Research Article

A study of adherence pattern toward antihypertensive therapy (antihypertensive drugs, dietary habits, and physical activity)and certain factors affecting it

Pratiksha A Sutar[1], Hemangini K Shah[2]

[1]MBBS Student, Goa Medical College, Bambolim, Goa, India, [2]Department of PSM, Goa Medical College, Bambolim, Goa, India

Correspondence to: Pratiksha A Sutar, E-mail: pratiksha_sutar@ymail.com

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ABSTRACT

Background: Adherence to antihypertensive treatment (pharmacological intervention and lifestyle modification)and related factors is an essential to hypertension (HTN)management and aids in planning intervention for its control. **Objectives:** The objective of this study was to analyze the adherence pattern of hypertensives toward antihypertensive treatment and factors affecting it and assess the impact of such adherence on HTN control. **Materials and Methods:** A hospital-based cross-sectional study was carried out at the outpatient department of medicine department at a tertiary hospital in Goa. Totally 213 patients with confirmed diagnosis of HTN and currently on antihypertensive treatment, selected through systematic randomized sampling, were interviewed using structured and clinically assessed questionnaire. **Results:** Adherence to antihypertensive drugs, dietary approach to stop HTN (DASH)diet, and recommended physical activity was studied along with sociodemographic factors, comorbidities, addiction, body mass index, medication, and other factors. Nearly 64.79% were highly adherent toward the antihypertensive drug treatment while 30.52% and 4.69% showed moderate and low adherence, respectively. A significant association was noticed between the presence of comorbidities and drug adherence, wherein patients with comorbidities showed higher adherence. Nearly 23.94% patients were highly adherent toward the DASH diet, while 51.64% were moderately adherent although not significantly associated. Almost 68.08% showed moderate activity while only 10.83% indulged in vigorous activity. A significant association was noted with age, employment status, and number of medications prescribed in determining adherence to physical activity. **Conclusion:** Presence of comorbidities, sex and age, number of antihypertensives, and employment status were seen to be associated with high adherence toward the treatment.

KEY WORDS: Antihypertensive Treatment; Dietary Approach to Stop Hypertension Diet; Physical Activity

INTRODUCTION

Hypertension (HTN) is a medical condition in which blood pressure (BP) is chronically elevated. As per the World Health Organization and Joint National Committee (JNC) 7 criteria, a systolic BP of 140 mmHg or above and diastolic BP of 90 mmHg or above are considered to be a case of HTN.[22,23]

HTN is the most prevalent risk factor for cardiovascular diseases (CVDs) and its adequate treatment is associated with significant reductions in the cardiovascular morbidity and mortality.[1]

Nearly 20.6% of Indian men and 20.9% of Indian women were suffering from HTN in 2005[18] and the rates are certain to increase in near future. Mostly, 90-95% of the cases suffer from essential HTN which is a heterogeneous disorder having different causal factors that lead to high BP, such as

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obesity, insulin resistance, high alcohol and salt intake, aging, sedentary lifestyle stress, and low potassium and calcium intake.[2,7] It remains a major modifiable risk factor for CVDs despite advances in understanding its pathophysiology and availability of effective treatment strategies.

It is well established that dietary intake and other lifestyle factors have an important function in the management of HTN.[16] Currently, the JNC 7 recommends lifestyle management for HTN, including lifestyle modification, dietary approach to stop HTN (DASH) diet, reduction in sodium intake (<1500 mg/day), and increase in physical activity (3-4 sessions a week, lasting on an average of 30 min per session and involving moderate-to-vigorous intensity physical activity), to be the first line of treatment strategy along with a single antihypertensive.[22]

The goal of HTN treatment is to achieve near-normal BP by medication and lifestyle modifications. Although the importance of detecting, treating, and controlling HTN has been recognized and is being practiced, a number of patients with HTN still remain uncontrolled.[7] The asymptomatic nature of hypertensives usually alters the adherence levels. Globally, many patients diagnosed with HTN do not follow medical and lifestyle recommendations. There are many terminologies related to the definitions and measurements of why patients do not take their prescribed medication and do not follow health recommendation, but the evidence converges that on an average only 50% of hypertensive patients on treatment adhere to it.[4] The most widely used terms to describe patients' behavior are compliance and adherence. The main difference is that adherence requires patients' agreement to the recommendations from the health-care provider. A major modifiable cause of inadequate BP control is non-adherence toward the antihypertensive treatment. Low adherence leads to reduction in treatment benefits or requirement of higher doses or more number of drugs. These behaviors pose a major concern in the management of HTN, where drug treatment and lifestyle changes are the principal management in preventing cardiovascular mortality and morbidity.[22] In addition, lack of conformance toward health-care recommendations is associated with greater health-care utilization requirement, through cardiovascular-related hospitalizations and emergency department visits, that increase the total health-care costs.[23]

The pooled estimate of awareness about high BP in rural and urban India was around 25.1% (21.0-29.1) and 41.9% (35.1-48.9), respectively. while that for the percentage of treated among those diagnosed with HTN in rural and urban areas was found to be 24.9 (16.7-33.0) and 37.6 (23.9-51.2), respectively. The percentage of hypertensive patients having their BP under control in rural and urban India was estimated to be 10.7 (6.4-15.0) and 20.2 (11.6-28.8), respectively, according to a review and meta-analysis made on HTN in India.[18]

Poor compliance is especially common when a patient has poor knowledge, understanding, and perception of HTN or when a complex antihypertensive drug regimen is prescribed. Besides it, the asymptomatic nature of newly diagnosed hypertensives usually alters the adherence levels. As it is important to recognize the reasons why hypertensive patients are poorly adherent toward treatment advised by their health-care provider, the present study was planned with the following aims and objectives. To study the sociodemographic profile of the hypertensive patients, their adherence pattern toward antihypertensive treatment and factors affecting it, and the impact of adherence of antihypertensive treatment on the control of HTN.

MATERIALS AND METHODS

Study Design

The study was carried out as a hospital-based, cross-sectional study, wherein patients with a confirmed diagnosis of HTN and currently on antihypertensive treatment were interviewed and examined after obtaining institutional ethical clearance and informed consent from the patients.

Study Area and Study Population

The study was carried out at the outpatient section of the medicine department of a tertiary hospital in Goa. The study population included previously diagnosed hypertensive patients attending the medicine outpatient department and who were ≥18 years of age with a confirmed diagnosis of HTN and on treatment for at least past 5 months, who had been provided with counseling on the antihypertensive treatment pertaining to diet and lifestyle modifications and importance of adherence to antihypertensive drugs at the time of diagnosis.

Exclusion Criteria

The hypertensives who did not give consent, who were not sure about counseling provided to them at the time of diagnosis, and those with complications such as hypertensive retinopathy, cardiomyopathy, nephropathy, encephalopathy, and CVA due to HTN were excluded from the study.

Sample Size and Sampling Technique

Based on the general prevalence of adherence toward the antihypertensive treatment through a review of literature, at a prevalence rate of 50%, a sample size of 256 was obtained and the study population was selected through systematic random sampling technique.

Study Period and Data Collection

Informed consent was obtained, and data were collected over a period of 4 months, using the following:

1. Structured questionnaire: Filled by personal interview which had details of sociodemographic profile, diagnosis and drug treatment for HTN, counseling with respect to adherence to antihypertensive treatment, drug adherence pattern, physical activity (based on the International Physical Activity scale), and dietary habits (DASH recommended)
2. Clinical examination: Measurement of BP, height, weight, and assessment of body mass index.

Measurement of Dietary Habits in Concordance with the DASH Diet

Although the dietary guidelines for Indians have been developed and evaluated by the National Institute of Nutrition,[3,10] an index for the DASH diet has not been derived previously. Thus, using the general approach applied in developing other dietary indices, an index was constructed to measure the degree of concordance with the DASH diet. In this study, the Indian equivalent of DASH diet was used.[14] The components of the index in Annexure 1 were weighted and summed to calculate a single score to rank each participant according to dietary concordance. Wherever possible, quantitative criteria provided as part of the DASH diet were used in establishing cutoff points for scoring index items. Overall, the scoring system was based on the premise that each of the major DASH diet guidelines should contribute equally to the total index score. A maximum total of 8 indicated total concordance with the DASH diet guidelines while 0 score represented total non-concordance.

DASH diet adherence score (Semi-structured scoring scales): 7.5-8 - High, 6.5-7 - Moderate, and ≤6 - Low.

Measurement of Physical Activity

Physical activity adherence of the patients was assessed using a semi-structured questionnaire designed based on the International Physical Activity Questionnaire.[6,9] Based on the daily activities performed, patients were classified into:

- Category 1: Low - This includes patients who did not fall under either Category 2 or Category 3
- Category 2: Moderate – (1) 3 or more days of vigorous intensity activity of at least 20 min/day and (2) 5 or more days of moderate intensity activity and/or walking of at least 30 min/day
- Category 3: High - (1) Vigorous intensity activity on at least 3 days fo r 30-40 min, (2) 7 or more days of any combination of walking, moderate intensity or vigorous intensity activities. The WHO criteria were used to define moderate and vigorous activities (Annexure 2).

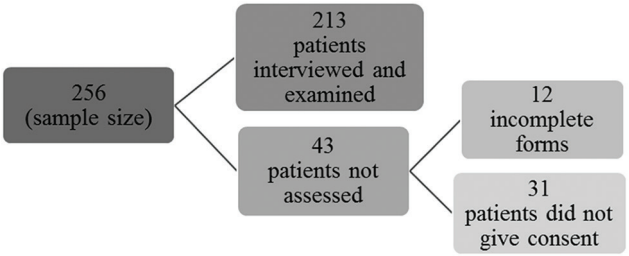
Measurement of Drug Adherence

Adherence to pharmacotherapy was assessed using the Modified Morisky Adherence scale-8,which is validated for assessing adherence towards antihypertensive agents, in the out patient setting. Patients with sore zero were considered to have high adherence to the medication prescribed to them While those in the range of 1-2 and more than or equal to 3 were considered to have moderate and low adherence, respectively.

Statistical Methods

Raw data collected were tabulated and assessed for its significance. Baseline characteristics of the patients were charted in number and percentage while the study of adherence pattern was carried out by using Chi-square test and significance was documented by means of *P* value (< 0.05 was taken as statistically significant), for which Chi-square test excel template (Microsoft) was used.

RESULTS



The present cross-sectional study aimed to explore the adherence pattern of the hypertensive patients toward antihypertensive treatment, and the data obtained from the study are as follows. Table 1 shows the baseline characteristics and sociodemographic characteristics of the study participants.

Drug Adherence of the Participants

A substantial number of participants were highly adherent toward the antihypertensive agents prescribed to them, i.e., 64.79% (138), while 30.52% (65) were moderately adherent and only 4.69% (10) participants had low adherence. Adherence to antihypertensive medication among the male and female study participants was seen to be almost similar. Besides this, the adherence pattern seen in the two categories of the age group, i.e., those ≤60 years and those above 60 years showed no variation. No significant pattern was observed with respect to marital, educational, and employment status and adherence to antihypertensive medication. A significant association was noticed between the presence of comorbidities and drug adherence, with $P = 0.0064$. Here, patients with comorbidities showed high adherence as compared to those without.

Nearly 91% (61) of the study participants on only one hypertensive drug were highly adherent to it. It was noted that adherence levels to the antihypertensive drugs decreased with increasing number of other drugs prescribed to the patient.

Table 1: Parameters and adherence

Characteristics	Adherence								
	Drugs			Diet			Physical activity		
	High (%)	Moderate (%)	Low (%)	High (%)	Moderate (%)	Low (%)	Category 1 (%)	Category 2 (%)	Category 3 (%)
Sex									
Males (96)	68 (70.83)	24 (25)	4 (4.17)	21 (21.88)	53 (55.21)	22 (22.92)	24 (25)	66 (68.75)	6 (6.25)
Females (117)	70 (59.83)	41 (35.04)	6 (5.13)	30 (24.64)	57 (48.72)	30 (25.64)	21 (17.95)	79 (67.52)	17 (14.53)
	P=0.2427		2.8322*	*P*=0.6367		0.9028	*P*=0.1002		4.6007
Age group (years)									
<60 (110)	73 (66.36)	31 (28.18)	6 (5.45)	29 (26.36)	56 (50.91)	25 (22.73)	15 (13.64)	80 (72.73)	15 (13.64)
>60 (103)	65 (63.11)	34 (33.01)	4 (3.88)	22 (21.36)	54 (52.43)	27 (26.21)	30 (29.13)	65 (63.22)	8 (7.77)
	P=0.6794		0.733	*P*=0.6554		0.8449	*P*=0.0145		8.4613
Marital status									
Married (160)	102 (63.75)	48 (30)	10 (6.25)	36 (22.5)	84 (52.5)	40 (25)	34 (21.25)	108 (67.5)	18 (11.25)
Unmarried (4)	2 (50)	2 (50)	0	1 (25)	2 (50)	1 (25)	1 (25)	3 (75)	0
Widowed (49)	34 (69.39)	15 (30.61)	0	14 (28.57)	24 (48.98)	11 (22.45)	10 (20.41)	34 (69.39)	5 (10.20)
	P=0.3866		4.1459	*P*=0.9421		0.7721	*P*=0.9665		0.5681
Educational status									
Literate	98 (63.64)	47 (30.52)	9 (5.84)	37 (24.03)	81 (52.6)	36 (23.38)	30 (19.48)	108 (70.13)	16 (10.39)
Illiterate	40 (67.8)	18 (30.51)	1 (1.70)	14 (23.73)	29 (49.15)	16 (27.12)	15 (25.42)	37 (62.71)	7 (11.86)
	P=0.4321		1.6782	*P*=0.8419		0.3443	*P*=0.5644		1.1439
Employment status									
Employed (37)	27 (72.97)	9 (24.32)	1 (2.70)	6 (16.21)	26 (70.27)	10 (27.03)	3 (8.11)	26 (70.27)	8 (21.622)
Unemployed (176)	111 (63.07)	56 (31.82)	9 (5.11)	45 (25.57)	89 (50.57)	42 (23.86)	42 (23.86)	119 (67.61)	15 (8.52)
	P=0.4956		1.4041	*P*=0.2630		2.6711	*P*=0.0144		8.4819
Presence of comorbidities									
Yes (184)	114 (61.96)	63 (34.24)	7 (3.80)	43 (23.37)	92 (50)	49 (26.63)	42 (22.83)	123 (66.85)	19 (10.33)
No (29)	24 (48.98)	2 (6.89)	3 (10.35)	8 (27.59)	18 (62.07)	3 (10.35)	3 (10.35)	22 (75.86)	4 (13.79)
	P=0.0064		10.093	*P*=0.1641		3.6142	*P*=0.2974		2.4251
BMI									
>18 (11)	7 (63.64)	3 (27.27)	1 (9.09)	3 (27.27)	5 (45.46)	3 (27.27)	1 (9.09)	8 (72.73)	2 (18.18)
18-25 (118)	81 (68.64)	33 (27.97)	4 (3.39)	32 (27.12)	61 (51.69)	25 (21.19)	33 (27.97)	75 (63.56)	10 (8.48)
25-30 (63)	42 (68.25)	17 (26.98)	4 (6.34)	12 (19.05)	32 (50.79)	19 (30.16)	8 (12.70)	47 (74.60)	8 (12.70)
>30 (21)	8 (38.09)	12 (57.14)	1 (4.76)	3 (14.28)	13 (61.90)	5 (23.81)	3 (14.29)	15 (71.43)	3 (14.29)
	P=0.5541		8.7698	*P*=0.7279		3.607	*P*=0.2129		8.3605
Addictions									
Alcohol									
Yes (6)	6 (100)	0	0	1 (16.67)	3 (50)	2 (33.33)	1 (16.67)	5 (83.33)	0
No (207)	132 (63.77)	65 (31.40)	10 (4.83)	50 (24.16)	107 (51.69)	50 (24.16)	44 (21.26)	140 (67.63)	23 (11.11)
	P=0.1868		3.3554	*P*=0.8432		0.342	*P*=0.6263		0.9359
Tobacco									
Yes	10 (100)	0	0	2 (20)	5 (50)	3 (30)	1 (10)	8 (80)	1 (10)
No	128 (63.05)	65 (32.02)	10 (4.93)	49 (24.14)	105 (51.72)	49 (24.14)	44 (21.68)	137 (67.49)	22 (10.84)
	P=0.0578		5.7025	*P*=0.9013		0.2078	*P*=0.6570		0.8402
Number of drugs									
1 (149)	91 (61.07)	50 (33.56)	8 (5.37)	36 (24.16)	73 (48.99)	40 (26.85)	25 (16.78)	103 (69.13)	21 (14.09)
>1 (64)	47 (22.07)	15 (23.44)	2 (3.13)	15 (23.44)	37 (57.81)	12 (18.75)	20 (31.25)	42 (65.63)	2 (3.13)
	P=0.2188		3.0389	*P*=0.3895		1.8859	*P*=0.0086		9.5071

(*Contd...*)

Table 1: *Contd...*

Characteristics	Adherence								
	Drugs			Diet			Physical activity		
	High (%)	Moderate (%)	Low (%)	High (%)	Moderate (%)	Low (%)	Category 1 (%)	Category 2 (%)	Category 3 (%)
Time since treatment									
0.5-1 (28)	16 (57.14)	11 (39.29)	1 (3.57)	8 (28.57)	14 (50)	6 (21.43)	4 (14.29)	20 (71.43)	4 (14.29)
1-5 (75)	50 (66.67)	23 (30.67)	2 (2.67)	22 (29.33)	34 (45.33)	19 (25.33)	15 (20)	55 (73.33)	5 (6.67)
>5 (110)	72 (65.46)	31 (28.18)	7 (6.36)	21 (19.09)	62 (56.36)	27 (24.55)	26 (23.64)	70 (63.64)	14 (12.73)
	P=0.6289		2.5885	*P*=0.4873		3.4387	*P*=0.4714		3.5425
Distance from the hospital									
<5 km (48)	34 (70.83)	13 (27.08)	1 (2.08)	9 (18.75)	31 (64.58)	8 (16.67)	5 (10.42)	39 (23.64)	4 (8.33)
>5 km (165)	104 (63.03)	52 (31.52)	9 (5.46)	42 (25.46)	79 (47.88)	44 (26.67)	40 (24.24)	106 (64.24)	19 (11.52)
	P=0.4750		1.4889	*P*=0.1206		4.2302	*P*=0.0709		5.2928

*Chi-square value. BMI: Body mass index

Almost similar adherence pattern was observed among those on treatment for 1-5 and 5 years and above. Adherence was seen to be more among those study participants who were within 5 km access from a health-care setting.

DASH Diet Adherence of the Participants

Almost 23.94% (51) of the patients were highly adherent toward the DASH diet, while a larger proportion of 51.64% (110) was moderately adherent. As depicted in Table 1, majority of the study participants irrespective of the age group were moderately adherent toward the DASH diet. The levels of adherence to the DASH diet seen in the males as well as females were similar. In addition, no significant difference to DASH diet adherence was seen with respect to educational and employment status. Higher proportion of moderate-level adherence to the DASH diet was seen to the total number of drugs prescribed to the study participants. Although not significant, the study participants who have been on treatment for more than 1 year were seen to be more adherent toward the DASH diet as compared to those who had recently started their treatment.

Physical Activity Adherence of the Patients

Majority of the participants, i.e., 145 (68.08%) showed Category 2, i.e., moderate activity while a very low proportion, i.e., 23 (10.83%) indulged themselves in vigorous activity (Category 3). A significant association was noted with the following parameters: Age ($P = 0.0145$, < 0.05), employment status ($P = 0.0144$), and number of medications prescribed ($P = 0.0086$). Thus, it was observed that age, employment status, and number of medications prescribed were significantly associated in determining the physical activity adherence.

Impact of Adherence on the BP Levels

The patients with high adherence toward the treatment had relatively low levels of BP levels compared to those who showed difference in the adherence pattern. The data are mentioned in Table 1.

DISCUSSION

Out of 213 patients, 64.79% (138) were highly adherent toward antihypertensive agents prescribed to them while 30.52% (65) patients were moderately adherent and 4.70% (10) were with low adherence. About 110, i.e., 51.64% of patients were moderately adherent toward the DASH diet, rest of the study population were seen to have high (51, i.e., 23.94%) and low (52, i.e., 24.42%) adherence. A total of 45 patients (21.13%) were under Category 1, 145 patients (68.08%) were under Category 2, and 23 patients (10.80%) were under Category 3 physical activity. Various factors were seen to be associated with adherence toward antihypertensive treatment which are listed as follows: The presence of comorbidities (diabetes mellitus, CVD, thyroid disorder, dyslipidemia, others such as spondylosis and depression) showed a significant association with the drug adherence ($P = 0.0064$, $\chi^2 = 10.093$). Age as a parameter showed noteworthy connotation with adherence to physical activity/lifestyle modification ($P = 0.0145$, $\chi^2 = 8.4613$). Besides this, employment status too showed significant results in case of physical activity/lifestyle modifications with $P = 0.0144$ and $\chi^2 = 8.4819$. Number of antihypertensive drugs prescribed and the total number of drugs (medication) the patient is being administered viewed a substantial association with adherence toward the same ($P = 0.0086$, $\chi^2 = 9.5071$).

In this study, it was noted that a majority of patients who approached the hospital for antihypertensive treatment were females. While similar findings were observed in "A Survey Study of 250 Hypertensive Patients in Jhansi (UP), India" by Patil et al.,[17] it contradicted the findings of the study made by Aubert et al.[12] The probable reason for females to be more hypertensive than males could be

the increased stress levels. However, in similarity to this study itself, it was seen that majority of patients with HTN were elderly (mean age: 60.52 ± 5.4). This could be due to age-related decrease in compliance of the arterial wall, leading to essential HTN. High adherence was seen in a study population toward antihypertensive agents which is similar to the study findings by Susan et al. in the study titled, "Antihypertensive Drug Compliance Across Clinic and Community Settings, in Thiruvananthapuram, South India."[20] And also in "Factors Associated with Adherence to Antihypertensive Treatment among Patients Attending a Tertiary Care Hospital in Mangalore, South India" by Kumar et al.[11] Here, in this study, medical reimbursement could be the reason for the same. There was no significant association between the sociodemographic factors (marital statuses, age, educational status, and employment status) and adherence toward the treatment unlike the findings of "Assessments of Adherence to Hypertension Medications and Associated Factors among Patients Attending Tikur Anbessa Specialized Hospital Renal Unit" by Hareri and Abebe.[8] High adherence was seen in patients with comorbidities, similar to the study mentioned above where this could be due to the reason that the patient already diseased and realizes the importance of being compliant. In similarity to the study stated above, in this study too, patients who were on treatment for longer duration had more adherence toward the treatment as compared to those who were recently started on treatment. Although this is true, a poor self-efficacy and self-management were seen to bring about drop in adherence in the remaining patients. A similar finding was noted by Shima et al. in their study, "A Qualitative Study on Hypertensive Care Behavior in Primary Health Care Settings in Malaysia."[19] Studies from the United Kingdom, Canada, and the Netherlands have in fact demonstrated that discontinuation rates are likely to be higher during the 1st year of follow-up but are more likely to remain rather stable thereafter for the long term.[23] A study made by Ahmed et al supported the fact that patients with higher baseline cardiovascular disease risk showed stronger association with high adherence.[15] and those with higher baseline cardiovascular risk showed stronger associations with high adherence to antihypertensive therapy. Similar finding was observed in the current study. In this study, only 24% of the patients achieved high adherence toward DASH diet, which is almost similar to the study made by Couch et al. in their study, "The Efficacy of a Clinic-based Behavioral Nutrition Intervention Emphasizing a DASH-type Diet for Adolescents with Elevated Blood Pressure."[21] In this study, majority of the patients were moderately adherent toward the DASH diet regimen, which is comparable to the study made by Shilpa et al. in "Knowledge and Life Style Factors of Hypertensive Subjects,"[5] where nearly half of the study participants followed food restrictions. Majority of participants had moderate (Category 2) physical activity levels, which is analogous to the study mentioned above. Patients with high adherence toward DASH diet showed a better control over their BP levels (128.21 ± 11.55/75.35 ± 6.02 mmHg). This supports the notion that dietary improvements are accompanied by positive BP changes.[10,15] The physical activity of moderate intensity was predominant in the study participants in this study unlike the study made by Mandal on "Physical Activity, Dietary Habits and Blood Pressure among Hypertensive Patients in Phutthamonthon District, Nakornapathom Province, Thailand," where 54.2% of the patients had a sedentary lifestyle with low activity. Besides this, patients in Category 2 with exercise achieved a BP level below 140/90 mmHg (135.15 ± 8.42/80.09 ± 5.58) (Table 2).[13]

In this study, the limitations observed were diet had to be assessed using a semi-structured scale as no scales to assess the DASH diet for Indian equivalent was available. Besides, there could have been overreporting of adherence by the patients, which could be tackled by conducting a longitudinal study and closely monitoring the same. Inclusion of studying the stress levels and adherence would perhaps help identifying the adherence well.

The study was able to identify the adherence pattern among the patients toward antihypertensive treatment as a whole which included the medications, DASH diet adherence, and physical activity, thus helping intervention planning for the management of HTN in regard to both pharmacotherapy and lifestyle modification.

In conclusion, in this study, various other factors were seen to be related with the adherence toward the antihypertensive treatment although no significant association was noted which are as follows:

A. Patient-related factors - Lack of self-efficacy, tendency to stop the medication on feeling alright, and tendency of forgetting to get the refill
B. Medication-related factors - Associated side effects of the drugs, frequent medication change, and frequency of drug intake
C. Health system-related factors - Distance from the hospital, medication reimbursement, and counseling provided by the health-care provider.

In addition to these factors, an important factor which was noted to be associated with a dip in adherence was lack of awareness. In a government tertiary care setting, where the patient load is considerably high, possibly less amount of time was allotted for counseling the patients.

CONCLUSION

Presence of comorbidities, sex and age, number of antihypertensives, and employment status were seen to be associated with high adherence toward the treatment.

Table 2: Impact of adherence pattern on the BP levels

Adherence			Mean BP (Standard deviation)	
Drug	**Diet**	**Physical activity**	**SBP (mmHg)**	**DBP (mmHg)**
High	High	Category 1	128 (12.7)	79 (3.5)
		Category 2	125 (11.37)	72 (7.12)
		Category 3	-	-
High	Moderate	Category 1	145 (8.67)	83.53 (7.5)
		Category 2	135.65 (9.72)	79.21 (6.45)
		Category 3	135 (11)	85.71 (8.26)
High	Low	Category 1	143.28 (15.29)	85.14 (4.19)
		Category 2	148.44 (16.75)	85.01 (5.91)
		Category 3	146.83 (9.37)	82 (3.73)
Moderate	High	Category 1	127 (7.69)	69.66 (7.42)
		Category 2	139.44 (10.73)	79.36 (7.25)
		Category 3	120 (12.64)	66 (10.02)
Moderate	Moderate	Category 1	141 (12.29)	73.6 (8.84)
		Category 2	139.62 (11.41)	83.34 (5.02)
		Category 3	132 (4.16)	89 (8.24)
Moderate	Low	Category 1	144 (8.82)	74.8 (8.84)
		Category 2	138 (9.8)	81.72 (5.23)
		Category 3	133.3 (9.93)	86.66 (4.67)
Low	High	Category 1	124 (9.51)	88 (5.54)
		Category 2	-	-
		Category 3	-	-
Low	Moderate	Category 1	175 (26.25)	85 (3.53)
		Category 2	168 (21.30)	92 (8.37)
		Category 3	132 (6.78)	79.17 (6.99)
Low	Low	Category 1	136 (1.33)	84 (2.71)
		Category 2	125 (9.11)	58 (15.68)
		Category 3	-	-

BP: Blood pressure

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ANNEXURE

Annexure 1

Food groups	Daily servings	Serving size
Grains and grain products	7-8	1 slice bread (preferably whole wheat), 1 cup dry cereal, ½ cup cooked rice
Vegetables	4-5	1 cup raw leafy vegetables, ½ cup cooked vegetables, ½ cup vegetable juice
Fruits	4-5	1 medium fruit or 200 ml fresh fruit juice
Fat-free or low-fat milk and milk products	2-3	250 ml milk or 1 cup yogurt
Lean meat, poultry, and fish	2 or less	½ cup cooked lean meat, skinless poultry, or fish; 1 small bowl of pulses
Nuts, seeds, and legumes	4-5/week	7-8 count of dry fruits, 1 small cup of legumes, 2-3 times a day
Fat and oils and salt intake	2-3 (Refer to the assessment mentioned above)	1 teaspoon vegetable oil 5 g/day
Sweets	5 or less per week	1 teaspoon sugar

Serving size specifications for the index were matched to the DASH diet plan serving size recommendations to the extent possible.
DASH: Dietary approach to stop hypertension

Annexure 2

Moderate-intensity physical activity (approximately 3-6 METs) requires a moderate amount of effort and noticeably accelerates the heart rate	Vigorous-intensity physical activity (approximately >6 METs) requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate
Examples of moderate-intensity exercise include	Examples of vigorous-intensity exercise include
Brisk walking	Running
Dancing	Walking/climbing briskly up a hill
Gardening	Fast cycling
Housework and domestic chores	Aerobics
Traditional hunting and gathering	Fast swimming
Active involvement in games and sports with children/walking domestic animals	Competitive sports and games (traditional games, football, volleyball, hockey, basketball)
General building tasks (e.g. roofing, thatching, painting)	Heavy shovelling or digging ditches
Carrying/moving moderate loads (<20 kg)	Carrying/moving heavy loads(≥20 kg)

Global Strategy on Diet, Physical Activity and Health. METs: Metabolic equivalents