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Assessment of Medication Adherence in Hypertensive Patients among Warangal Population

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Hypertension is the most common disease in India where 1 in 4 people suffering with it. In order to achieve the intended therapeutic outcomes, medication adherence is essential. Patients with hypertension must adhere to their disease by taking their prescriptions on time, following their diet, and making other lifestyle modifications. This study aims to assess medication adherence in Warangal population among hypertensive patients with comorbidities, social habits, medication use etc.
Aims: The aim of the study is to assess the level of medication adherence and to investigate predictors of medication adherence and controlled hypertension in patients and to identify the factors enhancing medication adherence. The secondary aim is to describe the extent and type of medication used in patient population in Warangal.
Study Design: An Observational, retrospective and cross - sectional study was employed to assess the predictors and level of medication adherence in hypertensive patients.

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Place and Duration of Study: Department of Cardiology, Sri Sri Cardiac Centre and Bhageerath Cardiac Care Centre, Hanamkonda, Warangal. The study was conducted from October 2022 to April 2023 for about a duration of 7 months.

Methodology: This study includes 300 Hypertensive patients (Male - 169, Female 131) of age range between $20-90$ years with various comorbidities like diabetes mellitus, coronary artery disease, hypothyroidism, dyslipidemia, COPD. We also included various sociodemographic factors like Gender, Age, Literacy, Income status, Alcohol consumption, Smoking status, Marital status, Controlled and Uncontrolled hypertension, usage of various drugs and Duration of hypertension. We observed Medication Adherence by using MMAS 8 scale.

Results: Low levels of medication adherence among female patients (41%), educated patients (58%) compared to other groups because of awareness about their condition. Low adherence is noted in patients with low-income status (9.6%), High adherence in nonsmokers (73.3%) and non-alcoholic (60.6%) compared to smokers (10.6%) and alcoholics (12.6%) and high adherence is reported in married (85%) category as compared to unmarried (2.6%), Patients with low comorbidities reported high adherence compared to patients with low comorbidities. High medication adherence is reported in uncontrolled blood pressure (50.3%) and in patients with ≤ 1 year (24.6%) and $2-6$ years (28%) of duration of hypertension. High adherence is noted with 2 combination therapy (23.6%), most of the participants are adherent to Telmisartan+ Metoprolol (25.2%) followed by Telmisartan+ hydrochlorothiazide (19.3%). According to MMAS-8 scale most of the patients reported (Q1) and (Q6), 91.3% of our study population were adherent to their medication, 7% were moderately adherent and 1.6% were low adherent to their medication.

Conclusion: 91.3% of Medication adherence is noted in hypertensive patients in Warangal population. 8.6% of Medication Non-Adherence is noted and various factors for nonadherence were reported by patients. However various methods and apps should be developed to overcome the Medication Non-Adherence.

Keywords: DASH diet; hypertension; medication adherence; MMAS – 8; non-adherence.

ABBREVIATIONS

ATH : Antihypertensive patient
aTRH : Apparent treatment-resistant hyper
DASH : Dietary approaches to stop hypertension
DAT : Digital adherence technologies
JNC-V : Fifth joint national committee
MAQ : Medication adherence questionnaire
MMAS - 8 : Morisky medication adherence scale - 8
N : Number of patients

1. INTRODUCTION

Hypertension is persistent increase in the blood pressure. It is defined as systolic blood pressure (SBP) values of 130mm Hg or more and/or diastolic blood pressure (DBP) more than $80\ \text{mmHg}$ [1]. Classification of hypertension was based on the impact on risk as was done by the Fifth Joint National Committee on the Detection, Evaluation and Treatment of high blood pressure (JNC-V). According to JNC-V, adult blood pressure is classified as follows: [2]. If the SBP $120-139\text{mmHg}$ and DBP $80-89\ \text{mmHg}$ is called as pre hypertension [3]. If the SBP $140-159\text{mmHg}$ and DBP $90-99\text{mmHg}$ is called as stage I hypertension [4,5]. If the SBP more than or equal to 160mmHg and DBP more than or equal to 100 mmHg is called as stage II hypertension. Medication adherence is the key in achieving the desired clinical outcomes [6]. Adherence to disease in hypertensive patients involves patient's regular use of medications, adherence to their diet and executing other lifestyle changes [7]. Medication adherence is influenced by multiple factors like disease related, patient related, therapy related, health care related factors [8,9].

Non- adherence can be two types Intentional where Active process whereby the patient chooses to deviate from the treatment regimen and Unintentional Passive process in which the patient may be careless or forgetful about adhering to treatment regimen [10,11]. Furthermore, psychosocial factors also influence medication adherence, such as depressed emotion, perceived severity of disease, self-rated health, perceived symptoms, and self-efficacy [12]. Morisky medication adherence scale - 8 (MMAS-8) is used to develop and to improve and structure self-reports [13].

This questionnaire is useful as a compliment to more objective measures as it may provide additional information on the reasons why patients do not adhere or on the barriers encountered by patients during their medication taking process [14]. The score of eight were summed to create an overall adherence score ranging from 0 to 8. An MMAS score < 6 indicates low adherence, a score $= 8$ indicates high adherence and a score ≥ 6 and < 8 indicates moderate adherence [6].

Adopting either the DASH diet or the classic Mediterranean diet can meet the nutritional needs of hypertensive people [15,16]. Consumption of fruits, vegetables, grains, dairy products, and foods high in $\mathrm{K}+$, $\mathrm{Mg}+2, \mathrm{Ca}+2$, and phosphorus are all part of this diet [17]. Restricting sodium is a key factor in decreasing blood pressure. The effects of the DASH diet are comparable to those of a single medication therapy. Exercise and weight loss are the second primary strategy for controlling hypertension after dietary changes. A stressful lifestyle, depression, and anxiety need to be avoided as much as possible. Reducing alcohol consumption also lowers blood pressure [18]. However, changing one's lifestyle is a dynamic process that necessitates ongoing adherence [19].

2. MATERIALS AND METHODS

The subjects of above 15 years with valid prescriptions were selected by a simple random sampling technique. The data was collected from hypertensive patients with or without comorbidities who visited the cardiology department after careful consideration of eligibility criteria. Each participant was informed about the objective of a study and the benefits associated with study immediately before sample collection. A structured MMAS 8 questionnaire that include medication use, missed doses, forgetfulness and socio demographic data which was in English and translated to local Telugu language and was re translated back to English to ensure consistency. Subjects who volunteered to participate in the study have answered questions in the questionnaire.

Morisky Medication Adherence Scale (MMAS-8) Questionnaire:

1. Do you sometimes forget to take your drug?
2. 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 drug?
3. Have you ever cut back or stopped taking drug without telling your doctor because you felt worse when you took it?
4. When you travel or leave home, do you sometimes forget to bring along your drug?
5. Did you take all your drug yesterday?
6. When you feel like your symptoms are under control, do you sometimes stop taking your drug?
7. Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your medication?
8. How often do you have difficulty remembering to take your medication?

Rarely $= 4$
Once a while $= 3$
Sometimes $= 2$
Never $= 1$

3. RESULTS AND DISCUSSION

Medication use among hypertensive patients were observed, however 91.3% patients who participated in our study are adherent to antihypertensive medications and observed by considering factors like age, gender, literacy rate, income status, marital status, social habits like alcohol consumption and smoking, comorbidities, duration of hypertension and treatment associated with level of awareness, forgetfulness, lack of reminders, misbelieves and side effects on medication, also medication adherence was measured using MMAS-8 scale.

Table 1. Medication adherence based on gender

Gender	N (%)	Adherence (%)	Non-Adherence (%)
Male	169(56.3%)	50.3%	6%
Female	131(43.6%)	41%	2.6%

Table 2. Age wise medication adherence in hypertensive patients

Age	N	Adherence (%)	Non-Adherence (%)
$20-30$	$14(4.6\%)$	4%	0.6%
$31-40$	$36(12\%)$	11.6%	0.3%
$41-50$	$75(25\%)$	22%	3%
$51-60$	$89(29.6\%)$	27.6%	2%
$61-70$	$55(18.33\%)$	16%	2.3%
$71-80$	$28(9.33\%)$	9%	0.3%
$81-90$	$03(1\%)$	1%	0%

Table 3. Medication adherence based on literacy

Education	N (%)	Adherence (%)	Non adherence (%)
Primary level	18 (6%)	5.3%	0.6%
Educated	191 (63.6%)	58%	5.6%
Graduate	15 (5%)	5%	0
Illiterate	76 (25.3%)	22.6%	2.6%

Table 4. Medication adherence based on income status

Income status	N	Adherence (%)	Non-Adherence (%)
High	3 (1%)	1%	0%
Moderate	139 (46.33%)	41.3%	5%
Low	33 (11%)	9.6%	1.3%
Unknown	125 (41.66%)	39.3%	2.3%

Table 5. Medication adherence based on alcohol consumption

Category	N	Adherence (%)	Non-Adherence (%)
Alcoholic	38 (12.6%)	8%	4.6%
Non alcoholic	189 (63%)	60.6%	2.3%
Reformed	7 (2.3%)	2%	0.3%
Occasional	69 (23%)	21%	1%

Table 6. Medication adherence based on smoking

Category	N	Adherence (%)	Non-Adherence (%)
Smoker	$45(15\%)$	10.6%	4.3%
Occasional	$11(3.6\%)$	3%	0.6%
Reformed	$15(5\%)$	4.6%	0.3%
Non-smoker	$229(76.33\%)$	73.3%	3%

Table 7. Medication adherence based on marital status

Marital status	N	Adherence (%)	Non-Adherence (%)
Married	$281(93.6\%)$	85%	8.6%
Unmarried	$8(2.6\%)$	2.6%	0%
Unknown	$11(3.66\%)$	3.6%	0%

Table 8. Medication adherence based on number of comorbidities

No. of comorbidities	N	Adherence (%)	Non-Adherence (%)
1	$113(27.6\%)$	33.3%	4.3%
2	$23(7.6\%)$	7%	0.6%
3	$6(2\%)$	2%	0%
>3	$1(0.3\%)$	0.3%	0%
No comorbidities	$127(42.3\%)$	39.3%	3%
Unknown	$30(10\%)$	9.3%	0.6%

Table 9. Medication adherence based on controlled and uncontrolled hypertension

Category	N	Adherence (%)	Non-Adherence (%)
Controlled	136(45.3%)	40.6%	4.6%
Uncontrolled	164(54.6%)	50.3%	4.3%

Table 10. Medication Adherence based on drugs used in hypertension

Drug	N	Adherence (%)	Non-Adherence (%)
Single therapy	110	98(89%)	12(10.9%)
2 combinations	79	71(23.6%)	8(2.6%)
3 combinations	40	39(13%)	1(0.3%)
Multiple therapy	71	66(22%)	5(1.6%)

Table 11. Medication adherence based on duration of hypertension

Duration	N	Adherence (%)	Non- adherence (%)
s 1 year	77(25.6%)	24.6%	1%
2-6 years	89(29.6%)	28%	1.6%
7-10 years	46(15.3%)	15.3%	0%
11-15 years	14(4.6%)	3.6%	1%
16-20 years	18(6%)	4.6%	1.3%
21-25 years	6(2%)	0.6%	1.3%
26-30 years	1(0.33%)		0.3%
Unknown	49(16.3%)	14.3%	2%

Table 12. Medication Adherence of patients assessed by MMAS-8 scale

Questions	Yes	No
Forgetting sometimes to take your medications	17(5.6%)	283(94.3%)
Forgetting to take medications over last two weeks	3(1%)	297(99%)
Stopping medication on own self after feeling discomfort with drugs or adverse effects	6(2%)	294(98%)
Forgetting to take medication while leaving out of home	7(2.3%)	293(97.6%)
Taking medication yesterday	292(97.3%)	8(2.6%)
Stopping drugs own-self thinking good blood pressure control	13(4.3%)	287(95.6%)
Feeling discomfort to take drugs daily	2(0.6%)	298(99.3%)

Frequency of forgetting:

Medication

Once in a while	4	1.3%
Rarely	2	0.6%
Sometimes	15	5%
Always	5	1.6%

Table 13. Overall adherence

Overall adherence	N	Percentage (%)
High adherence (=8)	274	91.3%
Moderate adherence (6-8)	21	7%
Low adherence (<6)	5	1.6%

Table 14. Reasons for non-adherence among participants

Reasons	N(%)
Forgetfulness	19(6.3%)
Lack of reminders	6(2%)
Busy lifestyle	15(5%)
Side effects of medication	6(2%)
Interruptions of daily routine	15(5%)
Misbelieves on medicine	5(1.6%)
Taking medication on wrong time	2(0.6%)

We have found that 48% of participants are with comorbid conditions. Most common were diabetes mellitus, CAD, COPD, Cervical spondylosis, Dyslipidemia, hypothyroidism etc. In our study we observed 300 patients. Out of which 91.3% of the study subjects were found to be adherent. In contrast to our study, according to Asgedom et al., [20] 61.8% were adherent.

169 (56.3%) of study participants were male and 131(43.6%) are females compared to 51 (33.3%) were male and 102 (66.7%) are females out of 153 participants Pirasath and Sundareshan [21] and in our study 50.3% male participants were adherent and 6% are non-adherent and 41% female participants are adherent and 2.6%are non-adherent compared to Khayyat et al. [6] 40% male patients are adherent and 41 patients are non-adherent and 59% male patients are adherent and 41% are non-adherent.

We found that the percentage of age group between $20-30$ years was 4.6%, 12% of the patients belongs to the age group 31-40 years, 25% of the patients belong to age group 41-50, 29.6% of the patients belong to age group $51-60$,18.33% of patients belong to the age group $61-70$,9.33% of patients belong to the age group 71-80 and 1% of patients belong to the age group 81-90. In contrast to our study, according to Khayyat et al. [6], 2.5% of patients belong to the age group of $19-35$,23% of patients belong to the age group of $36-50$,50.5% of the patients belong to the age groupof $51-65$,20.1% of the patients belong to the age group of $66-85$ and 3.9% of the patients belong to the age group of >85. In our study, out of 4.6% of age group $20-30$,4% are adherent and 0.6% are non-adherent, 12% of age group $31-40$,11.6% are adherent and 0.3% are non-adherent, 25% of age group $41-50$,22% are adherent and 3% are non-adherent, 29.6% of age group 51-60, 27.6% are adherent and 2% are non-adherent, 18.33% of age group 61-70, 16% are adherent and 2.3% are non-adherent, 9.33% of age group $71-81$,9% are adherent and 0.3% are non-adherent and 1% of age group $81-90$,1% are adherent and no non-adherence is noted.

We also considered level of education as a factor of medication adherence, we found that percentage of primary level was 6%, educated was 63.6%, graduates was 5% and illiterate was 25.3% compared to Khayyat et al. [6], elementary was 22.5%, high school was 17.2%, BS degree or higher was 12.3% and illiterate was 48%. Medication adherence in our study was found to be 5.3% are adherent and 0.6% are non-adherent in primary level, 58% are adherent and 5.6% are non-adherent in educated, 5% are adherent and no non-adherence is noted in graduates, 22.6% are adherent an 2.6% are non-adherent in illiterates.

We found that 1% of participants have high income, 46.33% have moderate income, 11% have low income and 41.66% participants income status is unknown. In contrast to our study, according to Shimels et al. [22], 45.7% was belong to extremepoverty and 54.3% was belong to moderate poverty or better and in our study 1% were adherent and no non-adherence is noted in high income, 41.3% adherence and 5% non- adherence is noted in moderate income, 9.6% adherence and 1.3% non-adherence is

noted in low income and in unknown income status 39.3% and 2.3% are adherence and non-adherence respectively.

We found that 8% were adherent and 4.6% were non-adherent in alcoholics, 60.6% were adherent and 2.3% were non-adherent in non-alcoholics, 2% were adherent and 0.3% were nonadherent in reformed and 21% were adherent and 1% were non-adherent in occasional alcoholics. In contrast to our study, according to Sibomana et al. [23], 11.7% were alcoholic in which 76.9% were highly adherent and 23.1% were low to moderate adherent and 88.3% were nonalcoholic in which 76.5% were highly adherent and 23.5% were low to moderate adherent.

In case of smokers 10.6% were adherent and 4.3% were non-adherent, 3% were adherent and 0.6% were non-adherent in occasional smokers, 4.6% were adherent and 0.3% were nonadherent in reformed and 73.3% were adherent and 3% were non- adherent in non-smokers compare to Sibomana et al. [23], 5.4% were smokers in which 83.3% were highly adherent and 16.7% were low to moderate adherent and 94.6% were non-smokers in which 76.2% were highly adherent and 23.8% were low to moderate adherent.

In this study 93.6% were married, 2.6% were unmarried and 3.66% participants marital status is unknown compared to Asgedom et al. [20], 78.6% were married, 6.8% were unmarried and widowed and 14.6% were divorced. In our study 85% were adherent and 8.6% were non-adherent in married category, 2.6% were adherent and nonon-adherence is noted in unmarried category and 3.6% were adherent and no non- adherence is noted in unknown category compared to Khayyat et al. [6], 49% wereadherent and 51% were non-adherent in married category, 60% and 40% were adherentand non-adherent in unmarried respectively, 31% and 69% were adherent and non- adherent in widowed respectively and 42% and 58% were adherent and non-adherent in divorced respectively.

We noticed that 48% of participants are with comorbidities, 42% are without comorbidities and 10% are unknown compared to Shimels et al., [22], 38.9% are with comorbidities and 61.1% are without comorbidities. In our study 27.6% of participants having 1 comorbidity in which 33.3% adherent and 4.3% were non-adherent, 7.6% of participants are having two comorbidities in which 7% were adherent and 0.6% were non-adherent, 2% of participants are having 3 comorbidities in which 2% were adherent and no non-adherence is noted, 42.3% of participants were having no comorbidities in which 39.3% were adherent and 3% were non-adherent and 10% of participants are unknown in which 9.3% were adherent and 0.6% were non-adherent compared to Khayyat et al. [6], 48% are with ≤ 2 morbidities, 45.6% are with 3 morbidities and 6.4% are with ≥ 4 comorbidities and 47% were adherent and 53% were non-adherent of participants having ≤ 3 comorbidities and 41% and 59% were adherent and non-adherent of participants with > 3 comorbidities respectively.

We figured out that 46.15% of hypertensive patients are with DM, 4.19% are with CAD, 4.89% are with COPD, 4.19% are with Cervical Spondylosis, 2.79% are with dyslipidemia, 2.79% are with hypothyroidism, 2.09% are with Epilepsy and 31.85% are others as comorbidities. In contrast to our study, according to Asgedom et al. [20], 26.1% are with DM, 23.2% are with peripheral neuropathy, 11.4% are with dyspepsia, 5% are with Hypertrophic heart disease, 2.5% are with heart failure, 2.1% are with CKD and 3.1% are others. In our study, 57 participants are adherent and 9 participants were non-adherent with DM, 6 were adherent and no non-adherence is noted in participants withCAD, 6 were adherent and 1 were non-adherent with COPD, 5 were adherent and 1 were non-adherent with Cervical spondylosis, 4 were adherent and no non-adherence is noted with dyslipidemia, 4 were adherent and no non-adherence is noted with hypothyroidism, 1 were adherent and no non-adherence is noted with epilepsy and 42 were adherent and 4 were non-adherent in others. High adherence (46.15%) is noted in patients with DM with Hypertension.

We came to know that 45.3% of participants are with controlled hypertension and 54.6% are with uncontrolled hypertension compared to Khayyat et al. [6], 69.6% are with controlled hypertension and 30.4% are with uncontrolled hypertension. In our study, 40.6% and 4.6% are adherent and non-adherent in controlled hypertension respectively and 50.3% and 4.3% are adherent and non-adherent in uncontrolled hypertension respectively.

We noticed that 25.6% of our study are with hypertension since ≤ 1 year, 29.6% are with hypertension from 2-6years, 15.3% are with hypertension from 7-10years, 4.6% are with

hypertension from 11-15years, 6% are with hypertension from $16-20 years,$ 2% are with hypertension from $21-25$ years, 0.33% are with hypertension from $26-30$ years and duration of hypertension of 16.3% was unknown, compared to Borates et al. [7] 9.5% are with hypertension from 6-12 months, 38.1% are with hypertension from 2-6 years, 20.4% are with hypertension from 7-10 years, 32% are with hypertension from ≥ 11 years.

In patients with duration of hypertension ≤ 1 year 24.6% were adherent, 1%w ere non adherent, 2-6 years 28% were adherent, 1.6% were nonadherent, $7-10$ years 15.3% were adherent, there is no non adherence, $11-15$ years 3.6% were adherent, 1% were non adherent, $16-20$ years 4.6% were adherent, 1.3% were non-adherent, $21-25$ years 0.6% were adherent 1.3% were non adherent, $26-30$ years there is no adherence 0.3% were non adherent and in unknown category 14.3% were adherent, 2% were non adherent.

Out of 300 patients, 110 patients were on monotherapy, 79 were on two combination therapy, 40 were on three combination therapy and 71 were on multiple therapy. In contrast to our study, according to Khayyat et al. [6] 10 were on 1 medication, 25 were on 2 medications, 34 were on 3 medications, 48 were on 4 medications, 34 were on 5 medications, 53 were on ≥ 6 medications. In patients receiving monotherapy - telmisartan - 45 were adherent 7 were non adherent, metoprolol - 26 were adherent 1 was non adherent, Bisoprolol - 8 were adherent and no non adherence is noted, amlodipine -6 were adherent, 1 was non adherent, Cilnidipine -4 were adherent and there is no non adherence, Clonidine - 1 was adherent there is no non adherence, propranolol - 1 was adherent 1 was non adherent, Olmesartan - 2 were adherent there is no non adherence, Prazosin - 2 were adherent 1 was non adherent, Nebivolol -1 was adherent there is no non adherence, Ramipril - 1 was adherent 1 was non adherence. Out of 110 patients receiving monotherapy most of the patients were adherent to telmisartan followed by metoprolol. In patients receiving two combination therapy 71 were adherent 8 were non adherent, where most of the patients were adherent to Telmisartan + Metoprolol and Telmisartan + Hydrochlorothiazide. In patients receiving three combination therapy 39 were adherent 1 was non adherent where most of the patients are adherent to Metoprolol + Telmisartan + Chlorthalidone and Telmisartan + Amlodipine + Hydrochlorothiazide. In patients receiving multiple therapy 66 were adherent 5 were non adherent.

We used MMAS-8 Scale to assess the medication adherence. This consists of 8 questions, Morisky medication adherence scale - 8 (MMAS-8) is used to develop and to improve and structure self-reports. It is simple, practical and cost effective to evaluate patient's medication adherence This questionnaire is useful as a compliment to more objective measures as it may provide additional information on the reasons why patients do not adhere or on the barriers encountered by patients during their medication taking process. The score of eight were summed to create an overall adherence score ranging from 0 to 8. An MMAS score < 6 indicates low adherence, a score $= 8$ indicates high adherence and a score ≥ 6 and < 8 indicates moderate adherence [24,25].

We found that 91.3% are highly adherent (=8), 7% were moderately adherent [10,19,20] and 1.6% participants are low adherent (<6) to their hypertensive medications. Incontrast to Khayyat et al. [6] 22.5% were highly adherent, 23.5% were moderately adherent and 54% were low adherent because in Saudi Arabia women with long time conditions are less likely to receive medical treatment and monitoring recommended by clinical guideline. Furthermore, middle aged patients usually have work related commitments and other priorities in their lives, therefore may not be able to attend theirclinic appointments and take their medications as prescribed.

4. CONCLUSION

This study determines the knowledge, beliefs about medication and medication adherence in hypertensive patients. Low levels of medication adherence among female patients (41%) have reported in this study, it has been documented that due to their busy life style, lack of reminders and forgetfulness are reasons for low adherence in females and in educated patients (58%) compared to other groups because of awareness about their condition, medication use and effects of not using medication. Low adherence is noted in patients with low-income status (9.6%) due to the affordability of the medication and lack of follow-ups. High adherence in non-smokers(73.3%) and non-alcoholic (60.6%) compared to smokers (10.6%) and alcoholics (

12.6%) is noted as smoking and alcoholic consumption weakens the effect of anti-hypertensive drugs so the people may think the drug is inefficient in them and high adherence is reported in married (85%) category as compared to unmarried (2.6%) dueto the lack of reminders. Patients with low comorbidities reported high adherence compared to patients with comorbidities. As the number of comorbidities increases adherence is decreased. This may be due to polypharmacy, adverse drug reactions and lack of interest in long term patients. High medication adherence is reported in uncontrolled blood pressure (50.3%) patients as they tend to take medications regularly.

High adherence is noted in patients ≤ 1 year (24.6%) and 2-6 years (28%) of duration of hypertension compared to long term hypertensive patients. Newly diagnosed patients have fear of their condition so that lead to take their medications regularly, in long term patients may neglect their medication due to polypharmacy and possible adverse drug effects and high adherence is noted with 2 combination therapy (23.6%) most of the participants are adherent to Telmisartan+ Metoprolol (25.2%) followed by Telmisartan+ hydrochlorothiazide (19.3%) as they are cost effective, minimal ADRs and easily available in the market. According to MMAS-8 scale most of the patients reported forgetting medication sometimes (Q1) and stopping drugs on their own thinking good blood pressure control (Q6), 91.3% of our study population were adherent to their medication, 7% were moderately adherent and 1.6% were low adherent to their medication. Most of the patients reported forgetfulness (6.3%) busy lifestyle (5%), interruptions in daily routine (5%), lack of reminders (2%), side effects of medications (2%), misbeliefs on medicine (1.6%) and taking medication in wrong time (0.6%) are the predictors of non-adherence in our study.

To overcome the medication non-adherence factors like medication charts, introducing pill counting method, medication tools like mobile apps, blood pressure trackers, educating the care

takers of the patients, automatic refills, ongoing communication with healthcare providers may improve the medication adherence.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this article and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the IEC of Care college of Pharmacy.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Morisky medication adherence scale (mmas-8) questionnaire:

Questions	Response (Yes)	Response (No)
Forgetting sometimes to take your medication		
Forgetting to take medication over last 2 weeks		
Stopping medication own-self after feeling of discomfort with drugs/ adverse effects		
Forgetting to take medication while leaving out of home		
Taking medication yesterday		
Stopping drugs own-self with thinking good blood pressure control		
Feeling discomfort to take drugs daily		
The frequency of forgetting to take medication		
Rarely = 4		
Once a while = 3		
Sometimes = 2 never =1		
Score - 8 high		

Sociodemographic details of hypertensive patient's questionnaire:

Demographic variables	Response (Yes/No)	(N)
Gender		
Male		
Female		
Age (Years)		
20-30		
31-40		
41-50		
51-60		
61-70		
71-80		
81-90		
91-100		
Education Level		
Educated		
Primary level		
Graduate		
Illiterate		
Employment Status		
Self-employee		
Government employee		
Home maker		
Software		

Demographic variables	Response (Yes/No)	(N)
RMP		
Retired		
Unknown		
Unemployed		
Income status		
High		
Moderate		
Low		
Unknown		
Marital status		
Single		
Married		
Unknown		
smoking status		
Smoker		
Non smoker		
Occasionally		
Reformed		
ALCOHOL STATUs		
Consumers		
Non consumers		
Occasionally		
Reformed		
comORBIDITY		
Diabetes Mellitus		
Renal calculi		
Old CVA		
Hypothyroidism		
Post PPI status		
AKI		
CAD		
Dyslipidaemia		
Cervical spondylitis		
Bronchial asthma		
Obesity		
COPD		
MVR		
Hyperthyroidism		
Gastritis		
Anxiety		
Psychiatric illness		
AWMI		
Lumbar PIVD		
Rheumatoid arthritis		
CKD		
Dialysis		
RHD		
Anaemia		
SLE		
Epilepsy		
Osteoarthritis		
No comorbidity		
DURATION OF HYPERTENSION (Years)		
1		
2 – 6		

Demographic variables	Response (Yes/No)	(N)
$7-10$		
$11-15$		
$16-20$		
$21-25$		
26-30		
Not known		

Duration of Treatment (Years)
1
$2-6$
$7-10$
$11-15$
$16-20$
$21-25$
$26-30$
Unknown
Hypertension Range
Controlled
Uncontrolled
Given Medications

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