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Short Communication

Frequency and predictors of compliance among patients taking antihypertensive medicines

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ABSTRACT

Introduction: Medication compliance, an important aspect in the treatment of chronic disease research, is often assessed using pill count method. The patient perception is usually not addressed objectively. The present study was conducted to assess patient cognizance, prevalence and predictors of compliance towards antihypertensive therapy in Indian patients.

Methods: Adult patients taking antihypertensive medicines were included from the cardiology and geriatric OPDs of a tertiary care hospital in India. Socio-demographic data and disease awareness information was collected. Hill-Bone high blood pressure compliance scale was administered for compliance score.

Results: For the 452 participants, mean age was 54.6 ± 13.7 years with approximate 2:1 ratio of males to females. Cronbach's alpha value of 0.7 for Hill Bone compliance scale showed good internal consistency. More than 80% participants had a score of ≥80%, showing good compliance among Indian patients. Factors that were significantly associated with uncontrolled blood pressure with correlation analysis were age, gender and awareness regarding disease.

Conclusion: The study suggests that Hill-Bone high blood pressure compliance scale may be useful for assessing compliance in Indian population. An age appropriate intervention for continued compliance should be considered to improve compliance and hence, reduce long term sequelae of hypertension.

1. Introduction

Hypertension itself is asymptomatic but it is the largest risk factor for cardiovascular morbidity and mortality.[1] The absence of a curative treatment implies life style changes and lifelong antihypertensive therapy. This makes treatment difficult in terms of compliance as the perceived benefits are few for a lay person with poor knowledge of the disease. Studies suggest a cause effect relationship between unsatisfactory blood pressure control and lack of compliance, thereby increasing the risk of cardiovascular complications.[2,3] Despite the importance of compliance, there is no universal tool to appropriately assess it across population. Many investigators have used de novo questionnaires which are neither hypertension specific nor validated. Hill bone high blood pressure compliance scale on the other hand is a questionnaire specific for hypertension which is validated in some ethnicities although not in the Indian population.[4]

Compliance is further affected by factors such as disease knowledge, importance of treatment, patient education, financial status and adverse drug reactions. These factors tend to vary with time and region and are further affected by the socio-cultural milieu and demographic shifts. Therefore, it is important to study compliance in a given population, using a validated questionnaire that allows comparison over time, within the population and outside. Hence, the present study was designed to determine the extent of treatment compliance and predictors thereof using Hill-bone high blood pressure compliance scale among Indian patients taking antihypertensive medicines.

2. Methods

This was an observational cross sectional study, approved by Institute Ethics Committee (IESC/T-175/15). The participants were

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Table 1
Principal component analysis of the Hill-bone high blood pressure compliance scale ($n = 452$).

Item How often	Score (Mean ± SD)	Principal component analysis		
		Salt intake	Appointment keeping	Medication taking
1. Do you forget to take your HBP medicine?	1.75 ± 0.70	0.634	0.290	−0.143
2. Do you decide not to take your HBP medicine?	1.22 ± 0.49	0.581	0.430	−0.110
3. Do you eat salty food?	1.25 ± 0.50	0.490	−0.246	0.176
4. Do you shake salt, fondor, or aromat on your food before you eat it?	1.47 ± 0.60	0.341	−0.513	0.488
5. Do you eat fast food?	1.59 ± 0.69	0.421	−0.419	0.327
6. Do you get the next appointment before you leave the clinic?	1.54 ± 0.87	0.337	0.223	−0.298
7. Do you miss scheduled appointments?	1.28 ± 0.49	0.147	0.355	
8. Do you leave the dispensary without obtaining your prescribed pills?	1.35 ± 0.66	0.222	−0.154	−0.175
9. Do you run out of HBP pills?	1.41 ± 0.60	0.364	−0.245	−0.119
10. Do you skip your HBP medicines 1–3 days before you go to the clinic?	1.28 ± 0.49	0.122		
11. Do you miss taking your HBP pills when you feel better?	1.52 ± 0.65	0.443	−0.104	−0.170
12. Do you miss taking your HBP pills when you feel sick?	1.23 ± 0.45	0.246	0.497	0.465
13. Do you take someone else's HBP pill?	1.2 ± 0.42	0.255	0.407	0.435
14. Do you miss taking your HBP pills when you care less?	1.66 ± 0.71	0.454	−0.301	−0.424

HBP: High blood pressure.

enrolled from a large tertiary care hospital that receives patients from different state, culture and socioeconomic status. Participants of age ≥18 years, of either gender, prescribed antihypertensive medicines were enrolled from cardiology and geriatric outpatient departments, after giving written informed consent. Patients having congestive heart failure (NYHA class III and IV) or other chronic conditions which could affect their ability to comprehend and respond to study questionnaire were excluded. The case report form was designed and pilot tested for collection of demographic details and patient awareness about disease and treatment. Self-administered Hill-bone high blood pressure compliance scale was used to assess compliance. Internal consistency of the scale was assessed using Cronbach's alpha for three domains. A total score of ≥80% was considered as compliant.[5,6] The scale contained 14 questions representing the three domains, i.e. medication taking, dietary habits and appointment keeping. Each response could range from 1 to 4 on Likert scale [1 = never; 4 = always]. The responses were summed up to get the final score [14 (minimum) to 56 (maximum)] and a lower total score was indicative of better compliance.[7] Percent compliance was calculated as described earlier.[8] Briefly, % Compliance= (total possible score (56)-patients score)/score range X100. The association was assessed between percent compliance and factors that might affect compliance such as patient awareness, life style modification, age, gender, treatment duration, total number of medicine and number of adverse effects.

2.1. Statistical analysis

The scale reliability and construct validity were assessed using Cronbach's alpha and Principal Component Analysis respectively. The data analysis was done using STATA 11.3. Pearson chi-square test, *t* test, one way ANOVA and correlation regression were used for parametric data and Ranksum test was used for comparison of treatment duration with antihypertensive medicine (non-parametric data). The results were considered significant if the *p* value was less than 0.05.

3. Results

Of the 502 patients screened, 452 met the inclusion criteria' and completed the questionnaire (100% response). The study excluded 28 patients because of concomitant diseases such as depression, anxiety and Alzheimer's etc. which could affect their performance in a self-administered questionnaire, 17 patients refused to participate and 05 patients had incomplete records. The mean age of participants was 54.6 ± 13.7 years with 67.5% males most of whom attained higher secondary education. Among female participants (32.5%), majority had secondary education. The participants represented 14 states/Union territories. According to Kuppuswami's Socio-Economic Status Scale, 2014, 9.3% participants were from upper class, 50.7% from upper middle, 29% from lower middle followed by 10.8% from upper lower and 0.2% from lower class. The median treatment duration with antihypertensive medicines was 3 years (IQR: 1–6 years). Concomitant diseases were noted in 32.5% patients of which most common were diabetes mellitus, rheumatoid arthritis and chronic obstructive pulmonary disease.

For data collected from first 20 participants, Cronbach's alpha was 0.7, 0.8 and 0.7 for salt intake, appointment keeping and medication taking domain respectively. The construct validity of the scale was assessed using Principal Component Analysis (PCA) (Table 1). Bartlett's test of sphericity showed normal distribution and appropriateness for factor analysis ($p < 0.001$).The mean inter-item correlation was 0.341 and Kaiser-Meyer-Olkin (KMO) coefficient was 0.591, suggesting correlation among coherent items. The Eigen value for individual 14 items was above 0.4 (Fig. 1).

An arbitrary cut off of ≥80% was taken as compliant and <80% as non-compliant. Majority of participants (80.8%) were compliant with the treatment. With this literature based cut off, possible predictors for compliance were further analyzed (Table 2).

Correlation analysis identified age, gender and patient awareness as likely predictors for compliance. After multivariate logistic modeling, age was noted to be the significant predictor (Table 3).

4. Discussion

The disease burden of hypertension has been increasing over the last few decades. It could previously be controlled using single antihypertensive medicine.[9,10] However, according to a survey conducted by the National Council of Patient Information and Education in 2014, most patients were taking atleast two antihypertensives.[11]

Increasing complexity of treatment regimen may influence compliance which is an important link between the prescribing and outcome. Compliance itself is also a complex issue for which more than 200 contributing factors have been identified which may vary with population, disease and time period.[12,13] Two studies from Southern India reported 24% compliance in hypertension and 76% compliance in diabetes.[14,15] For antihypertensive therapy, compliance has been shown to vary from 73% in Southern India to 23% in Northern India.[16,17] The compliance was noted to be good in most

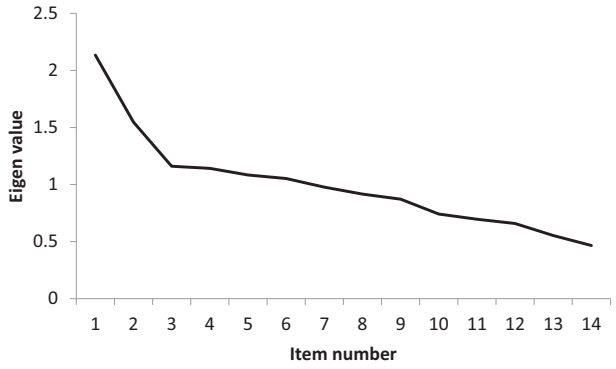

Fig. 1. Eigen value of 14 items of Hill-bone high blood pressure compliance scale among Indian patients ($n = 452$).

Table 2
Correlation analysis between compliance and predictors expressed as number (%).

Predictor	Non-compliance ($n = 87$)	Compliant ($n = 365$)	p value
Age			
• 18–60 years	63 (72.4)	171 (46.8)	**0.015**
• ≥ 60 years	24 (27.6)	194 (53.2)	
Gender			
• Male	52 (59.8)	253 (69.3)	**0.038**
• Female	35 (40.2)	112 (30.7)	
Qualification			
• No education	7 (8)	28 (7.7)	0.301
• Secondary level	37 (42.5)	153 (41.9)	
• Higher secondary level	43 (49.5)	184 (50.4)	
Awareness regarding disease			
• Yes	27 (31)	143 (39.2)	**0.048**
• No	60 (69)	222 (60.8)	
Life style modification			
• Yes	5 (5.7)	30 (8.2)	0.438
• No	82 (94.3)	335 (91.8)	
BP monitoring at home			
• Yes	9 (10.3)	47 (12.9)	0.519
• No	78 (89.7)	318 (87.1)	
Presence of adverse effects	87 (100)	365 (100)	0.628

Table 3
Multivariate logistic model for compliance.

Covariate	Odds ratio	Standard error	p value
Age	4.55	1.74	< **0.001**
Gender	0.64	0.164	0.086
Awareness regarding disease	1.43	0.37	0.172
Treatment duration	1.03	0.33	0.313

participants of our study. There could be skewing at a tertiary care centre which may not be representative of other levels of healthcare. However, a Nigerian tertiary centre study also reported 61.2% compliance among hypertensive patients.[18]

Several questionnaires are available to assess compliance, of which Hill-bone scale is specifically validated for antihypertensive therapy.[4] Hence, in the present study Hill-bone scale was assessed for suitability in Indian patients and percent compliance was correlated with the factors that might affect it. A study conducted in Namibian population showed positive internal consistency for the three domains, once they removed two out of fourteen questions.[8] However the present study found good internal consistency with all the three domains of the questionnaire, as evidenced by the Cronbach's alpha and PCA. The scale score, irrespective of the domains, was similar to previous studies from other parts of the world.

Age and gender are known factors affecting compliance.[19] Shruthi et al had reported progressively poor compliance with increasing age.[20] However more elderly patients were compliant in our study. The reasons were not explored in the study but could possibly be due to more concern for health than wealth. In addition, relatively higher education for males could be the reason of better compliance in males although compliance and education were not directly associated. The other, rather intangible factor could be more concern for the bread winner of the family in our patriarchal society. Similar gender predilection was also reported in the Namibian population.[8]

Awareness about the disease and treatment is likely to make patient more compliant and this was noted in the present study also.[21] Treatment complexity is another aspect leading to poor compliance. More the number of medicines to be taken daily and more the adverse effects less is the compliance. This was also reported by a study done in hypertensive Nigerian patients.[22] However, significant association was not found in our study between number of medicines and adverse effects with compliance. Lifestyle modification and blood pressure monitoring have also been associated with compliance.[23] However this correlation was not established in the present study.

To conclude, compliance should routinely be assessed with respect to antihypertensive treatment. The Hill Bone high blood pressure compliance scale demonstrated domain specificity and good internal consistency in Indian population. However, its use for interventional studies assessing compliance should keep potential confounders in mind.

Declaration of Competing Interest

All authors have none to declare.

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