

Adherence to antihypertensive therapy and its determinants among patients attending primary care hospitals of Kashmir, India

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ABSTRACT

Background: Adherence to antihypertensive therapy is an important factor in determining the clinical course of hypertension. This study was planned to estimate adherence to antihypertensive therapy and its determinants among OPD patients attending two primary care hospitals in Kashmir valley. **Methods:** This study employed a cross-sectional study design. All subjects who reported to OPD between October and December 2020 and had been prescribed antihypertensive medications for at least 1 year were included. Sociodemographic information was collected on a pretested schedule and adherence to medications was assessed by using the-14 item Hill-Bone HBP Compliance to High Blood Pressure Therapy Scale (HB-HBP). Mann-Whitney test and Spearman's rank correlation coefficient were used. **Results:** A total of 406 subjects were included in the final analysis with a mean age of 58 years for women and 56 years for men. The sample comprised 54% women. More than 60% of subjects were currently married, urban area residents, and belonged to middle strata of social class. The mean score obtained in the HB-MAS (maximum score 56) was 19.26 (SD \pm 4.3). Subjects aged 60 years and above, those belonging to lower socioeconomic class, and subjects prescribed three or more drugs with more than once-daily dosing regimen had higher odds of having poor adherence. **Conclusion:** There is suboptimal adherence among OPD patients at primary care level. There is a need for enhanced counselling regarding medication adherence particularly for elderly, poor, illiterate persons and those prescribed multiple medicines with more than once-daily dosing.

Keywords: Adherence, antihypertensive drugs, hill-bone scale, hypertension, medication

Introduction

Hypertension ranks first as a cause of Disability Adjusted Life Years worldwide (DALY).^[1,2] It is a leading risk factor for cardiovascular disease (CVD), chronic kidney disease as well as dementia due to cerebral small vessel disease.^[3] In addition, hypertension is the most common risk factor for cerebrovascular disease including both haemorrhagic and ischemic strokes.^[4,5] An estimated 26% of the global population have hypertension and

it is only projected to increase in future. Studies have estimated an even higher prevalence of hypertension in India with some studies estimating the prevalence of as high as 40%.^[6-8] Despite the high prevalence, awareness regarding hypertension remains low.^[9] In addition the percentage of untreated and uncontrolled hypertension is also high.^[10] Hypertension is becoming one of the leading causes for visits to hospitals and constitutes a major proportion of patients visiting primary care hospitals.^[8,11] Patients with poorly controlled blood pressure are at higher risk for short-term complications in addition to higher risk for long-term complications like CVDs, chronic kidney disease and cerebrovascular accidents.^[5] Essential hypertension contributes to 95% cases of hypertension and its management includes multiple interventions ranging from lifestyle modifications to

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medications.^[12,13] Adherence to therapy is an important factor that determines response to therapy. Despite its importance, adherence is usually suboptimal.^[14] Since a patient usually underreports poor adherence, it is important to have objective ways of assessing adherence.^[15] Validated scales provide us a quantifiable assessment of adherence and can guide in decision making. Hill-Bone HBP Compliance to High Blood Pressure Therapy Scale (HB-HBP) is one such validated scale to measure adherence.^[16]

Objectives

Adherence to high blood pressure therapy is one of the important factors which determine the degree of blood pressure control in short term and morbidity/mortality associated with hypertension in long term. Keeping in view its importance, this study was planned to estimate adherence to antihypertensive therapy among OPD patients attending one primary care hospital in Kashmir valley.

Methodology

Study design, setting and participants

The study had a cross-sectional design and was conducted in an urban health training centre affiliated to a medical college. The health facility is located in an urban area and caters a primarily urban populace with a good rural mix. The hospital sees an average footfall of around 500 patients daily. The hospital is a 24*7 facility with round-the-clock laboratory and diagnostic support. All adult patients aged 18 years and above who visited OPD of the hospital between October to December 2020 and were taking any antihypertensive medications for at least 1 year were explained the purpose of the study and their consent sought. Subjects who provided informed consent were included in the study.

Demographic and clinical information

A pretested schedule was used to collect basic socio-demographic information, past medical and surgical history, any history of comorbidity, history related to hypertension and self-perceived quality of life. In addition a detailed history was collected related to hypertension in terms of its duration, duration of treatment, no of antihypertensive drugs prescribed, dosage regimen prescribed and type of antihypertensive prescribed. All information was correlated with available medical records and those with unavailable records were followed up for a second time for reviewing medical records. Following this blood pressure was recorded as per recommended protocol which was followed by weight and height measurement.^[17] Self-perceived health status was categorized as excellent, good, not good/neither bad, poor and very poor.

Assessment of adherence

Adherence to therapy for high blood pressure was estimated using Hill-Bone HBP Compliance to High Blood Pressure

Therapy Scale (HB-HBP).^[18,19] It is a 14 item scale that can be divided into three subscales. The scale has nine items related to medication adherence, three items related to sodium intake, and two items related to appointment keeping subscale. Each item is scored on a 4-point Likert scale with a score of 4 meaning the highest level of adherence. The maximum and minimum scores are 56 and 14 respectively for all 14 items. The maximum scores for medication adherence, sodium intake and appointment keeping subscales are 36, 12, and 8, respectively.^[16]

Sample size calculation

Sample size was calculated using the formula for prevalence studies. The proportion of subjects with good adherence was estimated to be 50%. The desired precision and confidence level was estimated at 0.05 and 0.95 respectively. The minimum sample size required was estimated to be 385.

Exclusion criteria

Subjects less than 18 years, subjects suffering from dementia and other diseases which can affect recall and subjects severely ill were excluded from the study.

Variables

The study estimated total scores and subscale scores of Hill-Bone HBP Compliance to High Blood Pressure Therapy Scale (HB-HBP), socio-economic class as per modified Kuppuswamy scale for 2020, systolic and diastolic blood pressure, and body mass index (as per standard definition).^[20]

Statistical methods

The data was entered in excel and analysed using JASP version 14 statistical software which is open source software.^[21] The variables were categorized into quantitative and qualitative variables. Correlations between two quantitative variables were estimated by the Spearman rank correlation coefficient. Association of any qualitative variable on adherence was assessed by Mann–Whitney and Kruskal–Wallis test. Records with any missing data were excluded from the analysis.

Ethics statement

The study was approved by the institutional review committee. Informed consent was sought from all subjects for participation in the study and the subjects had an option to opt-out at any time of the study.

Results

Description of study sample

A total of 492 subjects met the inclusion criteria and were approached for participation in the study. Of these 448 provided consent and were included in the study. The age and gender composition of subjects who denied consent were not significantly different from final study subjects. Of these 33 subjects could not provide complete medical records and

9 records were excluded due to their incompleteness. The remaining 406 subjects were included in the final analysis. The flow chart for the same is depicted as Figure 1.

The study sample was composed of 54% females, 78% urban area residents, and 77% were currently married. One-third of females were illiterate whereas 1/4th of males were illiterate. Around half of males were self-employed and 70% of females were homemakers. Around half of the study subjects belonged to the middle strata of the socio-economic group with there being no significant difference in socio-economic class between males and females. The details are provided in Table 1.

Antihypertensive medications

More than 70% of participants had a duration of 5 years or more on antihypertensive treatment and half of the subjects were on two antihypertensive medications. The most commonly prescribed dosing regimen was once daily which had been prescribed to 70% of subjects. Out-of-pocket expenditure was the most common mechanism for procuring medicines being as high as 90%. Around one-fourth of subjects reported their health status above good with another 25% reporting it poor or bad. Only half of the subjects had a normal blood pressure reading at assessment and the proportion was less for males. The details are provided in Table 2.

Adherence to high blood pressure therapy

The subjects attained a mean total score of 19.8 ± 3.12 with a maximum of 28 and a minimum score of 14. The score was 13.04 ± 2.05 for the medication adherence sub-scale. For reduced sodium intake and appointment keeping subscale the scores were 4.42 ± 1.1 and 2.34 ± 0.57 . The scores are depicted as box plots in Figure 2.

Determinants of adherence to high BP therapy

Quantitative variables

Age of the subject, systolic and diastolic blood pressure at assessment had a significant negative correlation with the total score, medication adherence subscale and appointment keeping subscale. The reduced sodium intake subscale did not have any

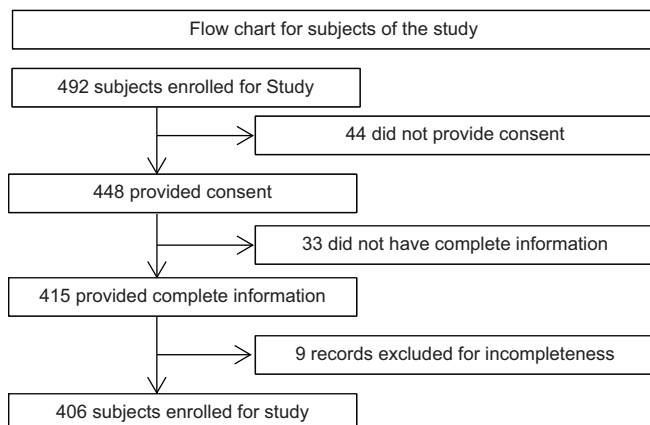


Figure 1: Flowchart showing subjects recruited in the study

significant correlation with age but had a significant negative correlation with systolic and diastolic blood pressure. BMI did not have any significant correlation with total or any of the subscale scores. The correlation coefficients for each variable are provided in Table 3.

Qualitative variable

Female gender, rural area residence, and upper socioeconomic strata were significantly related with the higher total score, higher medication adherence score and higher appointment keeping score. All three had no significant relation with reduced salt intake subscale. Total and subscale scores were also significantly related to the number of drugs prescribed and dosing regimen. Prescription of fewer than two drugs with once-daily dosing was associated with better adherence. Marital status and level of education and history of associated comorbidity had no significant relation with adherence scores. The detailed values are provided in Table 4.

Discussion

Adherence to therapy for high blood pressure is an important factor that determines the degree of BP control. Hill-Bone HBP Compliance to High Blood Pressure Therapy Scale (HB-HBP) is a valid scale for the estimation of adherence to blood pressure control therapy.

In the current study, the mean total score was estimated at 19.8 ± 3.12 . The score was 13.04 ± 2.05 for medication adherence sub-scale, 4.42 ± 1.1 for reduced sodium intake and 2.34 ± 0.57 for appointment keeping subscale. Total adherence score, as well as subcomponent scores, were suboptimal which would be contributing to suboptimal blood pressure control in the study population as around 50% of subjects had blood pressure

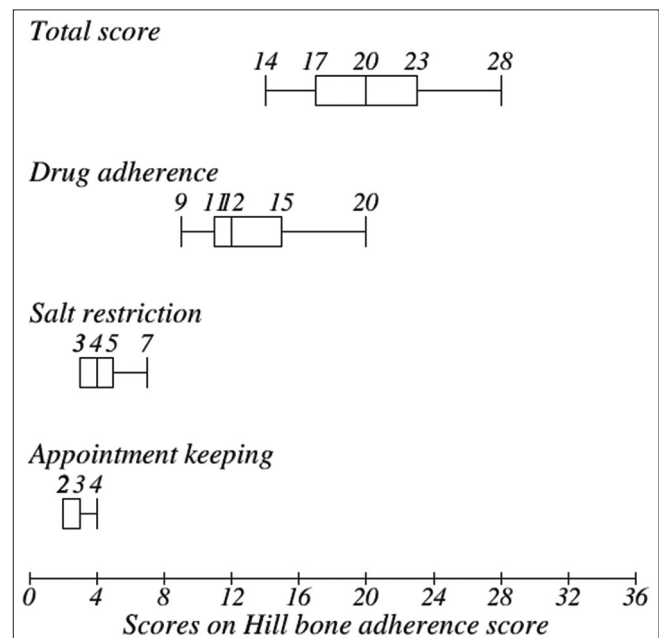


Figure 2: Box plot for total and subscale scores in Hill bone CHBPTS

Table 1: Characteristics of study subjects

Variable	Value	Male		Female (No)	
		No	%	No	%
Age	18-40	33	17.8	29	13.1
	41-60	65	35.1	78	35.3
	61 and above	87	47.0	114	51.6
Residence	Urban	143	77.3	176	79.6
	Rural	42	22.7	45	20.4
Marital Status	Unmarried	21	11.4	19	8.6
	Married	139	75.1	173	78.3
	Widowed/Divorced	25	13.5	29	13.1
Religion	Muslim	166	89.7	209	94.6
	Hindu	12	6.5	7	3.2
	Sikh	7	3.8	5	2.3
Educational status	Illiterate	43	23.2	79	35.7
	Primary and below	48	25.9	74	33.5
	Secondary	38	20.5	43	19.5
	Graduate and above	56	30.2	25	11.3
Employment status	Government	39	21.1	23	10.4
	Self employed	89	48.1	29	13.1
	Student	3	1.6	2	0.9
	Homemaker	0	0.0	156	70.6
	Retired with pension	23	12.4	11	5.0
Socioeconomic scale (modified for 2020)	Unemployed	31	16.8	0	0.0
	Upper (I)	31	16.8	39	17.6
	Upper Middle (II)	48	25.9	58	26.2
	Lower Middle (III)	53	28.6	64	29.0
	Upper Lower (IV)	29	15.7	31	14.0
	Lower (V)	24	13.0	29	13.1

Table 2: Description of antihypertensive treatment among study subjects

Variable	Value	Male		Female	
		No	%	No	%
Duration of Rx	1-5 years	62	33.5	67	30.3
	5 to 10 years	87	47.0	98	44.3
	More than 10 years	36	19.5	56	25.3
No of drugs using currently	1	49	26.5	42	19.0
	2	94	50.8	111	50.2
	3 or more	42	22.7	68	30.8
Dosage	Once daily	119	64.3	152	68.8
	BD	61	33.0	66	29.9
	TID	5	2.7	3	1.4
Cost of drugs covered by	Self	124	67.0	18	8.1
	Family	46	24.9	182	82.4
	Insurance/employer	2	1.1	0	0.0
	NGO/Free	13	7	21	9.5
Current health status	Excellent or good	65	35.1	56	25.3
	Not good and nor bad	83	44.9	113	51.1
	poor or very bad	37	20.0	52	23.5
Blood pressure (JNC Classification)	Normal	77	41.6	118	53.4
	Prehypertension	63	34.1	61	27.6
	Stage 1 & 2	45	24.3	42	19.0

above normal at the time of assessment. The adherence scores are comparable to multiple studies done internationally as well as in India.^[22-25] There is a need for further studies to identify

modifiable factors which contribute to poor adherence so that interventions can be developed for addressing those factors.^[26]

The age of the subject had a significant negative correlation with the total score, medication adherence and appointment keeping subscore. Poor adherence with increasing age has also been identified in multiple other studies which imply that there is a need for enhanced counselling and using simpler dosing regimens in the elderly.^[25,27] Salt restriction subscale had no significant correlation with age.^[22]

Female gender was associated with better adherence scores except for reduced salt intake. Females usually show better acceptance to medical therapies which has been found in multiple other studies.^[28] Females also had lower average systolic and diastolic blood pressures. SBP and DBP at assessment had a significant negative correlation with total and all sub-component scores. Better adherence leading to lower blood pressure readings has a plausible explanation and attaining lower blood pressure is a primary target of blood pressure therapy. In retrospect higher blood pressure readings during routine OPD visits should alert the treating physician towards adherence issues and try to improve adherence first before switching or adding medications.^[14,29] BMI of subjects did not have any significant correlation with adherence scores.

Subjects who had been prescribed only one antihypertensive had significantly better adherence than subjects on multiple drugs as they had better total and all subcomponent scores. This could be explained by less adverse effects and its simplicity of intake and the same has been found in multiple other studies.^[28,30] Dosing regimen also had an impact on adherence with once-daily dosing associated with better adherence. This study adds to the body of evidence that monotherapy with a once-daily dosing regimen will improve adherence and at the same time reduce adverse events which will further contribute to better adherence.^[31] There is a tendency among doctors to increase medications or dosing when a patient on antihypertensives is found to have suboptimal control. The treating physician should first rule out poor adherence before increasing the dose or its frequency. Increasing the number of medications or their frequency can get counterproductive as it may further decrease adherence so there is a need to incorporate assessment of adherence in routine clinical care to identify the reason for suboptimal blood pressure control.

Residing in a rural area and belonging to upper socioeconomic strata were significantly related with the higher total score, higher medication adherence score and higher appointment keeping score.^[25] Poor adherence in lower socio-economic status can be due to lower purchasing power and less access to regular medical care and counselling. It is supported by multiple studies conducted previously in India and other parts of the world.^[31]

Adherence to antihypertensive drugs has been assessed before in multiple parts of the world but this is one of the first studies conducted on this important topic in this part of the world. The

Table 3: Correlation of quantitative variable with CHBPTS

	Age	SBP	DBP	BMI
Total score	-0.235*	-0.624*	-0.579*	0.004
Medication taking	-0.242*	-0.522*	-0.576*	0.036
Reduced sodium intake	-0.026	-0.398*	-0.338*	-0.01
Appointment keeping	-0.242*	-0.263*	-0.293*	-0.004

RR with Spearman Rank Correlation Coefficient. *Denotes statistically significant association

study emphasizes that adherence to antihypertensive drugs is suboptimal among diagnosed patients. Certain sections of the population like the elderly and lower-income groups have an even higher degree of poor adherence. Poor adherence among already diagnosed patients and high levels of undiagnosed hypertensives can lead to an epidemic of cardiovascular and cerebrovascular diseases in near future. The primary care providers are supposed to have more time for counselling patients than their counterparts

Table 4: Correlation of qualitative variables with score on CHBPTS

Variable	Total score	Medication Adherence	Reduced Salt intake	Appointment keeping
Gender				
Female	20.9 (3.8)	13.4 (2.8)	5.1 (1.1)	2.4 (0.6)
Male	19.1 (2.9)	12.4 (2.4)	4.9 (1.01)	1.8 (0.3)
<i>P</i>	<.001	<.001	0.089	<.001
Socioeconomic scale (2020)				
Upper (I)	22.2 (4.1)	15.3 (3.32)	4.06 (0.7)	2.9 (0.59)
Upper & Lower Middle (II & III)	20.8 (3.3)	13.9 (2.63)	4.5 (1.05)	2.39 (0.5)
Upper Lower & Lower (IV & V)	18.3 (2.5)	11.8 (2.1)	4.34 (1.14)	2.2 (0.42)
<i>P</i>	<.001	<.001	0.2	<.001
Residence				
Urban	19.4 (3.2)	12.8 (2.8)	4.3 (1.01)	2.3 (0.5)
Rural	20.9 (2.9)	13.6 (2.1)	4.8 (0.78)	2.55 (0.7)
<i>P</i>	<.001*	0.01	0.78	<.001*
Marital status				
Currently married	19.2 (3.2)	12.9 (2.4)	4.1 (1.1)	2.2 (0.6)
Unmarried/widowed/divorced	19.8 (2.5)	13.1 (2.1)	4.4 (1.2)	2.3 (0.8)
<i>P</i>	0.073	0.061	0.051	<.3
Level of education				
Illiterate	20.08 (3.4)	13.15 (2.6)	4.46 (1.06)	2.41 (0.46)
Below graduate level	19.44 (3.3)	13.36 (2.8)	4.3 (1.14)	2.27 (0.61)
Graduate and above	19.42 (3.1)	12.84 (2.62)	4.24 (0.98)	2.39 (0.8)
<i>P</i>	0.003	0.067	0.71	0.054
No of drugs prescribed				
1	20.86 (3.1)	13.76 (2.66)	4.48 (1.01)	2.62 (0.79)
2	20.81 (3.2)	13.66 (2.63)	4.82 (0.98)	2.33 (0.50)
3 or more	16.58 (2.3)	10.99 (1.81)	3.45 (0.76)	2.13 (0.34)
<i>P</i>	<.001*	<.001*	<.001*	<.001*
Dosing regimen				
OD	20.5 (3.6)	13.6 (2.2)	4.5 (1.1)	2.35 (0.56)
BD	18.2 (2.3)	11.7 (1.8)	4.1 (0.9)	2.36 (0.62)
TID	15.5 (0.52)	10.5 (0.52)	3 (0.00)	2 (0.00)
<i>P</i>	<.001*	<.001*	0.07	0.71
Comorbidity				
No	19.6 (3.4)	12.8 (2.6)	4.5 (1.1)	2.3 (0.6)
Yes	20.2 (3.7)	13.6 (2.7)	4.3 (0.99)	2.3 (0.5)
<i>P</i>	0.153	0.01*	0.146	0.23
Cost of medicines borne by				
Self	19.9 (3.1)	13.1 (2.2)	4.4 (1.11)	2.4 (0.52)
Family	19.5 (3.2)	13.2 (2.7)	4.2 (1.3)	2.1 (0.42)
Reimbursed or free	19.6 (2.9)	12.9 (2.62)	4.4 (0.98)	2.3 (0.9)
<i>P</i>	0.68	0.59	0.78	0.61
Reported health status				
Excellent or good	20.2 (3.3)	13.4 (2.7)	4.5 (1.1)	2.4 (0.64)
Not good and nor bad	19.8 (3.4)	12.9 (2.5)	4.6 (0.99)	2.33 (0.54)
Poor or very bad	18.8 (3.5)	12.4 (2.7)	4.1 (1.1)	2.27 (0.45)
<i>P</i>	0.005*	0.012*	0.015*	0.314

Data are represented as mean±SD. *Significant results. Mann-Whitney test and Kruskal-Wallis test

at the tertiary care level so poor adherence at this level is more worrisome.

Strengths and limitations

The strengths of the study lies in the fact that it is one of the first studies conducted at primary care level in this geographical area. The compliance was assessed using validated. The primary limitation of this study is that the authors cannot rule out recall bias from participants and overreporting of compliance from the participants.

Conclusion

This study estimated adherence to blood pressure therapy and its determinants in routine OPD patients. The overall adherence to medications, salt restriction and the regular appointment was suboptimal and it was particularly low in elderly subjects, urban area residents, subjects with low socio-economic class, subjects prescribed multiple medications with multiple dosing. There is a need to pay more attention and devote more resources towards interventions for improving adherence. Special attention needs to be provided to elderly poor and those on multiple drugs. Drug adherence assessment needs to be an integral component of routine care.

Author contributions

All authors contributed to data collection, analysis, drafting and revising the article, and gave final approval of the version to be published.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

- Forouzanfar MH, Liu P, Roth GA, Ng M, Biryukov S, Marczak L, *et al.* Global burden of hypertension and systolic blood pressure of at Least 110 to 115 mm Hg, 1990-2015. *JAMA* 2017;317:165-82.
- Ghosh S, Kumar M. Prevalence and associated risk factors of hypertension among persons aged 15-49 in India: A cross-sectional study. *BMJ Open* 2019;9:e029714.
- Jamerson KA, Townsend RR. The attributable burden of hypertension: focus on CKD. *Adv Chronic Kidney Dis* 2011;18:6-10.
- Carey RM, Muntner P, Bosworth HB, Whelton PK. Prevention and control of hypertension: JACC health promotion series. *J Am Coll Cardiol* 2018;72:1278-93.
- World Health Organization. (2013). Global action plan for the prevention and control of noncommunicable diseases 2013-2020. World Health Organization. <https://apps.who.int/iris/handle/10665/94384>.
- Rouf A, Rasool M, Khan SMS, Haq I, Hamid A, Bashir K, *et al.* Prevalence of hypertension and its association with waist circumference in adult population of block Hazratbal, Srinagar, India. *Ann Med Health Sci Res* 2018;8:68-73.
- Yousoof M, Wani MI, Imran A, Ali G. Prevalence of pre-hypertension in Kashmir. *Indian J App Res* 2020;10:59-60.
- Saju MD, Allagh KP, Scaria L, Joseph S, Thiyagarajan JA. Prevalence, awareness, treatment, and control of hypertension and its associated risk factors: Results from baseline survey of SWADES family cohort study. *Int J Hypertens* 2020;2020:4964835.
- Karmakar N, Nag K, Saha I, Parthasarathi R, Patra M, Sinha R. Awareness, treatment, and control of hypertension among adult population in a rural community of Singur block, Hooghly District, West Bengal. *J Edu Health Promot* 2018;7:134.
- Oparil S, Acelajado MC, Bakris GL, Berlowitz DR, Cifková R, Dominiczak AF, *et al.* Hypertension. *Nat Rev Dis Primers* 2018;4:18014.
- Tripathy JP, Thakur JS, Jeet G, Chawla S, Jain S. Alarming high prevalence of hypertension and pre-hypertension in North India-results from a large cross-sectional STEPS survey. *PLoS One* 2017;12:e0188619.
- Oscar A. Carretero SO. Essential hypertension. *Circulation* 2000;101:329-35.
- Nguyen Q, Dominguez J, Nguyen L, Gullapalli N. Hypertension management: An update. *Am Health Drug Benefits* 2010;3:47-56.
- Burnier M, Egan BM. Adherence in hypertension: A review of prevalence, risk factors, impact, and management. *Circ Res* 2019;124:1124-40.
- Lam WY, Fresco F. Medication adherence measures: An overview. *Biomed Res Int* 2015;2015:217047.
- Hopkins J. About the Hill-Bone scales. Available from: https://nursing.jhu.edu/faculty_research/research/projects/hill-bone/about-hill-bone-scales.html. [Last accessed on 2021 Feb 13].
- Muntner P, Shimbo D, Carey RM, Charleston JB, Gaillard T, Misra S, *et al.* Measurement of blood pressure in humans: A scientific statement from the American heart association. *Hypertension* 2019;73:E35-66.
- Kim MT, Hill MN, Bone LR, Levine DM. Development and testing of the Hill-Bone compliance to high blood pressure therapy scale. *Prog Cardiovasc Nurs* 2000;15:90-6.
- Lambert EV, Steyn K, Stender S, Everage N, Fourie JM, Hill M. Cross-cultural validation of the Hill-Bone compliance to high blood pressure therapy scale in a South African, primary health care setting. *Ethn Dis* 2006;16:286-91.
- Saleem SM. Modified Kuppusswamy socioeconomic scale updated for the year 2020. *Indian J Forensic Community Med* 2020;7:1-3.
- JASP-A fresh way to do statistics. Available from: <https://jasp-stats.org/>. [Last accessed on 2021 Feb 14].
- Mutneja E, Yadav R, Dey AB, Gupta P. Frequency and predictors of compliance among patients taking antihypertensive medicines. *Indian Heart J* 2020;72:136-9.

23. Uchmanowicz B, Chudiak A, Uchmanowicz I, Rosińczuk J, Froelicher ES. Factors influencing adherence to treatment in older adults with hypertension. *Clin Interv Aging* 2018;13:2425-41.
24. Boima V, Ademola AD, Odusola AO, Agyekum F, Nwafor CE, Cole H, *et al.* Factors associated with medication nonadherence among hypertensives in Ghana and Nigeria. *Int J Hypertens* 2015;2015:205716.
25. Venkatachalam J, Abrahm S, Singh Z, Stalin P, Sathya G. Determinants of patient's adherence to hypertension medications in a rural population of Kancheepuram District in Tamil Nadu, South India. *Indian J Community Med* 2015;40:33-7.
26. Macquart de Terline D, Kramoh KE, Bara Diop I, Nhavoto C, Balde DM, Ferreira B, *et al.* Poor adherence to medication and salt restriction as a barrier to reaching blood pressure control in patients with hypertension: Cross-sectional study from 12 sub-Saharan countries. *Arch Cardiovasc Dis* 2020;113:433-42.
27. Karakurt P, Kaşıkçı M. Factors affecting medication adherence in patients with hypertension. *J Vasc Nurs* 2012;30:118-26.
28. Tilea I, Petra D, Voidazan S, Ardeleanu E, Varga A. Treatment adherence among adult hypertensive patients: A cross-sectional retrospective study in primary care in Romania. *Patient Prefer Adherence* 2018;12:625-35.
29. Lee GKY, Wang HHX, Liu KQL, Cheung Y, Morisky DE, Wong MCS. Determinants of medication adherence to antihypertensive medications among a Chinese population using Morisky medication adherence scale. *PLoS One* 2013;8:e62775.
30. Johnson J, Vijayakumar K, Nujum ZT, Thankamoniamma PM. Compliance and its determinants to pharmacologic management of hypertension. *Indian J Comm Health* 2019;31:63-72.
31. Kumaraswamy R, Kauser M, Jagadeesh Mk, Kumar Ru, Afreen A, Vagesh Kumar S, *et al.* Study of determinants of nonadherence to anti-hypertensive medications in essential hypertension at a teaching hospital in Southern India. *CHRISMED J Health Res* 2015;2:57-60.