nonadherence. Viswanathan *et al.*, (2012) research has revealed

that polypharmacy negatively impacts adherence since many patients struggle to grasp their complicated regimens and make time in their schedules to follow them. Buabeng, Matowe and Plange-Rhule's (2004) study has revealed that the high cost of antihypertensive medications also contributes to non-adherence.

Umair Khan, Anne Brien and Aslani (2020) research showed that patients who forget to take their prescriptions and who are concerned about unfavourable side effects are the ones who discontinue treatment the most frequently.

In our study, Higher adherence to hypertensive medication as measured by MMAS-8 was only 2.3%, we find it is lower than some other studies in Ethiopia reported from Gondar hospitals, 64.6, Ugandan version of MMAS-8 (5%), moderate adherence was 34.1%, and low adherence was 63.5% it was low compared to the study conducted in Ugandan (85%) (Korb-Savoldelli *et al.*, 2012).

Question-wise analysis was done. "Do you sometimes forget to take your medicine". We have observed that 26.27% of the subjects are non-adherent due to forgetfulness, and work stress and 73.73% are adherent to their medication. Hence counselling

 Table 3: Factors Affecting Medication Adherence among Hypertensive Patients by Age and Gender. Data on factors that influence adherence to antihypertensive medications among hypertensive patients, by age and gender. There were significant differences in answers to questions on inconvenience related to the daily intake of medication (p=0.062) and difficulty in remembering to take medications, by age groups (p=0.001). There were no differences in answers to all questions by gender (p-values range from 0.241 to 0.487).

Questions	When you feel like your symptoms are under control, do you sometimes stop taking your medicine?		Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		How often do you have difficulty remembering to take all your medicines?				
	No	Yes	No	Yes	All the time	Never/ rarely	Once in a while	sometimes	usually,
Age	159(100)	58(100)	168100)	49(100)	8(100)	146(100)	36(100)	19(100)	8(100)
19-25	0(0.0)	1(1.7)	0(0.0)	1(2.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(12.5)
26-35	1(0.6)	0(0.0)	1(0.6)	0(0.0)	0(0.0)	0(0.0)	1(2.8)	0(0.0)	0(0.0)
36-45	12(7.5)	6(10.3)	16(9.5)	2(4.1)	4(50.0)	7(4.8)	3(8.3)	2(10.5)	2(25.0)
46-55	32(20.1)	12(20.7)	34(20.2)	10(20.4)	1(12.5)	30(20.5)	11(30.6)	1(5.3)	1(12.5)
56-65	58(36.5)	19(32.8)	60(35.7)	17(34.7)	1(12.5	57(39.0)	11(30.6)	5(26.3)	3(37.5)
66-75	51(32.1)	17(29.3)	54(32.1)	14(28.6)	1(12.5	48(32.9)	10(27.8)	8(42.1)	1(12.5)
76-80	4(2.5)	3(5.2)	3(1.8)	4(8.2)	0(0.0)	4(2.7)	0(0.0)	3(15.8)	0(0.0)
Below 18	1(0.6)	0(0.0)	0(0.0)	1(2.0)	1(12.5)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
<i>p</i> -value	0.650		0.062		0.001				
Gender	159(100)	58(100)	168(100)	49(100)	8(100)	146(100)	36(100)	19(100)	8(100)
Female	91(57.2)	28(48.3)	90(53.6)	29(59.2)	7(87.5)	75(51.4)	22(61.1)	10(52.6)	5(62.5)
Male	68(42.8)	30(51.7)	78(46.4)	20(40.8)	1(12.5)	71(48.6)	14(38.9)	9(47.4)	3(37.5)
<i>p</i> -value	0.241		0.487		0.292				

 Table 4:
 Adherence Levels among Hypertensive Patients by Age and Gender Adherence levels among hypertensive patients were categorized by age group and gender. No significant differences were observed in adherence levels based on age (p=.658) or gender (p=.753).

	Adherence	Total		
	Н	L	Μ	
Age	5(100)	138(100)	74(100)	217(100)
19-25	0(0.0)	1(0.7)	0(0.0)	1(0.5)
26-35	0(0.0)	1(0.7)	0(0.0)	1(0.5)
36-45	0(0.0)	13(9.4)	5(6.8)	18(8.3)
46-55	3(60.0)	28(20.3)	13(17.6)	44(20.3)
56-65	1(20.0)	43(31.2)	33(44.6)	77(35.5)
66-75	1(20.0)	45(32.6)	22(29.7)	68(31.5)
76-80	0(0.0)	6(4.3)	1(1.4)	7(3.2)
Below 18	0(0.0)	1(0.7)	0(0.0)	1(0.5)
<i>p</i> -value	0.658			
Gender	5(100)	138(100)	74(100)	217(100)
Female	2(40.0)	75(54.3)	42(56.8.)	119(54.8)
Male	3(60.0)	63(45.7.)	32(43.2.)	98(45.2)
<i>p</i> -value	0.753			



Graph 2: Distribution of medication adherence Scores. The pie chart illustrates the distribution of medication adherence scores among hypertensive patients. Most patients scored low on medication adherence, followed by Moderate (M) and High (H) adherence levels.

to the patient related to this aspect will improve the adherence there by the outcome of the therapy.

"People sometimes miss taking their medicines for reasons other than forgetting Thinking over the past 2 weeks, were there any days when you did not take your medicine". Observation on this questionnaire has shown 84.79% of patients are not missing their medication for the reasons other than forgetfulness and in our study subjects and 15.21% are missing in the last 14 days duration due to medicine not available, work tensions and forgetfulness. Finding the reasons for the missing in the subjects will improve the adherence level.

"Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it". As per the current study, 19.35% of participants stopped receiving their medicine without first seeing a doctor. As they experienced worse symptoms due to usage of medicine. Educating them regarding making the decisions for the termination with the consultation of a physician will have positive outcomes in the therapy. It is a psychological phenomenon to terminate medication usage when the condition is getting worsens.

"When you travel or leave home, do you sometimes forget to bring along your medicine?" The response to this questionnaire emphasizes the subjects' commitment to physician orders. 21.19% of the people have a negative response, and 78.80% are positively adherent. Hence, the patients need to be counselled, as strict adherence is required to regulate blood pressure values.

Did you take all your medicines yesterday response to this questionnaire is 87.56% of the subjects are positive and 12.44% of the subjects are identified to be ineffective.

"When you feel like your symptoms are under control, do you sometimes stop taking your medicine". In general sense of wellness will make an impact on medication adherence, in our study 27.18% had discontinued the medication when their hypertension was under control, 72.81% are adherent even after symptomatic relief.

"Taking medicine every day is a real inconvenience for some people Do you ever feel hassled about sticking to your treatment plan". In our study response to this questionnaire is that 22.58% have a sense of real inconvenience in taking medicines every day, 77.4% are sticking to their treatment plan.

How often do you have difficulty remembering to take all your medicine". The response to this questionnaire is that 67.28% of subjects have forgotten to take their prescribed medication.

Our study population's observations show that 77.87% of participants adhere to their treatment plans. Counselling and patient education will raise this percentage even further, improving the effectiveness of the treatment. The study revealed that the following factors contributed to low adherence: forgetfulness (20.73%), polypharmacy (6.45%), adverse effects (3.22%), drug regimen (2.76%), medication not available (1.38%), depression (1.38%), complex and high pharmaceutical costs (0.92%).

CONCLUSION

The present study revealed forgetfulness as a major contributing factor to low adherence among hypertensive patients. Hence based on this hypothesis taking measures to decrease forgetfulness and improve patient medication adherence by following strategies such as patient education, counselling, and medication management programs could help the identified hurdles to adherence and reduce hypertension-related cardiac adverse outcomes in hypertensive patients.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

WHO: World Health Organization; MMAS: Morisky Medication Adherence Scale; PROMs: Patient-Reported Outcome Measures; MARS: Medication Adherence Rating Scale; SPSS'statistics: Statistical package for social science.

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