Determinants of Hypertension Care and Control among Peri-Urban Black South Africans: The HiHi Study

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Objective: To examine determinants of hypertension (HTN) care and control among peri-urban hypertensive Black South Africans.

Design: Cross-sectional, descriptive.

Setting: Public and private primary care sites in three townships near Cape Town, South Africa.

Participants: 403 hypertensive Black patients (183 men, 220 women), ages 35–65 years.

Methods: The Precede-Proceed Model guided the study. Self-report sociodemographics, medical history, health behaviors, health service utilization, quality of life, social support, and exposure to life threats and illness were assessed. Blood pressure (BP) was measured and height and weight recorded.

Results: Mean BP (mm Hg) was 151/99 for men, 142/88 for women with BP controlled (<140/90 mm Hg) among 33% of men, 44% of women. Patient-related barriers to HTN care included limited HTN-related knowledge, poor quality of life and stressors such as family death. An unhealthy lifestyle involving smoking cigarettes, physical inactivity and using alcohol excessively was common. In regression models of select socioeconomic, lifestyle risk and HTN care variables, significant predictors of lower SBP and DBP or BP control included: fewer antihypertensive medications, better compliance to HTN recommendations, younger age, female, higher education level, not using alcohol excessively, and private sector healthcare.

Conclusion: This study identified a high level of barriers to HTN control and the need for comprehensive multilevel interventions to improve HTN care and control in this high-risk population. Furthermore, the data illustrate that the Hill-Bone compliance scale can be a practical tool in primary healthcare settings to identify patient-related factors and guide counseling to improve adherence in HTN care. (*Ethn Dis.* 2007;17:484–491)

Key Words: Hypertension, Compliance, South Africa, Blacks, Health Disparities, Ethnicity, Urbanization, Precede-Proceed Model

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INTRODUCTION

Hypertension (HTN), at 59% prevalence, is the most common cardiovascular disease (CVD) risk factor among Black South Africans. Estimates of HTN control in this population range from 20% among Black South African men in a population-based study to 47% among those attending general practices.[1,2] Barriers to HTN care and control are well-recognized[3] and exist at the patient, provider and organizational levels.[4] These barriers include lack of knowledge about the seriousness of untreated HTN and the benefits of controlling HTN, lack of health insurance or a healthcare provider for HTN care, a non-therapeutic patient-provider relationship, unemployment, alcohol and illicit drug use, social isolation, cost of care and medications, drug side effects and complexity of the regimen.[3–5] In addition, duration of urbanization is an independent predictor of HTN among Blacks in Cape Town.[6] In 2005, Opie and Seedat suggested that, in sub-Saharan Africa, the overall management of HTN was as much a socioeconomic problem as a therapeutic problem.[5] It is necessary to identify and address these barriers in order to develop culturally salient interventions to reduce racial disparities in HTN care and control.

The HiHi Study of HTN care in South Africa provides the first opportunity to examine barriers to continuous HTN care and control among Black South Africans. The purpose of this paper is to examine determinants of HTN control among hypertensive Black South Africans attending public and private primary healthcare services.

METHODS

Conceptual Framework.

The Precede-Proceed Model[3,8] of health promotion program planning integrates health education, behavioral change and maintenance principles, culturally sensitive strategies, social action, and social learning theory; this model was the guiding force for this research. The model emphasizes the relationship between health and social problems, early planning, a comprehensive approach including sensitivity to psychosocial barriers, saliency for participants, and evaluation. Figure 1 illustrates the conceptual framework and main study variables. Pertinent factors and potential barriers to continuous care and blood pressure (BP) control are conceptualized as independent variables and organized as predisposing, enabling, and reinforcing factors. Predisposing factors are those antecedents to behavior that provide or influence the rationale or motivation for the behavior, such as knowledge, attitudes, beliefs, quality of life, perceived health, and life threats and priorities. Enabling factors allow a predisposition to be translated into a behavior such as utilizing available health care resources and acquiring appropriate BP self-care skills. Reinforcing factors, such as social support and satisfaction with care, are subsequent to a behavior and provide the continuing reward or incentive for the behavior and

INDEPENDENT VARIABLES

Predisposing Factors
Knowledge, Attitudes and
 Beliefs
Quality of Life
Perceived Health
Life Threat & Priorities

Enabling Factors
Healthcare Resources
Health Behavior Skills

Reinforcing Factors
Satisfaction with Care
Social Support

INTERVENING VARIABLES

**Compliance to Treatment
Recommendations**
Remain in HTN Care
Modify Lifestyle Behaviors
Take HTN Medication

OUTCOME VARIABLES

Primary Outcome
Blood Pressure

Secondary Outcomes
Target Organ Damage
 Left Ventricular Hypertrophy
 Renal Impairment
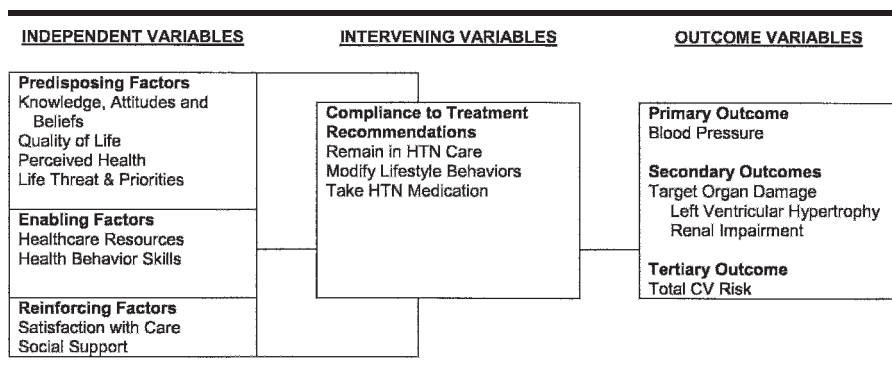
Tertiary Outcome
Total CV Risk

Fig 1. The HiHi Study conceptual framework with main study variables. Adapted from Green & Kreuter[4] and Hill[3]

contribute to its persistence or repetition. The categories of independent variables, which are not mutually exclusive, address the complexity of the health behavior change process. Intervening variables include remaining in HTN care and complying with HTN treatment recommendations. The primary outcome was blood pressure and target organ damage and total cardiovascular risk were secondary and tertiary outcomes, respectively.

The HiHi Study has been described along with CVD risk profile and comorbid conditions in this sample in the companion paper.[7]

Study Population

The study population was Black South Africans, aged 35–65 years with diagnosed HTN, who attended primary care sites within the previous 12 months. The study was conducted in three townships in peri-urban Cape Town: Langa, Guguletu, and Cross Roads. Participants were recruited from three public sector community health centers (CHC) and 11 private sector general practitioner (GP) offices. The recruitment sites and methods and study sample were described in the companion paper.[7]

Instruments and Data Collection

Validation of instruments and data collection and management methods were described.[7,9] Trained research nurses collected data on standardized pre-coded forms. The self-report questionnaire, administered by the research nurse, assessed sociodemographic characteristics, medical history, lifestyle behaviors, health behavior skills, health service utilization, quality of life, perceived health status, social support, exposure to life threats and illness, and death in the family. Methods for measurement and coding of BP and anthropometrics have been described.[7]

Hypertension knowledge, attitudes and beliefs were measured using items derived from the National Heart, Lung, and Blood Institute High Blood Pressure (NHLBI HBP) IQ quiz,[10] which assessed: knowledge of causes, symptoms and dangers of HTN and ways to prevent or control it; items previously used in South African surveys of the Black population; and knowledge of last BP reading. Responses to the 10-item NHLBI HBP IQ quiz were coded as correct or incorrect and a knowledge sum score was created. Quality of Life was measured by the EuroQol (EQ-5D), scoring methods have been reported.[11] Life threats and priorities were measured by asking the open-ended question, "What are the five things you are most concerned about, the things you worry about?" Perceived health was assessed by two separate methods: a 5-point Likert scale item, "Compared to other people, how would you rate your health?" and a visual analog scale (0–100) indicating how good or bad one's health was viewed to be.

Healthcare services use for HTN care, payment for HTN medications, and health insurance was measured via chart audit. Health behavior skills were defined as HTN self-care behaviors including medication-taking, reasons for missing appointments, and use of alternative or folk therapies.

Social support from family, friends, community members, and clinic staff was measured by six items assessing social activity, isolation and networks previously used in South Africa with a similar population. A social support index of the six items was created for inclusion in multivariate models. Satisfaction with doctor, nurse, and site care was measured by a 7-item, 5-point Likert scale.[12]

Lifestyle behaviors (ie, tobacco use, diet, and alcohol and illicit drug use) were assessed using items previously tested in Black South African populations. HTN medication taking and use of salt was assessed by the 10-item, 3-point Likert-type Hill-Bone Compliance Scale, which has a .80 alpha coefficient and demonstrated predictive validity in Americans[13] as well as South Africans with HTN.[9] Scoring methods for the Hill-Bone Compliance Scale have been reported.[9] Methods to assess excess alcohol use, physical activity patterns, blood pressure, weight, height, and the calculation of body mass index (BMI) have been described in the companion paper.[7]

Statistical Analyses

Statistical analyses were performed using SPSS software (Chicago, Ill). Univariate analyses were conducted to describe sociodemographic and HTN care variables presented as means and standard deviation for continuous data and percentages for categorical data. Between-group differences were assessed using chi-square tests for categorical variables and unpaired *t* tests for continuous variables. Comparisons were conducted to assess sex differences within the total sample, as well as

within the public and private sector samples.

Exploratory multiple regression models of continuous dependent variables, mean systolic and diastolic BP, and multivariate logistic model of the categorical variable HTN control (<140/90 mm Hg), included the following independent variables: sex; age in years; education level (lower than secondary / any secondary education); employment status (employed /unemployed); percent of lifetime in urban area; home occupancy rate; BP medications taken on the morning of study visit (yes/no); hypertension knowledge score (0–10); perceived health status (not good or fair / good very good); quality of life (EQ-5D score); physician told patient BP reading at last visit (yes / no); number of HTN care visits in the past 12 months; number of times physician changed antihypertensive medications in last 12 months; number of antihypertensive medications; care source (public / private); any health-related social support (yes / no); satisfaction with clinic care (satisfied / unsatisfied); daily tobacco smoking (yes/no); adjusted METS (metabolic equivalents) / week (METS/week higher or lower than 600) high risk for alcoholism (yes / no); body mass index in kg/m^2; and Compliance Scale sum score. The data management and statistical analyses procedures were previously described.[7]

The Johns Hopkins Medicine institutional review board and South Africa medical research council ethics committee approved the study. All participants provided written informed consent after a research nurse explained the purpose and procedures of the study in Xhosa, the primary language of the study participants.

RESULTS

There were 403 participants (183 men, 220 women) recruited from public (*n*=323) and private (*n*=80) primary healthcare sectors in three Cape Town townships. The sociodemographic characteristics have been published.[7] Participants' mean age was 52 years. Public, in comparison to private, sector participants reported greater rates of unemployment, lower social class indicators (ie, lower education level, subeconomic and informal housing, higher home occupancy rate), and lower degree of urbanization (ie, spent less of their lives in an urban setting).

The predisposing, enabling, and reinforcing factors for HTN care and control as conceptualized within the Precede-Proceed Model are reported in Table 1. Knowledge of HTN causes and treatment was low, with knowledge lower among public compared to private sector patients and equivalent for men and women. Quality of life and perceived health status were lower among women compared to men within the public sector and total sample. Public sector patients reported current and previous poor health more frequently than private sector patients. Patients were seldomly informed of results of their previous BP reading and this occurred more in the public than private sector. Eighty-five percent of patients reported receiving a sufficient supply of antihypertensive medication at their last visit.

Social support was more common for private sector patients and particularly for women, compared to men, in the public sector. More than half of the sample, and significantly more public sector patients and women, reported that they wanted to talk to someone else about health-related problems. About half the patients indicated that caring for their own health was limited by family illness or death. More than 20% of the sample reported young people in the family who had died or were very ill and 13% were caring for grandchildren whose parents had died.

Public sector patients were less likely to report being satisfied with their HTN care than were private sector patients.

Sources of healthcare information for the public and private sector patients, respectively, included doctors (37% vs 82%), nurses (51% vs 21%), posters / leaflets in clinic (47% vs 17%), family, friends, and neighbors (9% vs 15%), and media, including radio, TV, magazines, pamphlets, newspapers (13% vs 51%) (data not shown).

Intervening and outcome variables are provided in Table 2. Men in the public sector had better compliance according to the Hill-Bone Compliance scale compared to women. More than half (53%) of the sample reported not taking their antihypertensive medications the morning of their health provider visit, more so in the public (66%) than private (44%) sector. However, SBP, DBP, and BP control did not differ when those who took meds the morning of study visit were compared to those who did not. Private sector patients reported higher rates of lifestyle modification efforts to control weight, reduce salt, and exercise than public sector patients. Almost 20% of the sample reported using home or folk therapies to reduce BP.

Overweight and obesity were exceedingly common, with 85% of the sample being overweight or obese and sample mean BMI in the obese range. BMI was significantly higher in the private, compared to public sector, and in women compared to men. The majority of overweight (94%) and obese (61%) participants perceived themselves as normal- or under-weight and half of those with normal weight (55%), perceived themselves as under-weight (data not shown).

Mean BP was higher in the public sector (148±28/90±13 mm Hg) compared to the private sector (138±21/86±13 mm Hg) and in men (151±29/91±14 mm Hg) compared to women (142±24/88±12 mm Hg). BP control was greater in the private compared to public sector (51% vs 36%) and among women compared to men (44% vs 33%).

Table 1. Predisposing, enabling, and reinforcing factors in hypertension care and control by sex and site of health care

	CHCs (Public Sector)			GPs (Private Sector)			Total Sample			
	F *n*=171	M *n*=151	All *n*=322	F *n*=49	M *n*=32	All *n*=81	F *n*=220	M *n*=183	All *n*=403	*P*‡
PREDISPOSING FACTORS										
Knowledge										
HTN knowledge index (11 items), % correct	33(14)	33(14)	33(14)	40(14)	37(18)	39(15)	35(14)	34(15)	34(15)	.001
Salt knowledge subscale (5 items), % correct	37(23)	34(24)	40(23)	42(21)	38(27)	36(24)	38(23)	35(25)	37(24)	.065
Quality of life										
Quality of life (EQ-5D),† mean (SD)	.6(.3)	.7(.3)	.6(.3)*	.6(.3)	.7(.3)	.6(.3)	.6(.3)	.7(.3)	.6(.3)*	.686
Health state,§ mean (SD)	53(23)	60(22)	56(24)*	62(20)	64(14)	62(18)	54(24)	61(21)	57(23)*	.014
Perceived health status										
General health rating poor, %	68	58	64	49	38	44	64	55	60	.002
Health state deteriorated over past year, %	29	21	25	16	13	15	26	20	23	.046
ENABLING FACTORS										
Health care resources										
Doctor told patient BP reading at last visit, %	29	22	26	56	84	68*	35	33	34	.000
# of clinic visits in past 12 m, mean (SD)	5(3)	4(2)	4(3)*	5(3)	4(2)	4(3)	5(3)	4(2)	4(3)*	.994
Antihypertensive medications										
Number of HTN medication changes in last 12 months, mean (SD)	.6(.8)	.8(1)	.7(1)	.6(1)	.6(.8)	.6(1)	.6(.8)	.7(1)	.6(1.1)	.721
Received insufficient antihypertensive medication supply at last visit, %	17	16	16	10	9	10	15	15	15	.053
REINFORCING FACTORS										
Social support										
Talked to relative, friend, neighbor about health problems, %	78	60	69*	90	87	89	80	64	73	.000
Ways neighbor(s) provided supported, %										
Remind about appointments and meds	76	65	72	76	79	77	76	68	73	.380
Gave quiet time to rest	82	78	80	91	89	90	84	81	83	.043
Ask about MD's findings/gave advice	80	68	75*	84	93	88	81	74	78	.024
Prepared special diets	57	66	61	60	61	60	58	65	61	.892
Other support	36	48	41	64	61	63	43	50	46	.001
Wanted someone else to talk to, %	73	54	64*	63	67	65	71	56	64*	.931
Any social activities in past 12 m (yes), %	94	89	92	100	100	100	95	91	93	.007
Cares for grandchildren whose parents have died, %	18	12	15	4	9	6	15	12	13	.036
Young family members have died or are very ill, %	22	17	20	37	22	31	25	18	22	.029
Caring for own health limited by family illness and death, %	64	41	55	53	43	50	61	41	54	.668
Satisfaction with HTN care										
Satisfied with clinic site care, %	64	62	63	83	72	79	68	63	66	.007

* Significant within group (ie, CHC group, GPO group, total sample) difference between females and males (*P*<.05).

† EQ-5D scale 0–1.0.

‡ Significant difference between CHC total sample to GPO total sample (*P*<.05).

§ Current health status on 0–100 visual analogue scale.

Multivariate regression analyses identified several sociodemographic and intervening variables shown in Table 3 to be associated with SBP and DBP levels and BP control. Significant predictors of lower SBP included taking lower number of antihypertensive medications, better compliance via the Hill-Bone Compliance Scale, younger age, female, and higher level of education. Significant predictors of lower DBP included taking lower number of antihypertensive medications, better compliance via the Hill-Bone Compliance Scale, not using

alcohol excessively, and receiving private sector health care. Having controlled BP (BP <140/90 mm Hg) was associated with taking lower number of antihypertensive medications, better compliance via the Hill-Bone Compliance Scale, and being female.

DISCUSSION

These data provide, for the first time, a comprehensive description of the multifaceted barriers to continuous

HTN care and control for Black South Africans who live in three peri-urban townships in Cape Town. Differences between the public sector patients, who had significantly higher SBP and DBP and lower levels of BP control, and private sector patients in the same townships are also reported for the first time. Guided by the Precede-Proceed Model,[4] a number of predisposing, enabling and reinforcing factors have been identified that contribute to poor HTN control. These barriers to care relate to the patient, the health care

Table 2. Intervening and outcome variables in hypertension care and control by sex and site of health care

	CHCs (Public Sector)			GPs (Private Sector)			Total Sample			
	F $n=171$	M $n=151$	All $n=322$	F $n=49$	M $n=32$	All $n=81$	F $n=220$	M $n=183$	All $n=403$	P‡
INTERVENING VARIABLES										
Compliance										
Hill-Bone Compliance Sum Scale†, mean (SD)	14.7(5)	13.9(3)	14.4(4)*	14.3(4)	15.8(7)	14.9(5)	14.7(5)	14.2(4)	14.5(4)	.297
HTN medications taken morning of appointment, %	47	43	44	60	53	56	50	45	47	.094
Lifestyle Behaviors										
Salt intake index (0–5 scale), mean (SD)	2.5(1)	2.8(1)	2.6(1)*	2.1(1)	2.7(1)	2.3(1)*	2.4(1)	2.8(1)	2.6(1)*	.065
Daily smoker, %	8	29	18*	–	31	12*	6	30	17	.652
Daily smokeless tobacco user, %	9	1	5*	8	3	6	9	2	6	.157
Physical activity, adjusted METS / wk <100 (sedentary), %	71	64	67	53	56	54	67	62	65	.016
High risk for alcoholism (CAGE ≥ 2), %	19	52	35*	–	53	21*	15	53	32*	.020
Unprompted Lifestyle Actions Reported, %										
Control weight	0	3	1*	16	22	19	4	6	5	.000
Reduce salt intake	11	7	9	14	13	14	12	8	10	.000
Exercise	10	11	10	16	34	24	11	15	13	.000
Reduce alcohol intake	1	1	1	0	9	4*	1	3	2	.132
Use of home/folk therapies	20	17	18	22	13	19	20	16	18	.935
Body mass index										
Body mass index (BMI) kg/m², mean (SD)	35(7)	28(5)	32(7)*	38(8)	32(8)	36(8)*	36(7)	29(6)	33(8)*	.000
Overweight (BMI ≥25 and <30), %	17	40	28*	8	31	17*	15	38	26*	.007
Obese (BMI ≥ 30), %	75	31	55*	88	56	75*	78	36	59*	
Number of antihypertensive medications, %										.071
1 antihypertensive meds	28	26	27	39	41	40	31	28	30	
2 antihypertensive meds	42	38	40	43	38	41	41	38	40	
≥3 antihypertensive meds	30	36	33	18	22	20	28	33	31	
OUTCOME VARIABLES										
Blood pressure										
Systolic BP mm Hg, mean (SD)	144 (25)	153 (30)	148 (28)*	137 (21)	140 (22)	138 (21)	142 (24)	151 (29)	146 (27)*	.003
Diastolic BP mm Hg, mean (SD)	89 (12)	92 (14)	90 (13)	84 (12)	89 (15)	86 (13)	88 (12)	91 (14)	89 (13)*	.005
BP control (BP<140/90), %	41	30	36	53	47	51	44	33	39*	.016

* Significant within group (i.e., CHC group, GPO group, total sample) difference between females and males (p<0.05).
† Hill-Bone Compliance Sum Scale (10 items) score ranges from 10–30 with a higher score reflecting lower level of compliance.
‡ Significant difference between CHC total sample to GPO total sample (p<0.05).

provider, and to health system inadequacies.

Predisposing, Enabling, and Reinforcing Factors

The patient-related factors predisposing to poor HTN control (ie, lack of HTN-related knowledge, poor quality of life and level of current health, and declining health during the preceding year) were common. Importantly, they are modifiable through culturally appropriate, tailored patient education and treatment strategies to increase patient understanding and HTN control. The limited presence of enabling factors was related to a series of healthcare provider and health system inadequacies. Only 26% of public sector patients reported that they were told what their BP reading was at the previous visit and, on average, less than one change in medication prescriptions in the past year was found in the patient records despite low BP control rates for both sectors. Failing to inform patients of their HTN status likely has a negative influence on patient empowerment and treatment compliance. Improved HTN control can only be achieved with active patient participation, which requires increased patient awareness and understanding of progress toward BP goals. In addition, the apparent health-care provider inertia related to uncontrolled HTN was compounded for the 16% of patients who received an inadequate supply of medication at their previous visit. These deficiencies in care delivery occurred less frequently in the private sector. Such healthcare provider inertia sends a powerful message to patients, families, and other health care providers suggesting that HTN control is not important.[14]

Despite the above-mentioned problems at the provider and health system levels, the reinforcing factor of patient satisfaction with care was surprisingly high in public and private sectors. This finding is consistent with previous

Table 3. Multivariate regression models for determinants of systolic and diastolic blood pressure and blood pressure control*

Variable	Systolic blood pressure, mean R^2=.166			Diastolic blood pressure, mean R^2=.078			Blood pressure control (<140/90 mm Hg) R^2=.069		
	β	Standard error	P value	β	Standard error	P value	Odds Ratio	95% Confidence Interval	P value
Number of antihypertensive meds	8.11	1.27	.000	2.45	.67	.000	.61	.48–.77	.000
Hill-Bone Compliance Scale†	.77	.29	.008	.37	.15	.14	.94	.89–.99	.046
Age, in years	.41	.18	.022						
Sex (Male=1, Female=2)	−7.87	2.54	.002				1.66	1.08–2.56	.021
Education level (< secondary=0, ≥ secondary=1)	−6.35	2.50	.011						
Excessive alcohol use (Negative=0, Positive=1)				3.43	1.40	.015			
Healthcare sector (Private=0, Public=1)				3.29	1.61	.042			

* Exploratory multiple regression models of continuous dependent variables, mean systolic blood pressure and mean diastolic blood pressure, and multivariate logistic model of categorical variable, blood pressure control (BP<140/90 mm Hg), included the following independent variables: sex, age in years, education level (lower than secondary / at least secondary education), employment status (employed / unemployed), percent of time in urban area, home occupancy rate, taken BP medications on the morning of study visit (yes/no), Hypertension Knowledge Index score, perceived health status (not good or fair / good or very good), quality of life (EQ-5D score), physician told patient BP reading at last visit (yes / no), number of HTN care visits in the past 12 months, number of times physician changed antihypertensive medications in last 12 months, number of antihypertensive medications, care source (public / private), has any health-related social support (yes / no), satisfaction with clinic care (satisfied / unsatisfied), daily tobacco smoking (yes / no), adjusted METS / week (METS/week higher or lower than 600), high risk for alcoholism (yes / no), body mass index in kg/m², Compliance Scale sum score, Compliance Scale medication-taking subscale score, Compliance Scale appointment-keeping subscale score, Compliance Scale sodium subscale score. (Data is shown above only for those variables with p values < 0.05).

† Hill-Bone Compliance Sum Scale (10 items) score ranges from 10–30 with a higher score reflecting lower level of compliance.

reports in CHCs in Cape Town.[15] Moreover, greater satisfaction with providers was reported by patients with controlled HTN. The level of social support reported in the sample also was high.

The impact of dramatic escalation of the HIV/AIDS epidemic in the study communities was apparent. More than half of these middle-aged patients with HTN reported that caring for their own health was limited by illness and death in their family. Many reported death of young family members and more than 10% were caring for grandchildren whose parents had died. In a study including Black men with HTN living in inner-city Baltimore, the cumulative effect of multiple stressful life events significantly predicted increased depression and poor QOL.[16] These findings suggest a need for further research to determine if psychological interventions (eg, cognitive behavioral stress management) can modify the effects of stressful events, thereby altering the outcomes of HTN care and control.

Intervening and Outcome Variables

The validated Hill-Bone compliance scale suggested relatively high levels of overall adherence to HTN treatment recommendations, although approximately half of patients reported not taking their medication on the morning of their HTN care visit. In the public sector, very long waiting times at CHCs may partially explain this. Patients on diuretics arrive early in the mornings to join long waiting queues and are reluctant to leave the queues to go to toilets, lose their place in the queue and thereby extend their wait time.

An unhealthy lifestyle involving smoking cigarettes, physical inactivity, and using alcohol excessively was common in the study population, more so in public than private sector patients. Very few participants provided unprompted responses to questions about appropriate lifestyle actions to improve HTN control. An astounding 85% of patients were overweight or obese and most of these overweight / obese patients perceived

that they were normal- or under-weight, which creates a significant public health challenge. These inaccurate perceptions of body weight were consistent with recent findings among Black South Africans where this incorrect perception of body weight was related to level of education, with the least-educated groups of men and women showing the greatest discrepancies between perceived and actual categories of BMI.[17] Clearly, there is a need for programs that provide education and self-care skills to promote the necessary lifestyle adjustments to decrease weight and improve HTN control.

It is not surprising that HTN control levels remained suboptimal given the high prevalence of unhealthy lifestyle behaviors, social and economic challenges, and healthcare system inadequacies. Of interest is the finding that private sector patients had better BP control than public sector patients despite the former group being more obese and having more diabetes than the latter.[7]

All three multivariate regression models included lower number of antihypertensive medications and better compliance via the Hill-Bone Compliance as significant predictors of lower SBP and DBP and HTN control. This may emphasize the importance of a simple medication regimen (ie, fewer medications in combined formulations if required) to enhance compliance. As reported in the companion paper, two or more antihypertensive medications were prescribed for over 70% of participants and nearly all were prescribed diuretics alone or in combination with other HTN agents.[7]

While it may seem counterintuitive that patients on a greater number of meds would have higher SBP and DBP and lower BP control, there may be several reasons for this finding. Those patients on one drug may have had moderate levels of BP increases and consequently could be controlled more easily with only one drug. A more complex regimen including multiple drugs may have resulted in decreased compliance and lower HTN control rates. In addition, patients achieving control on one drug may have been on a maximum dose which may be more effective in achieving HTN control than taking more drugs at lower doses.

This study illustrates the cross-cultural usefulness of the Hill-Bone Compliance Scale to identify patients who would benefit from measures to enhance compliance.[9,13] This 10-item questionnaire can readily be completed by patients or staff while waiting to the see the healthcare provider. This tool provides the necessary information for the healthcare provider and patient to address compliance issues and thereby may lead to improved HTN care. Nonetheless, the measurement of compliance to HTN treatment recommendations by means other than self-report is challenging in a low resource environment.

Our data have identified important areas for intervention, particularly in the public sector. These include lack of knowledge and inappropriate attitudes regarding comprehensive HTN care, inadequate skills among patients to make the necessary lifestyle changes, and many other competing life threats for which patients need support to enable them to also focus on complying with HTN recommendations. The high levels of social support experienced by the patients could be harnessed to help support patients improve HTN care behaviors. Improving healthcare provider inertia related to effective communication with patients and changing medications in response to uncontrolled BP as well as organizational arrangements in the clinics present additional opportunities for intervention.

CONCLUSIONS

These findings suggest that interventions at the patient, provider, and system level are needed to improve HTN care and control in primary health care settings in South Africa peri-urban townships. The Precede-Proceed Model was a useful theoretical guide to examine and identify multiple interrelated factors influencing HTN control in primary care settings in peri-urban Black townships near Cape Town. Furthermore, our data illustrate that the Hill-Bone compliance scale can be a practical tool in primary health care settings to identify patient-related factors and guide counseling to improve HTN care among Blacks.

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