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The Facilitators of and Barriers to Adherence to Hypertension Treatment Scale

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Background: Lack of adherence to recommended regimens is a major cause of uncontrolled blood pressure (BP) among African/Black American (AA) women. The national initiative to increase BP control among AAs by 50% makes clear the need for culturally appropriate instruments to assess facilitators of adherence to treatment of hypertension (high BP [HBP]). **Objective:** The aim of this study was to develop a culturally sensitive measure of facilitators of and barriers to adherence to hypertension treatment regimens for AA women. **Methods:** We developed the Facilitators of and Barriers to Adherence to Hypertension Treatment Scale (FATS) with input from focus groups with 20 AA women. A total of 147 AA women from a federally funded inner-city clinic in Los Angeles were enrolled in the study and 70 (48%) completed the survey. Internal consistency reliability was estimated using Cronbach's α . **Results:** Coefficient α for the 18-item FATS was .78. In a multivariate regression model, controlling for BP stage, the FATS was significantly associated with the Hill-Bone High Blood Pressure Compliance Scale (standardized $\beta = .35$; $P = .004$), the Enhancing Recovery From Coronary Heart Disease Social Support Inventory ($\beta = .42$; $P = .001$), the and CAGE (cut down on your drinking, annoyed by being criticized for your drinking, guilty about drinking, and eye-opener drink in the morning) alcohol screening instrument ($\beta = -.24$; $P = .05$). **Discussion:** The FATS is a culturally sensitive measure for assessing adherence to treatment regimens of HBP in AA women. Further study in other samples of AA women is needed to confirm that the FATS adequately assesses facilitators of adherence to regimens for HBP in AA women.

KEY WORDS: African American women, blood pressure control, Hypertension treatment adherence measure

Background

Hypertension or high blood pressure (HBP) is a major risk factor for cardiovascular disease, including heart and kidney diseases and stroke.^{1–4} Hypertension prev-

alence is higher among ethnic minorities than among whites in the United States. Data from the National Health and Nutrition Examination Survey 2007 to 2010 showed that 31% of American (1/3) adults have HBP and 43% of non-Hispanic black men and 46% of women have HBP compared with 34% of men and 31% of women in non-Hispanic whites. Although racial and gender breakdowns were not reported, 75% with HBP are under current treatment and 52% have their blood pressure (BP) under control.⁴ However, analysis of the National Health and Nutrition Examination Survey 2005 to 2008 data showed that 31 million of those with HBP (46%) had controlled BP (whites, 48%, vs blacks, 43%).⁵ On the basis of the National Center for Health Statistics,⁶ 64% of those on treatment have controlled BP that is less than 140/90 mm Hg. In a 9-year study on the incidence of HBP, Nemesure et al⁷ found that women of African origin had higher incidence of HBP than men did (37% vs 31%).

Maintaining a controlled BP reduces morbidity and mortality.⁴ However, lack of treatment and nonadherence to HBP treatment recommendations are major reasons for uncontrolled BP.^{8–10}

Several factors, such as a lack of knowledge of the disease and its management, contribute to nonadherence to treatment.⁹ However, there is a paucity of culturally sensitive measures to evaluate knowledge of, attitudes

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toward, barriers to, and facilitators of adherence, particularly in AA women.^{11,12} Spector¹³ defined culturally sensitive care as one in which the care provider possesses some basic knowledge of and constructive attitudes toward the health traditions observed among diverse cultural groups. Therefore, a culturally sensitive measure for hypertensive African American women should consider the beliefs and lifestyle of the women, such as their management of the disease and dietary pattern.¹⁴

The Hill-Levine¹⁵ framework (adapted from the PRECEDE-PROCEED model by Green and Kreuter¹⁶) that underlies this study is a combined public health and medical model that integrates health education, behavior change principles, culturally sensitive approach, social action, and social learning theory. The model includes individual factors that positively or negatively affect adherence behaviors and lead to health outcomes. Predisposing factors assess knowledge, beliefs, and attitudes about HBP. Enabling factors to adherence assess healthcare access, health behavior skills, health status, and lifestyle. Reinforcing factors to adherence assess social support and supportive services, living arrangement, and social isolation. The Hill-Levine conceptual model was previously used to guide research with hypertensive young African-American men; thus, applying it to women is a natural next step. However, applying the concepts in the model to hypertensive black women is crucial, as gender and role differences may influence women's attitudes and behaviors toward adherence to recommended treatment for HBP. The Hill-Levine model guided a qualitative study of factors associated with adherence in hypertensive AA women¹² that was the basis of the development of the culturally sensitive measure of facilitators of and barriers to adherence in AA women.

Methods

The 18-item Facilitators of and Barriers to Adherence to Hypertension Treatment Scale (FATS) was developed using descriptors of adherence to HBP treatment regimens derived from a qualitative study with AA women receiving treatment in a federally funded inner-city clinic in West Los Angeles, California. That study used focus groups with 20 hypertensive AA women to identify 3 main categories of HBP treatment adherence factors: beliefs and knowledge about HBP, facilitators and barriers to adherence.¹² The principal investigator drafted the items and then these were reviewed by 3 experts (2 adherence-to-treatment researchers and a cardiovascular healthcare researcher). Then, 5 AA women (3 visiting the clinic for healthcare, 1 clinician at the clinic, and 1 in an academic healthcare setting) reviewed the instrument draft and were each paid \$5 for their input. Feedback received was used to reword items for clarity and remove redundancy, resulting in the 18 items

shown in Table, Supplemental Digital Content 1, <http://links.lww.com/JCN/A8>.

The inner-city clinic generated a list of patients who met the inclusion criteria and expressed interest in the study. A total of 147 hypertensive AA women receiving treatment for HBP, able to read sixth grade level English, and not having a condition that prevented her from participating (such as inability to speak) were asked to complete the survey. Follow-up telephone calls were made to remind people to return the survey. Packages returned because of address change were mailed back to the persons if we could reach them by telephone for current address information. The data collection period was 1 month, and in the end, the survey participation rate was 48% (70/147). The study was approved by the University of California Los Angeles Institutional Review Board (IRB G05-06-114-04, 2005).

Measures

This study included 4 HBP treatment-related adherence screener instruments. The 14-item Hill-Bone Compliance Scale¹⁷ measures adherence to HBP treatment, but it was developed for use with young AA men. Because the perceptions of AA women may differ from those of men, we developed an HBP treatment adherence facilitators of and barriers to adherence measure for AA women. Alcohol use/abuse¹⁸⁻²⁰ and social support²¹ have been found to be important factors associated with adherence. We used the 7-item Enhancing Recovery From Coronary Heart Disease Social Support Inventory (ESSI),²¹ the 4-item CAGE Questionnaire¹⁸ (cut down on your drinking, annoyed by being criticized for your drinking, guilty about drinking, and eye-opener drink in the morning), and the 12-item Check Your High Blood Pressure IQ (CYHBPIQ) by the National Institutes of Health/National Heart Lung Blood Institute (NHLBI)²² in this study. Health knowledge is a prerequisite for adherence to a treatment regimen.²³ Items on the CYHBPIQ relate directly to HBP.

The Hill-Bone Compliance Scale uses a 4-category response scale to assess the degree of adherence to HBP medications, appointment scheduling, and reduced salt dietary recommendations. Internal consistency reliability coefficients were reported to be 0.74 and 0.84 in 2 community-based samples of hypertensive AAs that included men and women as participants.¹⁷ The ESSI was developed for the Enhancing Recovery From Coronary Heart Disease clinical trial. It measures predominantly emotional social support and uses a 5-category response scale. Internal consistency for the ESSI was estimated to be 0.86 in a sample of 186 participants from across the United States. The CAGE is an Alcohol Screening Questionnaire. Items are scored as 0 or 1; a higher score indicates an alcohol problem. A total score of 2 or more (of 4) is considered clinically significant. Cronbach's α

values ranging from .80 to .95 have been reported for the CAGE.²⁴ The National Institutes of Health/NHLBI's instrument is typically administered using a true/false response scale, but we administered the items using a polytomous response scale: 1, never; 2, once in a while; 3, half of the time; 4, most of the time.

Analysis Plan

Distributions and summary statistics (eg, mean, SD) were examined for individual items and the FATS total score. We estimated item-total correlations (Pearson r , corrected for item overlap with scale–correlations of items with sum of other items in the measure) and Cronbach's coefficient α .²⁵ Pearson product-moment correlations were computed between the 18-item FATS and the Hill-Bone High Blood Pressure Compliance Scale score, ESSI score, CAGE score, and CYHBPIQ Quiz score. In addition, 3 separate analysis of covariance models were ran to examine associations between the FATS and the Hill-Bone High Blood Pressure Compliance Scale score, ESSI, CAGE, and CYHBPIQ individually after controlling for BP stage.

As a secondary analysis, we examined the underlying dimensions of the FATS using exploratory principal factor analysis with Promax factor rotation. Promax rotation provides an opportunity to estimate the associations between factors rather than assume that they are uncorrelated. Several number of factor criteria were examined, including Guttman weakest lower bound, scree test, and parallel analysis. Analyses were conducted using SAS version 9.4.²⁶

Results

Table 1 provides information on demographic and clinical characteristics. The mean (SD) age of the 70 respondents was 54 (8) years, with a range of 37 to 75 years. The mean (SD) weight was 191 (48) lb, and mean (SD) height was 64 (3) in. Fifty-one percent were single, and over 90% had either high school or some college level education. About 42% worked part- or full-time; 66% had no or less than \$10 000 household annual income, 55% had no health insurance, and 89% were receiving treatment for HBP from the free clinic (research site). Most (53%) said that their overall health status was fair to poor. The average duration of diagnosed HBP was 115 months. Most of their clinicians (53%) had told them their cholesterol levels were high. The mean (SD) score for the sum of the 18 FATS items (possible range of 18–72) was 59 (8) ($n = 70$).

Item-scale correlations (corrected for item overlap) ranged from 0.01 to 0.66 (Table 2). The range for the interitem correlations within scales was -0.29 to 0.74 and the mean was 0.16 . The internal consistency reliability (Cronbach's α) of the 18-item FATS was $.78$. Coefficient α

TABLE 1 Demographic and Clinical Characteristics of African American Women and Descriptive Statistics on Scales Used in the Study ($n = 70$)

Characteristics	N	Percentage/Mean (SD)
Demographic		
Age	70	54 (8)
Height, in	70	63.8 (3.4)
Weight, lb	70	190.9 (47.9)
Marital status		
Single	36	51
Married	11	16
Divorced	13	19
Widowed	10	14
Education		
<High school	6	9
High school	24	34
College	40	57
Employment status		
Unemployed	18	26
Employed (part- or full-time)	40	42
Disabled	15	21
Retired	7	10
Income, \$		
No income	11	16
<10 000	35	50
10 000–19 999	15	21
≥20 000	8	11
Insurance		
Government plan	26	37
Commercial plan	5	7
No insurance	38	55
Smoking history		
Yes	37	54
No	32	46
Clinical characteristics		
Duration of diagnosed HBP, mo	67	115
Overall health		
Poor	6	9
Fair	31	44
Good	26	37
Very good	6	9
Excellent	1	1
Diabetes status		
Yes	20	29
No	50	71
High cholesterol		
Yes	37	53
No	33	46
High blood fat		
Yes	17	24
No	53	76
Hypertension care place		
Study free clinic	62	90
Other	7	10
Scales in Study	N	Mean (SD)
18-item FATS	70	58.65 (8.47)
Hill Bone Scale	70	49.44 (3.84)
ESSI Scale	70	21.37 (6.64)
CAGE Questionnaire	66	2.30 (4.49)
CYHBPIQ	68	97.06 (15.75)

The FATS scale score is the average of the answered items multiplied by 18 and includes all cases that have answered at least 1 of the FATS items.

Abbreviations: CAGE, cut down on your drinking, annoyed by being criticized for your drinking, guilty about drinking, and eye-opener drink in the morning; CYHBPIQ, Check Your High Blood Pressure IQ; ESSI, Enhancing Recovery From Coronary Heart Disease Social Support Inventory; FATS, Facilitators of and Barriers to Adherence to Hypertension Treatment Scale; HBP, high blood pressure.

TABLE 2 Item-Scale Correlations (Corrected for Overlap) and Coefficient α of Scale if Item Is Deleted

Item	Correlation With Total	α (if Item Deleted)
Item 1	0.22	0.78
Item 2	0.26	0.78
Item 3	0.30	0.78
Item 4	0.54	0.77
Item 5	0.06	0.79
Item 6	0.34	0.78
Item 7	0.38	0.77
Item 8	0.18	0.80
Item 9	0.14	0.78
Item 10	0.01	0.79
Item 11	0.48	0.76
Item 12	0.44	0.77
Item 13	0.57	0.76
Item 14	0.61	0.76
Item 15	0.48	0.76
Item 16	0.46	0.77
Item 17	0.66	0.75
Item 18	0.53	0.76

values for the other scales were .70 for the Hill-Bone, .90 for the ESSI, .83 for the CAGE, and .10 for the CYHBPIQ.

Pearson correlation coefficients between the FATS and Hill Bone, ESSI, CAGE, and CYHBPIQ scales are shown in Table 3. Also shown are standardized regression coefficients between FATS and these scales for each individual analysis of covariance model, controlling for BP stage. The Hill Bone (better adherence), ESSI (more social support), and CAGE (less alcohol abuse) were significantly associated with better FATS scores. The CYHBPIQ hypertension knowledge measure was not significantly associated with FATS.

The number of factor criteria provided support for 4 underlying factors for the 18 FATS items. The first 4 eigenvalues based on squared multiple correlations ex-

TABLE 3 Associations Between the Facilitators of and Barriers to Adherence to Hypertension Treatment Scale and the Hill Bone, Check Your High Blood Pressure IQ, CAGE, and Enhancing Recovery From Coronary Heart Disease Social Support Inventory Scales

	Product-Moment Correlation	Standardized Regression Coefficient ^a
Hill Bone	0.35 ($P = 0.003$)	0.35 ($P = .004$)
CYHBPIQ	0.08 ($P = .50$)	0.048 ($P = .52$)
9-Item CYHBPIQ	0.09 ($P = .47$)	0.09 ($P = .48$)
ESSI Scale	0.37 ($P = .002$)	0.42 ($P = .001$)
CAGE Questionnaire	-0.24 ($P = .05$)	-0.24 ($P = .05$)

Abbreviations: CAGE, cut down on your drinking, annoyed by being criticized for your drinking, guilty about drinking, and eye-opener drink in the morning; CYHBPIQ, Check Your High Blood Pressure IQ; ESSI, Enhancing Recovery From Coronary Heart Disease Social Support Inventory.

^aAdjusting for blood pressure stages: pre, pre I, pre II, and normal stages.

ceeded random data eigenvalues (3.99, 1.81, 1.41, and 0.94). The 4 factors (Table 4) represent taking charge and social support (factor 1), positive personal/individual behaviors to improve adherence to treatment recommendations (factor 2), barriers to adherence to treatment recommendations (factor 3), and knowledge about HBP (factor 4). Hence, 4 subscales appear to be represented in the FATS measure (see Table, Supplemental Digital Content 1, <http://links.lww.com/JCN/A8>), and the Cronbach's α values for the subscales were .81 for factor 1, .71 for factor 2, .64 for factor 3, and .71 for factor 4. We created summed scores from the items defining each factor and correlated them with the Hill Bone, ESSI, CAGE and CYHBPIQ scales. Scoring each item of FATS on a scale of 1 to 4 (none of the time, some of the time, most of the time, and all of the time), the ESSI measure of social support was significantly and positively related to 3 of the multi-item FATS scales (taking charge and social support; positive behaviors to improve adherence; and barriers to adherence), with the significant r values ranging from 0.285 to 0.320 (Table 5). The Hill-Bone Compliance Scale was positively correlated with the taking charge and social support and the positive behaviors to improve adherence scales (r values of 0.280 and 0.300, respectively).

TABLE 4 Rotated Factor Pattern (Standardized Regression Coefficients, $N = 61^a$)

	FATS-F1	FATS-F2	FATS-F3	FATS-F4
Item 15	0.92	-0.17	-0.02	-0.06
Item 16	0.87	0.01	-0.09	-0.20
Item 14	0.70	0.01	-0.07	0.31
Item 17	0.70	0.04	0.22	0.19
Item 11	-0.08	0.89	0.07	-0.08
Item 12	-0.11	0.65	0.21	0.17
Item 7	-0.08	0.65	-0.10	0.27
Item 8	0.13	0.59	-0.46	-0.25
Item 6	0.01	0.52	-0.08	-0.07
Item 18	0.33	0.41	-0.03	0.03
Item 2	0.11	0.03	0.76	-0.10
Item 5	-0.16	0.02	0.75	-0.24
Item 10	-0.16	-0.12	0.58	0.13
Item 13	0.30	0.26	0.50	0.10
Item 9	0.28	-0.02	0.49	-0.16
Item 3	-0.02	-0.03	-0.01	0.78
Item 1	-0.05	-0.03	-0.24	0.77
Item 4	0.26	0.16	0.07	0.56

$P < 0.05$, extraction method: maximum likelihood with Promax factor rotation. Data in bold denote items loading strongly on each factor.

FATS-F1 = taking charge and social support; FATS-F2 = positive personal/individual behaviors to increase adherence to recommended treatment for high blood pressure; FATS-F3 = barriers to adherence to recommended treatment for high blood pressure; FATS-F4 = knowledge about high blood pressure. Estimated correlations among the factors were as follows: FATS-F1 with FATS-F2 = 0.36, FATS-F1 with FATS-F3 = 0.12, FATS-F1 with FATS-F4 = 0.18, FATS-F2 with FATS-F3 = 0.10, FATS-F2 with FATS-F4 = 0.26, and FATS-F3 with FATS-F4 = 0.18.

Abbreviation: FATS, Facilitators of and Barriers to Adherence to Hypertension Treatment Scale.

^a61 participants with complete information. The sample size is 61 (listwise deletion of cases).

TABLE 5 Facilitators of and Barriers to Adherence to Hypertension Treatment Scale Subscale Item Summed Score Correlations With Hill-Bone, Check Your High Blood Pressure IQ, CAGE, and Enhancing Recovery From Coronary Heart Disease Social Support Inventory

Scales	FATS-F1	FATS-F2	FATS-F3	FATS-F4	Hill-Bone	CYHBPIQ	CAGE	ESSI
FATS-F1	1							
FATS-F2	0.330 ^a	1						
FATS-F3	0.285 ^b	0.124	1					
FATS-F4	0.302 ^b	0.349 ^a	0.190	1				
Hill-Bone	0.280 ^b	0.300 ^b	0.227	0.144	1			
CYHBPIQ	−0.194	−0.036	−0.293 ^b	0.043	−0.057	1		
CAGE	−0.223	−0.306 ^b	0.138	−0.162	−0.235	−0.097	1	
ESSI	0.285 ^b	0.312 ^a	0.320 ^a	0.067	0.155	−0.308 ^b	0.032	1

FATS-F1 = taking charge and social support; FATS-F2 = positive personal/individual behaviors to increase adherence to recommended treatment for high blood pressure; FATS-F3 = barriers to adherence to recommended treatment for high blood pressure; FATS-F4 = knowledge about high blood pressure.

Abbreviations: CAGE, cut down on your drinking, annoyed by being criticized for your drinking, guilty about drinking, and eye-opener drink in the morning; CYHBPIQ, Check Your High Blood Pressure IQ; FATS, Facilitators of and Barriers to Adherence to Hypertension Treatment Scale; ESSI, Enhancing Recovery From Coronary Heart Disease Social Support Inventory.

^a $P < .01$.

^b $P < .05$.

The CYHBPIQ measure correlated significantly and negatively with barriers to adherence ($r = -0.293$), and the CAGE, with positive behaviors to improve adherence ($r = -0.306$).

Discussion

About a third of adults in the United States have hypertension.^{4–6} Nonadherence to recommended treatment regimens results in poor BP control, especially among AA women. However, culturally sensitive measures of adherence to HBP treatment are needed. This study developed a culturally targeted measure of facilitators of adherence to hypertension treatment, barriers and beliefs about HBP, and its management in low-income AA women from a federally funded inner-city clinic in Los Angeles, California. The 18-item tool contributes to filling the gap on measures of adherence facilitators in hypertensive AA women.

Study results provide support for the internal consistency reliability of the 18-item scale. Although FATS has a mix of items that tap into beliefs and reasons for adhering or not adhering to recommended treatment, the construct validity of the measure was supported by its positive and statistically significant associations with the Hill-Bone Compliance Scale. The significant associations of the FATS with the ESSI indicate that the stronger an AA woman's social support system is, the greater her adherence level to prescribed HBP treatment regimens. The FATS was negatively associated with the CAGE, indicating that problematic alcohol use is related to potential problems with adherence to hypertension treatment.

Previous studies reported that HBP knowledge and its management are related to treatment adherence.^{27–29} In this study, the correlation between the 18-item FATS and the NHLBI IQ quiz was not statistically significant.

This study found that the CYHBPIQ was unreliable (Cronbach's $\alpha = .10$). We were unable to locate any published information about the reliability of the measure.

The study sample included a relatively high percentage of educated participants despite low levels of income. Only 11% of the participants work on a full-time basis and 66% earned less than \$10 000 annually. In addition, 55% had no form of health insurance and 53% described their health as fair to poor. Strategies that promote healthy living, such as quitting smoking, not abusing alcohol, and adhering to recommended HBP treatment, would be beneficial to both hypertensive AA women.

The predisposing, enabling, and reinforcing factors are the main concepts/constructs in the adapted Hill-Levine framework. Social support (measured with the ESSI),²¹ risk factors (measured with the CAGE),¹⁸ and knowledge (measured with the IQ quiz)²² operationalize those concepts in the framework. For instance, social support operationalizes reinforcing factor; that is, 1 measures reinforcing dimension of the framework through examining the social support system. With the use of variables in this study, a hypertensive AA woman who is trying to quit smoking and also has a significant other who smokes or continues to smoke may never succeed to quit smoking. The continuous smoking habit in the significant other is a reinforcing factor to keep smoking for the hypertensive AA woman.

Analysis of the qualitative study suggested 3 categories of factors that influence adherence, namely, beliefs about HBP, facilitators of adherence, and barriers to adherence to treatment.¹² These categories fit in the Hill-Levine framework. For instance, beliefs about HBP fit in the predisposing factors dimension of the framework. On the whole, the qualitative and quantitative results reflect the Hill-Levine conceptual model. Empirical

What's New and Important

- Social support has a positive effect on adherence to treatment for hypertension.
- There is a need to explore the concept of social support system that this study indicates influences adherence to treatment positively in hypertensive AA women.
- There is also a need to further validate the newly developed FATS in a larger sample of hypertensive AA women.

results suggest 4 subscales underlying the FATS. The 4 factors are captured by the Hill-Levine framework as well. Factor 1, taking charge and social support, and factor 4, knowledge about HBP provides grounding for managing HBP and getting treatment for it is critical, fall within the predisposing factor and the social support domain of the Hill-Levine framework. The self-help items describing factor 2, positive personal/individual behaviors for increased adherence to recommended treatment for HBP, fit in the predisposing factors domain of the framework. Items in factor 3, barriers to adherence to recommended treatment for high blood pressure, are captured by the enabling factors domain of the framework.

Strengths and Limitations

The findings of this study contribute to closing a gap in the paucity of culturally sensitive measures on factors that influence adherence to HBP treatment in AA women. Because of the small sample size, replication is needed in other larger samples of hypertensive AA women. The study was in AA women, and findings may not be generalized to the men, but the same type of study can be conducted with AA men or the instrument pilot tested in that population. The measure may not directly apply for upper level income AA women. Some of the item-total correlations for the 18-item FATS were lower than 0.3 (items 1, 2, 5, 8, 9, and 10), so we identified FATS subscales. We recommend that future researchers focus on the FATS subscales. Finally, we only have demographic information from those who completed the survey and are unable to compare nonrespondents with study participants.

Conclusions

Social support has a positive association to adherence to treatment for HBP, in contrast to alcohol abuse, which has a negative association even after controlling for HBP diagnostic stage. It behooves healthcare researchers to explore and describe the concept of the support system that this study indicates influences adherence to treatment positively in hypertensive AA women. Future studies with larger samples of AA women

with more diversity (such as higher-income group) are needed to further validate this newly developed scale as a culturally sensitive tool for measuring adherence to hypertension treatments among AA women.

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