

Original Research Article

Determinants of medication adherence and blood pressure control among elderly hypertensive patients attending geriatric OPD at a tertiary-care hospital in a metropolitan city

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ABSTRACT

Background: Hypertension is a prevalent non-communicable disease (NCD) in the elderly, posing significant health risks if uncontrolled. While pharmacological interventions are effective, medication adherence remains a major barrier, particularly in low and middle-income countries like India. This study aimed to assess the level of medication adherence and blood pressure (BP) control among elderly hypertensive patients attending a geriatric outpatient department (OPD) at a tertiary-care hospital and to identify their key determinants.

Methods: A cross-sectional study was conducted over two months involving 160 hypertensive patients aged 60 and above. Data were collected using a semi-structured questionnaire, 8-item Morisky medication adherence scale (MMAS-8), and medical records. BP control was categorized per 2017 AHA guidelines.

Results: Among participants, 49.4% demonstrated low medication adherence, while only 26.9% achieved optimal BP control. Adherence was significantly associated with living with a spouse ($p=0.043$) and financial support ($p=0.010$). BP control was significantly linked to medication adherence ($p<0.01$), tobacco use ($p<0.005$), duration of antihypertensive treatment ($p=0.0138$), and number of prescribed antihypertensives ($p=0.039$) were indicators of poor BP control. Common challenges included difficulty accessing healthcare (51.9%) and non-availability of medications in public pharmacies (44.4%).

Conclusions: The study highlighted poor adherence and suboptimal BP control in the geriatric hypertensive population. Socioeconomic dependence, lack of support, and logistical barriers significantly affect treatment outcomes. Targeted interventions like improved drug availability, home-based care, and family support systems are crucial for enhancing adherence and BP management in elderly patients.

Keywords: Blood pressure control, Hypertension, Medication adherence, Sociodemographic determinants

INTRODUCTION

The incidence of non-communicable diseases (NCDs) such as hypertension, diabetes, and obesity has seen a catastrophic rise in recent years. While NCDs are already the leading cause of morbidity and mortality worldwide as the global population ages, the burden of NCDs is expected to follow an upward trend.¹

Several factors contribute to the prevalence of NCDs in the elderly, aging in itself being a major risk factor. Other risk factors include- poor diet, physical inactivity, tobacco usage and excessive consumption of alcohol. Furthermore, socio-economic factors such as access to healthcare, education, and income can also contribute to one's individual risk to develop NCDs.²

Amongst NCDs, hypertension is a serious threat to Public Health as it increases the risk for heart, brain and kidney disease among others. The World Health Organization estimates 1.28 billion adults living with hypertension 220 million of which are from India.³ Furthermore, recent studies find that only 12% of Indians with hypertension have good blood pressure control.⁴ Thus hypertension is popularly dubbed ‘the silent killer’ as it may remain relatively asymptomatic for many years.⁵

Out of the large population currently living with hypertension globally, 60-80% belong to the geriatric age group.⁶ Development of arterial stiffness due to increasing age and changes in arterial compliance due to poor lifestyle choices and environmental factors cause the progressive increase in blood pressure. This increase in blood pressure is associated with increased risk of stroke, heart failure, chronic kidney disease and dementia.³ Moreover, the risk of these conditions in elderly has been found to be significantly higher than their younger counterparts with the same blood pressure.⁷

The prevention of hypertension-associated end organ damage includes adherence to life-long treatment which is based on lifestyle changes and antihypertensive medication. The systolic blood pressure intervention trial (SPRINT) confirmed intensive lowering of blood pressure in patients aged above 75 years was associated with significant cognitive benefits and reduction of cardiovascular risk.^{8,9} The World Health Organization in its current “guidelines for treatment of hypertension in adults” also highlights that pharmacological treatment of hypertension carries an overwhelmingly promising benefit/risk ratio.¹⁰

Asia was found to have a non-adherence rate of 48%, with middle to low socioeconomic countries having the highest rates of non-adherence.¹¹ In India, adherence had a wide range. Adherence was found to be only 24% in a study conducted in rural population of Kancheepuram in Tamil Nadu, and 73% in a study conducted in slum-dwellers in Kolkata.^{12,13}

In the geriatric population in India, a study conducted in Kasturbha Hospital, Manipal in 2014 found that the rate of adherence amongst 120 elderly adults was 50.8%, while in a rural health center in West Bengal amongst 186 elderly patients, adherence was found to be 44.63%.^{14,15} Both these studies used Morisky medication adherence scale-8.¹⁶

The geriatric population presents with unique barriers to accessing and consuming medication daily. Along with existence of multiple co-morbidities and polypharmacy, India's geriatric population has a high illiteracy rate and is economically dependent on others for day-to-day maintenance.¹⁷ Physical limitations in accessing healthcare centers and pharmacies as well as cognitive and psychological impairment may make management of blood pressure a challenge for the elderly.

Due to presence of such difficulties, it may be hypothesized that compliance to anti-hypertensive medication may be associated with age, however, there is no definitive literature to suggest that age is a predictor of poor adherence. Interestingly, some studies suggest a higher level of compliance in older adults. In a study conducted among 452 patients in a tertiary hospital in India found that age was a positive predictor for medication compliance. The study attributed this trend to be due to a shift of concern from wealth to health in the elderly.¹⁸

Thus, this study aimed at describing the socio-demographic profile, level of medication adherence and hypertensive control, as well as determinants of the same in the geriatric patients attending the tertiary care hospital.

METHODS

Study place

This study was conducted at Lokmanya Tilak Municipal Medical College and General Hospital.

Study design and duration

It was a cross-sectional study. Duration of study was 2 months.

Study population

The study participants were individuals over the aged 60 or above (geriatric population) attending the out patient department at a tertiary-care hospital.

Inclusion criteria

Hypertensive patients aged 60 or above, who have been diagnosed with hypertension and are currently taking at least one type of anti-hypertensive medication for more than or equal to one year. Not suffering from any acute conditions such as Myocardial Infarction, stroke, acute renal failure.

Exclusion criteria

Those not willing to participate in the study. Those suffering from emergency medical conditions were excluded from the study.

Sample size

Approximately 50 geriatric patients attended the geriatric OPD conducted on a once-a-week basis. Approximately 80% of which suffer from hypertension. Since the data collection was conducted over 1 month, the sample size taken was 160.

Study variables

Independent variables

Age, gender, education, working status, living with spouse, type of family, source of financial support, duration of antihypertensive treatment, number of medications taken daily, number of antihypertensive medications, source of medication, difficulty accessing healthcare, comorbidities.

Outcome variables

Lifestyle modifications, low salt consumption, adherence to medication, blood pressure over last 6 months, current blood pressure.

Sampling method

Convenient sampling method was used for selecting the study participants. The required number of participants as per the sample size were selected.

Study tool

A pretested, semi structured questionnaire, 8-item Morisky medication adherence scale, manual sphygmomanometer, weighing scale, pamphlets containing information on blood pressure control in local languages.

Data collection

A face-to-face interview was conducted using a semi-structured pre-tested questionnaire in English, Hindi and Marathi consisting of Socio-demographic variables, including income and family support, life style measures, presence of co-morbidities, and previously validated tools including WHO STEP wise approach to surveillance non-communicable disease.¹⁹

Medical adherence was measured by the 8-item Morisky medication adherence scale.¹⁶

BP was measured on spot according to standard practice with manual BP machine placed at heart level. The BP machines were subject to regular calibration. Patients' charts were accessed and average of 3 blood pressure readings over the past 6 months were found, 1st being the most recent.

Pamphlets containing information on the importance of blood pressure adherence were be distributed in regional languages.

Data processing and analysis

Descriptive statistics were presented as proportions or percentages for categorical data and as mean (SD) or median (IQR) for continuous data.

The difference between various means and association were analyzed using non-parametric tests. The data analysis was done using Statistical Package for Social Sciences (SPSS) 2022 software and Microsoft Excel.

Operational definition

Optimally controlled BP was defined as an average systolic BP<130 mm of Hg and average diastolic BP<80 mm of Hg for patients above 60 years, 130-139/80-89 was defined as moderately controlled and more than equal to 140/90 was defined as uncontrolled. For bivariate analysis, blood pressure was defined as <130/90 to be controlled.²¹

The MMAS-8 total score was calculated by summing the values from all 8 items, with reverse coding when necessary. A cut-off score of 6 (out of a full range of 8). A score 8 was "highly adherent", 6 and 7 was "moderately adherent" and less than 6 was "low adherence".¹⁶

Top added salt on plate was defined as the addition of raw salt on meal during meal preparation.

Aerobic exercise was defined as walking, jogging, cycling, swimming for greater than or equal to 90 minutes a week.

Tobacco usage was defined as use of tobacco over the last 3 months.

Alcohol consumption was defined as consumption of alcohol over the last 3 months.

Ethical considerations

Approval was taken from institutional ethics committee. Participants were explained that their identity will remain confidential. Informed written consent was obtained from all the participants.

For illiterate participants, the informed consent sheet was read out and their left-hand thumb impression was taken in place of signature in presence of two witnesses.

Confidentiality

Complete confidentiality of participants was maintained throughout the duration of the study and after.

RESULTS

Socio-demographic profile

Among 160 participants collected over one month, 93 were male and 67 were female. The mean age of the participants was 69.4±5.67 years. 88 (55%) of participants were aged between 60-69 years, 63 (39.4%) between 70-79 years of age and 9 (5.6%) in between 80-89 years.

Table 1: Socio-demographic profile and lifestyle of the study participants (n=160).

Characteristics	Frequency	Percent
Age (in years)		
≥60-70	88	55.0
≥70-80	63	39.4
≥80-90	9	5.6
Gender		
Female	67	41.9
Male	93	58.1
Family type		
Alone	19	11.9
Joint	94	58.8
Nuclear	47	29.4
Employment status		
Currently working	35	21.9
Housewife	47	29.4
Retired	78	48.8
Education		
Graduate	9	5.6
Illiterate	43	26.9
Primary	85	53.1
Secondary	23	14.4
Lifestyle factors		
Top salt consumption		
No	112	70.0
Yes	48	30.0
Aerobic exercise		
No	124	77.5
Yes	36	22.5
Alcohol consumption		
No	154	96.3
Yes	6	3.8
Tobacco		
No	121	75.6
Yes	39	24.4

Out of the participants, 94 (58.8%) were living in a joint family, 47 (29.4%) were living in a nuclear family and 19 (11.9%) lived alone. 78 (48.8%) were retired, 47 (29.9%) were housewives and 35 (21.9%) were currently working. Majority of the participants 85 (53.1%) had received some form of primary education, while 43 (26.9%) were illiterate.

Their lifestyle habits were assessed to find that 112 (70%) did not add top salt to their food. 124 (77.5%) did not do any form of aerobic exercise. Only 6 (3.8%) consumed alcohol over the last 6 months, while 39 (24.4%) consumed tobacco.

Clinical variables and treatment profile

Mean: out of the 160 participants, 58 (49.1%) were on treatment for hypertension for 5-10 years, 58 (36.3%) and

34 (21.25%) were on treatment for 1-5 years and more than 10 years respectively. The mean number of medications taken on a daily basis were 6.18 ± 3.4 , and the average number of antihypertensives taken daily were 1.64 ± 0.68 . 76 (47.5%) of participants had one co-morbidity, while 48 (30%) had more than one co-morbidity. The most common co-morbidity was type II diabetes mellitus with 105 (65.6%) of participants suffering from type II DM. Other co-morbidities were hyperlipidemia, obesity, chronic kidney disease, osteoarthritis, history of stroke, hypothyroidism, and asthma.

More than half, 83 (51.9%) of participants found difficulty in accessing the hospital, the most common reason being mobility issues which was faced by 66 (41.25%) of participants. Other reasons were due to difficulty finding transport to the hospital or lack of family support.

Table 2: Clinical variables and treatment profile of the study participants (n=160).

Characteristics	Frequency	Percent
Treatment duration (years)		
1-5	58	36.3
5-10	68	42.5
>10	34	21.25
No. of medications taken daily		
1-5	83	51.9
>5	77	48.1
Number of anti-hypertensive medications taken daily		
1	73	45.6
2+	87	54.4
Number of co-morbidities		
0	36	22.5
1	76	47.5
1+	48	30.0
Difficulty in accessing the hospital		
No	77	48.1
Yes	83	51.9
Source of medication		
Commercial pharmacy	45	28.1
Government pharmacy	115	71.9
Finance for treatment		
Self	53	33.1
Family	99	66.9
Blood pressure control		
Well controlled	43	26.9
Moderately controlled	45	28.1
Uncontrolled	72	45.0

115 (71.9%) participants procured their medications from government pharmacies. 45 (28.1%) of participants used commercial pharmacies to purchase one or more medications on a regular basis. The most common reason for using commercial pharmacies was non-availability of medication in government hospitals. Other reasons were due to long lines and increased convenience of commercial pharmacies. 71 (44.37%) of participants said that they have used the commercial pharmacy due to non-availability of drugs at government pharmacies

More than half the participants, 95 (59.4%) were dependent on others for finance for their treatment, either children, other members of family or donations. 53 (33.1%) paid for treatment themselves, while 4 (2.5%) said that they had no means of financing their treatment.

Medication adherence

33 (20.6%) of participants were found to be highly adherent, while 48 (30%) and 79 (49.4%) showed

medium and low levels of adherence. In accordance with the other studies, for further analysis, high and medium adherence (MMAS score 6 or more) was taken as adherent, and low (MMAS 8 score <6) was taken as non-adherent.¹⁶

Table 3: Medication adherence amongst study participants (n=160).

Adherence	Frequency	Percentage
High	33	20.6
Medium	48	30.0
Low	79	49.4

Out of these, living with spouse ($\chi^2=6.309$, $p=0.043$) and finance for medication ($\chi^2=9.21$, $p=0.010$) was found to be significantly associated with medication adherence. Blood Pressure control was also found to be significantly associated with medication adherence ($\chi^2=36.029$, $p<0.01$). Other factors were found to not have a significant correlation with medication adherence.

Table 4: Chi-square test for exploring the variables associated with adherence to antihypertensives among elderly.

Variables	High adherence (%)	Moderately adherence (%)	Low adherence (%)	χ ² (df)	P value
Age (years)					
≥60-70	14 (46.57)	27 (69.23)	47 (59.49)	4.264	0.371
≥70-80	18 (60)	18 (46.15)	27 (34.18)		
≥80-90	1 (3.33)	3 (7.59)	5 (6.33)		
Gender					
Male	19 (57.58)	26 (64.17)	48 (60)	0.538	0.764
Female	14 (42.42)	22 (45.83)	31 (40)		
Living with spouse					
Yes	22 (66.67)	23 (47.92)	55 (59.62)	6.309	.043
No	11 (33.33)	25 (52.08)	24 (30.38)		
Type of family					
Nuclear	10 (29.41)	14 (29.17)	23 (29.11)	3.208	0.524
Joint	22 (64.71)	27 (56.25)	45 (56.96)		
Alone	1 (5.88)	7 (14.58)	11 (23.92)		
Education					
Illiterate	5 (15.15)	15 (31.25)	23 (29.11)	3.393	0.758
Primary	20 (60.60)	24 (50)	41 (51.9)		
Secondary	6 (18.18)	7 (14.58)	10 (12.6)		
Graduate	2 (6.06)	2 (41.6)	5 (6.32)		
Treatment duration					
1-5 years	11 (27.08)	13 (33.33)	34 (40.48)	10.084	0.121
5-10 years	18 (45.83)	22 (54.55)	28 (33.33)		
10-20 years	3 (12.50)	6 (9.09)	13 (15.48)		
More than 20 years	1 (14.58)	7 (3.03)	4 (4.76)		
Number of medications taken daily					
5 or under	14 (42.42)	28 (58.33)	41 (51.89)	1.983	0.371
More than 5	19 (57.57)	20 (41.67)	38 (48.11)		
Number of anti-hypertensive medications taken daily					
1	15 (45.45)	26 (54.17)	32 (40.50)	2.246	0.325
2+	18 (54.54)	22 (45.8)	47(59.49)		
Number of co-morbidities					
0	8 (24.2)	14 (29.2)	14 (17.7)	4.385	0.356
1	13 (39.4)	24 (50.0)	29 (49.4)		
1+	12 (36.4)	10 (20.8)	26 (32.9)		
Difficulty in accessing the hospital					
No	18 (54.5)	27 (56.3)	32 (40.5)	3.651	0.161
Yes	15 (45.5)	21 (43.8)	47 (59.5)		
Source of medication					
Commercial	4 (12.1)	15 (31.3)	26 (32.9)	5.308	0.070
Government	29 (87.9)	33 (68.8)	53 (67.1)		
Finance for treatment					
Self	4 (12.1)	21 (43.75)	28 (35.4)	9.21	0.010
Family	29 (87.9)	27 (56.25)	51 (64.56)		
Blood pressure control					
Well controlled	17 (51.5)	17 (35.4)	9 (11.4)	36.029	<0.001
Moderately controlled	11 (33.3)	17 (35.4)	17 (21/5)		
Uncontrolled	5 (15.2)	14 (29.2)	53 (67.1)		

Table 5: Chi-square test for exploring the variables associated with blood pressure control among elderly.

Variables	Controlled blood pressure	Moderately controlled	Uncontrolled	χ ² (df)	P value
Age (years)					
≥60-70	23 (53.48)	30 (66.67)	35 (48.61)	4.699	0.320
≥70-80	18 (41.86)	14 (31.11)	31 (43.05)		
≥80-90	2 (4.65)	1 (2.22)	6 (8.33)		
Gender					
Male	20 (46.51)	28 (62.22)	45 (62.5)	3.259	0.196
Female	23 (53.48)	17 (37.78)	27 (37.5)		
Living with spouse					
Yes	26 (60.46)	27 (60.00)	47 (65.28)	0.433	0.805
No	17 (39.53)	18 (40.00)	25 (34.72)		
Type of family					
Nuclear	13 (30.23)	13 (28.89)	13 (28.89)	1.377	0.848
Joint	27 (62.79)	26 (57.78)	26 (57.78)		
Alone	3 (6.98)	6 (13.33)	6 (13.33)		
Treatment duration					
1-5 years	20 (46.51)	16 (35.55)	22 (30.55)	12.52	0.0138
5-10 years	14 (32.56)	25 (55.55)	29 (40.23)		
More than 10 years	9 (20.93)	4 (8.89)	21 (29.17)		
Number of medications taken daily					
5 or under	27 (62.79)	19 (42.22)	37 (51.39)	3.739	0.154
More than 5	16 (37.20)	26 (57.78)	35 (48.61)		
Number of anti-hypertensive medications taken daily					
1	26 (60.47)	21 (46.67)	26 (36.11)	6.464	0.039
2+	17 (39.53)	24 (53.33)	46 (63.89)		
Number of co-morbidities					
0	13 (30.23)	9 (20)	14 (19.44)	2.221	0.695
1	19 (44.19)	21 (46.67)	36 (50)		
1+	11 (25.58)	15 (33.33)	22 (30.56)		
Difficulty in accessing the hospital					
No	25 (58.14)	21 (46.67)	31 (42.47)	2.507	0.286
Yes	18 (41.86)	24 (53.33)	42 (57.53)		
Source of medication					
Commercial	9 (20.93)	12 (26.67)	24 (33.33)	2.115	0.347
Government	34 (79.06)	33 (73.33)	48 (66.67)		
Finance for treatment					
Self	16 (37.21)	18 (40)	31 (43.06)	0.39	0.822
Family	27 (62.79)	27 (60)	41 (56.94)		
Adherence					
High	17 (39.53)	11 (24.44)	5 (6.94)	36.029	<0.001
Medium	17 (39.53)	17 (37.78)	14 (19.44)		
Low	9 (20.93)	17 (37.78)	53 (73.61)		
Top salt addition					
Yes	9 (20.93)	17 (37.78)	22 (30.56)	2.991	0.224
No	34 (79.07)	28 (62.22)	50 (69.44)		
Aerobic exercise					
Yes	12 (27.90)	12 (26.67)	12 (16.67)	2.574	0.276
No	31 (72.09)	33 (73.33)	60 (83.33)		
Alcohol consumption					
Yes	3 (6.98)	2 (4.44)	4 (5.56)	0.262	0.88
No	40 (93.02)	43 (95.56)	68 (94.44)		
Tobacco consumption					
Yes	5 (11.62)	8 (17.78)	26 (36.11)	17.96	<0.005
No	38 (88.37)	37 (82.22)	46 (63.89)		

A binary logistic regression analysis was conducted to explore how various factors influence the likelihood of participants adhering to their antihypertensive medication regimen

Hypertension control in elderly and determinants

Out of the 160 participants, 72 (45%) were found to have uncontrolled blood pressure (greater than or equal to 140/90 mmHg), while only 43 (26.9%) and 45 (28.1%) had well (less than 130/80 mmHg) and moderately controlled blood pressure (130-139/80-89 mmHg).

Univariate analysis was performed to determine the relationship between blood pressure control and gender, age, education level, living with spouse, type of family, support at home, financial assistance, duration of antihypertensive medication, number of medication and antihypertensive medication taken, difficulty in reaching the hospital, medication control and lifestyle factors such as top salt consumption, tobacco, alcohol and exercise. Of these parameters, a statistically significant association was found between duration of treatment ($\chi^2=12.52$, $p=0.00138$), number of antihypertensive medications ($\chi^2=6.464$, $p=0.039$) and tobacco consumption ($\chi^2=17.96$, $p<0.005$)

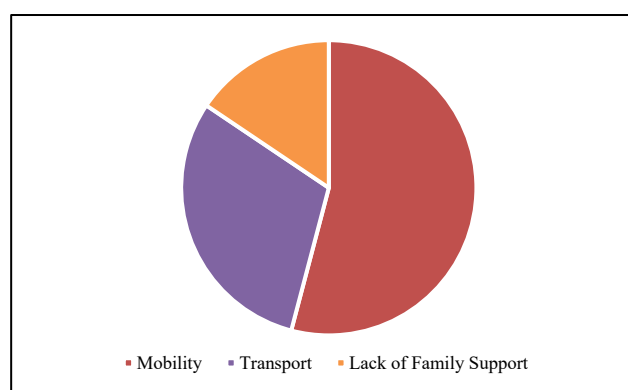


Figure 1: Reasons for difficulty in accessing the hospital.

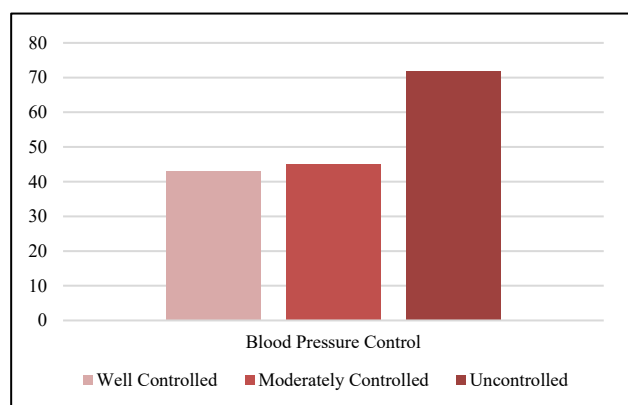


Figure 2: Blood pressure control amongst participants.

Binary logistical regression was carried out to find out how various factors influence the likelihood having good blood pressure control.

DISCUSSION

As with most chronic health conditions, medication adherence remains a major barrier in the adequate treatment of hypertension. It is clear that those in the geriatric age group face different problems than others to accessing, affording and continuing their medications. It is thus imperative to study the determinants of medication adherence and blood pressure control in the elderly population to identify certain modifiable risk factors to adherence and optimal blood pressure control.

This study helped in highlighting multiple challenges faced by the elderly, with 83 (51.9%) of the participants finding it difficult in accessing the hospital, mostly due to mobility issues and lack of family support. This proves particularly difficult in our setting where the patients have to come every 15 to 30 days to refill their medication. It may be considered that at-home checkups and door-to-door supply of medications for the elderly could be beneficial for improvement of quality of life and treatment outcomes.

This study also threw light on the non-availability of medications at government hospitals, with 71 (44.37%) of participants stating that they have had to purchase medications from commercial pharmacies due to non-availability of drugs.

Since 59.4% of participants were dependent on others for their treatment, coupled with the high number of medications taken by the elderly on a daily basis, affording treatment would be particularly challenging. This challenge was further touched on by Sahoo et al which also found that inadequate availability of medications at government pharmacies was the most common factor for poor adherence to anti-hypertensive treatment.¹⁵

In this study, it was found that 20.6% of participants were highly adherent, 30% were moderately adherent and 49.4% were poorly adherent to antihypertensive medication. The findings were similar to Venkatachalam et al which found prevalence high adherence to be 24% among all age groups.¹² When compared to Sahoo et al who conducted a similar study in geriatric patients in rural India found 55.4%, 12.3%, and 32.3% to be highly, moderately and poorly adherent respectively.¹⁵ Nagarkar et al conducted a similar study in Pune which found high, moderate and low adherence to be 29.6, 73.33, and 25.54% respectively. Thus, our study was found to have a more number participants with lower adherence compared to other studies conducted in India.²⁰

In Japan, low adherence was found to be only 24.2%, which is in accordance with other studies in the West,

probably owing to the socio-demographic profile of the participants.^{21,22}

Multiple factors which may be determinants of good or poor adherence to medication were analyzed in this study. Of which living with spouse ($\chi^2=6.309$, $p=0.043$) and finance for treatment ($\chi^2=9.21$, $p=0.010$) were found to be statistically significant.

Since most elderly participants that were not living with spouse were widows/widowers, this difference may be attributed to psychological impairment, depression and loneliness. Smith et al conducted a systematic review on medication non-adherence and its relationship with cognitive impairment which found that having no spouse presents as one of the most frequently reported risk factors to medication non-adherence.²³ While Sheilini et al did not find any statistical correlation between living with spouse and medication adherence.¹⁴ Sahoo et al did not consider marital status or living with spouse, highlighting the need for further studies to be conducted.¹⁵

Finance for treatment was also found to have significant association with medication adherence. Those who were supported by their family accounted for 64.56% of those who were highly adherent to medication. This may be due to increased social support in those who were financially supported by others, as well as increased affordability of medications. This is further supported by a systematic review and meta-analysis conducted on social determinants of health on medication adherence which found that social and financial support was linked to better adherence (aOR=0.75; 95% CI 0.65-0.88).²⁴

Furthermore, blood pressure control ($\chi^2=36.029$, $p<0.01$) was found to be significantly associated with medication adherence. 51.5% of those with high adherence and 35.4% of those with medium adherence achieved their target blood pressure control. Only 11.4% of those with low medication adherence have optimal blood pressure control. A similar trend was observed by Jhaj et al which found 16.5%, 11.5% and 1.5% for high, medium and low blood pressure respectively.²⁵

Other factors such as age, gender, education status, family type, employment status, duration of treatment, number of medications, number of anti-hypertensives, source of medication, number of co-morbidities, and difficulty in accessing the hospital was not found to be statistically significant with medication adherence.

Sheilini et al which considered similar variables only found a number of medications to be statistically significant, while Sahoo et al found age, education level, duration of treatment and presence of co-morbid condition to be significantly associated with poor adherence.^{14,15} A systematic review and meta-analysis in Abegaz et al including 13,688 participants from various countries found that comorbidities, uncontrolled blood

pressure, gender, and number of antihypertensive medications were associated with medication adherence.¹¹ This difference in the findings in our study may be attributed to a smaller sample size and restricted socio-demographic profile of participants.

Only 26.9% of the participants obtained target blood pressure of below 130/80, while 28.1% were moderately controlled and 45% were uncontrolled (greater than 140/90). 34.3% of females were found to have adequate blood pressure control, while only 21.5% of males achieved their target blood pressure. These findings were similar to Kothavale et al which that blood pressure control was 48.1% in elderly patients being treated for hypertension were uncontrolled (greater than 140/90).²⁶ Studies conducted in the west also found that blood pressure control was less than 50% in older adults.²⁷ However, it is important to note that most epidemiological studies consider “controlled” blood pressure as less than 140/90. the latest guidelines (2017) by American College of Cardiology/American Heart association state that for older adults, a target blood pressure of less than 130/80 should be considered as most older adults have increased risk of coronary artery disease.²⁸

Various socio-demographic and lifestyle factors were studied to find their associations with blood pressure control. Number of medications and duration of antihypertensive treatment were associated with blood pressure outcomes.

Tobacco consumption was found to be significantly associated with poor blood pressure control. The relationship between tobacco smoking and blood pressure have been well established through its pathophysiology due to nicotine acting as an adrenergic agonist. Pathak BG et al. concluded cigarette smoking to be a significant modifiable risk factor for progression of hypertension in the Indian population.²⁹ This study further helps to highlight the importance of encouraging the elderly hypertensive patients to quit tobacco consumption.

CONCLUSION

This study assessed the medication adherence amongst elderly hypertensive patients and found the level of adherence to be lower in comparison to other studies conducted in India, and in the West. It highlighted difficulties faced by the elderly patients in accessing healthcare services, inadequate and irregular supply of medication by government pharmacies and the subsequent dependence of elderly for finance of their medication. It is found that living with spouse and financial support from children had significant association with medication adherence.

The present study also found inadequate control of blood pressure in elderly hypertensive patients, with tobacco usage to be a significantly associated with poor blood

pressure control. This may call for more stringent control of tobacco and tobacco products and increased awareness on the ill effects of tobacco consumption amongst the hypertensive patients.

There were only a handful of studies conducted on medication adherence and blood pressure control and their determinants amongst the elderly population in India, most in a single center. There is a need for larger scale, multicentric studies to be conducted to further study these parameters.

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