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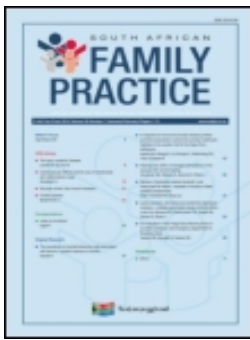
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Determinants of blood pressure control in rural KwaZulu-Natal, South Africa

Polly Duncan,^{a*} Laura Howe,^{ab} Zibonele Manakusa^c and Sarah Purdy

^aSchool of Social and Community Medicine, University of Bristol, Bristol, United Kingdom

^bMRC Integrative Epidemiology Unit, University of Bristol, Bristol, United Kingdom

^cManguzi Hospital, Kosi Bay, South Africa

*Corresponding author, email: pollyduncan@doctors.org.uk

Background: Hypertension is a common problem in South Africa and is known to be inadequately treated and poorly controlled.

Objectives: The objective of the study was to investigate what proportion of patients prescribed antihypertensive medication had controlled blood pressure (BP) and to identify factors associated with poor control.

Method: In May and June 2012, clinic-attending adults who had been prescribed antihypertensive medication were recruited into this cross-sectional study. A questionnaire administered by field assistants investigated participants' socio-demographic characteristics, medical history, perception of health, use of traditional healers, illness perceptions, beliefs about medication, compliance with the medication and suggestions as to how to improve hypertensive treatment. BP measurements were taken. Logistic regression analysis identified the determinants of poor BP control.

Results: Of the 500 participants, the mean age was 58 years, 78% were female and the majority had never been to school, or had only attended primary school. One third had adequately controlled BP (< 140/90 mmHg). Factors associated with poor BP control included being prescribed more than one antihypertensive medication, self-reported asthma and poor compliance with the medication, although the latter was not significant after adjusting for other variables. Participants with diabetes and those with a family history of a stroke were more likely to have good BP control.

Conclusion: Only one third of participants had adequately controlled BP, and almost half did not understand their high BP at all. Many had concerns about taking medication, but most felt that it was necessary. Participants suggested that better health education and ensuring that medication was available in the clinics could improve BP control.

Keywords: blood pressure control, compliance, health beliefs, hypertension, medication

Introduction

Hypertension is common in South Africa, with a population prevalence of 21% in those aged 15 years and older.¹ In 2000, it was estimated that 9% of deaths, 50% of strokes and 42% of ischaemic heart disease cases in South Africa were attributable to hypertension.² It is estimated that 35% of end-stage renal failure is attributable to hypertension in black South Africans.³

Several studies in South Africa report that only a third of patients who have been prescribed treatment for hypertension have adequately controlled blood pressure (BP < 140/90 mmHg).⁴⁻⁶ Barriers to BP control, as suggested by nurses, include patients not being able to afford transport to the clinics, shortages of medication, inaccurate BP-measuring devices⁴ and staff shortages.⁶ Poor understanding of hypertension by patients is also likely to contribute.⁷

The majority of patients with diagnosed hypertension in rural KwaZulu-Natal are managed by nurse-led primary healthcare (PHC) clinics. The purpose of this study was to investigate what proportion of patients who had been prescribed anti hypertensive medication had adequately controlled BP, and what factors were associated with poor control. This is the first study in South Africa to seek ideas from patients as to how clinics could improve hypertension treatment.

Method

Patients attending five of the eleven PHC clinics - Maputa, Mahlangu, Thengane, Mshudu and Zama Zama - near Manguzi Hospital, KwaZulu-Natal, South Africa, were recruited. The clinics were purposively selected to include clinics close to and those

furthest away from the hospital. Zulu is the most commonly spoken local language in the Manguzi District.

The sample size calculation was based on an estimate that 50% of patients would comply with their hypertension treatment. This is consistent with the literature, which suggests that between 44% and 66% of patients comply with treatment.^{1,7} A sample size of 366 patients would allow the detection of a difference of 15% in the proportion of patients with BP control (BP < 140/90 mmHg) between the compliant group⁴ and the noncompliant group, with 80% power at the 5% significance level.

A questionnaire was developed in English to include socio-demographic information; self-reported perceptions of health, medical history and use of traditional healers and remedies; the Brief Illness Perception Questionnaire (BIPQ),⁸ the Beliefs About Medicines Questionnaire (BMQ),⁸ the Hill-Bone Compliance to High Blood Pressure Therapy Scale;⁹ and an open-ended question on how the clinics could improve hypertension management. The questionnaire was translated into Zulu and independently translated back into English in order for the translation to be checked. Three BP measurements were taken using an automated machine in the sitting position.

The BIPQ was developed from the Illness Perception Questionnaire Revised to assess patients' cognitive and emotional perceptions of their illness. Validation showed good test-retest reliability.¹⁰ The 10-item Hill-Bone Compliance to High Blood Pressure Therapy Scale has been validated in a South African primary healthcare setting.⁹ The BMQ assesses patients' perceived necessity against their perceived risk of taking

medication. It has been used in South Africa and demonstrated good consistency and reliability.⁸

Recruitment, consent and questionnaire administration

Data collection took place for three weeks in May and June 2012. Participants were eligible to take part if they were aged 18 years or older and had been prescribed at least one antihypertensive medication.

A trained fieldworker was placed in each of the five clinics for a period of three weeks. With assistance from the clinic nurses, they identified and recruited participants into the study opportunistically. Individual written consent was obtained, using a thumb print if the participant was unable to write. The principal investigator obtained verbal and written community consent from members of the tribal council for the Manguzi District, including representatives from each of the clinic areas.

The fieldworkers were trained face to face by the principal investigator. Questions and possible responses were read aloud to participants in Zulu and answers were written down. A series of statements were read to the participants from the BIPQ, BMQ and Hill-Bone Compliance to High Blood Pressure Therapy Scale, followed by answers which were graded using a Likert scale. For example, if the question was: "How much does high BP affect your life?" Possible answers were: "(It has) no affect at all", "A small amount", "(I'm) uncertain", "A large amount" or "It severely affects my life". Fieldworkers were supervised on a one-to-one basis by the principal investigator during the pilot phase of the study to ensure that they read out every question, and where applicable, all possible answers to the participants.

After the questionnaire was administered, an information sheet on hypertension was given to the participants. If they were unable to read, it was read aloud to them. Participants were given R10 (approximately \$1 dollar) to take part, and the fieldworkers were paid a small amount to cover transport costs.

Data entry, data analysis and ethical approval

The data were entered into an Excel[®] computer spreadsheet. Data from one clinic were entered in duplicate by independent fieldworkers to check for the accuracy of the data input. The data were imported into the Stata[®] statistical software programme for analysis.¹¹

Descriptive statistics were used to describe the socio-demographic variables presented as the mean and standard deviation for continuous variables and percentages for categorical variables. A mean of the three BP measurements was calculated and participants with a mean systolic BP < 140 mmHg and a mean diastolic BP < 90 mmHg were categorised as having controlled BP in line with the South African hypertension guidelines.¹² Logistic regression analysis identified factors associated with BP control. Adjustments were made for potentially confounding variables.

Participants who scored 10 or 11 out of 40 for the Hill-Bone Compliance to High Blood Pressure Therapy Scale were categorised as being compliant with their medication. A score of 10 equated to answering: "None of the time" to all of the questions, and a score of 11 equated to answering: "Some of the time" to one of the questions and "None of the time" to all of the other questions.

For open-ended questions, such as: "What causes your high BP?", answers were written both in Zulu and in English. An independent person checked the translation.

Ethical approval was granted by the Biomedical Research and Ethics Council, University of KwaZulu-Natal. The study was approved by the KwaZulu-Natal Health Research and Knowledge Management Group, Department of Health.

Results

A total of 500 participants entered the study with a response rate of 100%. Every patient who was invited to participate in the study was willing to do so. The error rate was 5% for the data that were entered in duplicate. Participants were aged 23–98 years, with a mean age of 58 years (Table 1). The majority of the participants had either never been to school or had only attended primary school. The majority had never smoked, and only 12% reported drinking alcohol. One third of participants had adequately controlled BP.

The majority of participants reported that their health was poor or average (Table 1). Most of them were aware that they had hypertension. Myocardial infarction, diabetes and human immunodeficiency virus were the most commonly reported co-morbidities. Almost a third of participants reported a family history of hypertension. Eighty-four per cent of participants reported having had a BP check in the last 12 months, but only 53% reported having had their blood sugar checked over the same period. Six per cent of patients reported seeing a traditional healer in the last 12 months for their BP. Similarly, only 3% reported current use of a herbal or traditional remedy for hypertension.

Beliefs about hypertension, beliefs about medication and reported compliance with treatment

When asked: "How well do you feel that you understand your high BP?", 40% responded that they did not understand it "at all", 22% that they understood it "a bit", while 24% understood it "well". Just over half of the participants said that their high BP would continue for either "a long time" or "forever", but 40% were uncertain. When asked: "How many symptoms do you experience as a result of your BP?", 62% responded "a few" and 15% "many".

The most commonly reported cause of hypertension related to emotions, and feeling stressed, in particular (Table 2). Diet was the next most common cause. Participants made comments about salty and oily food, as well as lack of food. Most other causes related to physical symptoms, e.g. feeling tired or having insomnia, as well as social factors, such as poverty, unemployment, financial problems, domestic abuse and alcohol use.

Most participants agreed with the statements relating to the necessity of the medication (Table 3). Eighty-two per cent agreed that doctors place too much trust in medication, and one fifth agreed that doctors would prescribe less if they had more time. One third of participants had concerns about the long-term effects of the medication and becoming dependent on it. Just over half agreed with the statement that most medicine is addictive.

Participants reported good compliance with their medication, with over 90% of participants replying "none of the time" to eight of the 10 Hill-Bone Compliance to High Blood Pressure Therapy Scale statements (Table 4). Thirty-three per cent of participants reported that they ate salt some of the time, and 14% reported that they missed appointments some of the time.

Determinants of blood pressure control

Factors associated with poor BP control included being a pensioner [adjusted odds ratio (OR) 0.27, 95% confidence interval (CI): 0.07–0.97, *p* 0.045], being prescribed more than

Table 1: Participant characteristics

Characteristics	Total sample	BP controlled (< 140/90 mmHg)	BP uncontrolled (> 140/90 mmHg)
	<i>n</i> = 500, <i>n</i> (%)	<i>n</i> = 157, <i>n</i> (%)	<i>n</i> = 343, <i>n</i> (%)
Average age (SD)	58 (13.8)	57 (14.6)	58 (13.4)
Age (years)			
20–39	46 (9)	19 (12)	27 (8)
40–49	95 (19)	32 (20)	63 (18)
50–59	130 (26)	39 (25)	91 (27)
60–69	127 (25)	39 (25)	88 (26)
70–79	70 (14)	18 (11)	52 (15)
≥ 80	32 (6)	10 (6)	22 (6)
Gender			
Male	109 (22)	32 (20)	77 (22)
Female	391 (78)	125 (80)	266 (78)
Marital status			
Married	130 (26)	41 (26)	89 (26)
Never married	296 (59)	90 (57)	206 (60)
Separated	16 (3)	6 (4)	10 (3)
Widowed	58 (12)	20 (13)	38 (11)
Level of schooling			
Never went to school	264 (53)	82 (53)	182 (54)
Grades 1–7	194 (39)	63 (40)	131 (39)
Grades 8–12	37 (7)	11 (7)	26 (8)
Tertiary education	1 (0.2)	0 (0)	1 (0.3)
Employment status			
Employed	19 (4)	10 (6)	9 (3)
Unemployed	82 (16)	30 (19)	52 (15)
Full-time homemaker	163 (33)	55 (35)	108 (32)
Pensioner	202 (40)	54 (34)	148 (43)
Receiving a disability grant	33 (7)	8 (5.1)	25 (7)
Drinks alcohol (Yes)	59 (12)	13 (9)	46 (14)
Smoker			
Current	41 (8)	8 (5)	33 (10)
Ex-smoker	37 (8)	13 (9)	24 (8)
Never smoked	415 (85)	132 (86)	283 (83)
Number of prescribed antihypertensive medications			
1	207 (43)	81 (55)	126 (38)
2	165 (35)	41 (27)	124 (38)
3	88 (18)	21 (14)	67 (20)
4	15 (3)	5 (3)	10 (3)
5	2 (0.4)	0 (0)	2 (1)
Self-reported past medical history	468 (94)		
Hypertension	468 (94)	145 (93)	323 (94)
Myocardial infarction	61 (12)	19 (12)	42 (12)
A stroke	22 (4)	7 (4)	15 (4)
High cholesterol	15 (3)	3 (2)	12 (4)
Diabetes	49 (10)	23 (15)	26 (8)
Asthma	31 (6)	4 (3)	27 (8)
Epilepsy	12 (2)	5 (3)	7 (2)
HIV	64 (13)	17 (11)	47 (14)
Mental health illness	44 (9)	14 (9)	30 (9)

(Continued)

Table 1: (Continued)

Characteristics	Total sample <i>n</i> = 500, <i>n</i> (%)	BP controlled (< 140/90 mmHg) (31%) <i>n</i> = 157, <i>n</i> (%)	BP uncontrolled (> 140/90 mmHg) (69%) <i>n</i> = 343, <i>n</i> (%)
Self-reported family history			
Hypertension	155 (31)	55 (35)	100 (29)
Myocardial infarction	22 (4)	8 (5)	14 (4)
A stroke	22 (4)	11 (7)	11 (3)
Diabetes	34 (7)	15 (10)	19 (6)
Patient perception of own health			
Poor	339 (64)	98 (62)	241 (70)
Average	150 (33)	55 (35)	95 (28)
Good	8 (3)	2 (1)	6 (2)
Very good	3 (1)	2 (1)	1 (0)
Visited a traditional healer about BP in last 12 months (Yes)	32 (6)	12 (8)	20 (6)

BP: blood pressure, HIV: human immunodeficiency virus, SD: standard deviation

one antihypertensive medication (adjusted OR 0.61, 95% CI: 0.39–0.96, *p* 0.032) and self-reported asthma (adjusted OR 0.18, 95% CI: 0.05–0.71, *p* 0.014) (Table 5). Self-reported diabetes and a family history of strokes were associated with good BP control (respective adjusted OR, 95% CI and *p*: 3.62, 1.73–7.56 and 0.001; and 2.90, 1.01–8.28 and 0.047).

Compliance with their medication appeared to be associated with good BP control (unadjusted OR 1.63, 95% CI: 1.01–2.61, *p* 0.045), but after adjusting for other variables, the strength of the association was reduced and the OR was no longer statistically significant (adjusted OR 1.31, 95% CI: 0.87–2.58, *p* 0.148). Similarly, receiving a disability grant seemed to be associated with poor BP control (unadjusted OR 0.29, 95% CI: 0.09–0.96, *p* 0.042), but the result was no longer significant after adjusting for other variables (adjusted OR 0.42, 95% CI: 0.10–1.73, *p* 0.229).

Patient suggestions to improve hypertension management

When asked: "Can you think of any changes that the clinic could make to improve your high BP control?", only 13% of participants responded affirmatively. Suggestions from participants to

improve hypertension management are listed in Table 6. Common themes included ensuring that the clinic did not run out of treatment, improving patient education, offering lifestyle advice and reducing poverty and unemployment.

Discussion

Only one third of participants had controlled BP. Almost half reported that they did not understand their BP at all, and many had concerns about taking antihypertensive medication.

The high response rate is similar to that in other studies.¹³ The predominance of females (78%) is similar to Thorogood et al's study, and this is likely to represent male labour migration.⁴ However, the study by Maepe and Outhoff on mostly male goldminers found similar rates of poor BP control.⁶

A strength of the present study was that the fieldworkers underwent rigorous training and close supervision to ensure good validity of the data. The 100% completion rate means that selection bias was reduced. This must be weighed up against the increased risk of selection bias due to convenience sampling. Random sampling would have reduced this bias, but this was not possible because of time constraints. Owing to a questionnaire design error, one question relating to harm caused by medication was unintentionally omitted from the BMQ. Another limitation of this study was that it was restricted to patients visiting the clinics. Possibly, patients who were unable to present at the clinics differed from those who attended, making the results less generalisable to the wider community.

The low proportion of patients with controlled BP was similar to that in other studies in South Africa^{4–7} and Nigeria.¹⁴ A lack of understanding of hypertension was one reason for this, with almost half of the participants reporting that they did not understand their BP at all. Dennison et al reported similar low levels of understanding in hypertensive patients.⁷ Interestingly, this study and others found that the majority of patients experienced symptoms, such as headaches and lethargy, from their BP,^{13,15} a condition which is considered to be reasonably asymptomatic by the medical profession. Perhaps patients only comply with treatment on days when they experience symptoms that they associate with their hypertension.

Table 2: A sample of responses to the question: "What causes your high blood pressure?", grouped according to themes

Emotions
"Stress, because I am not working. I am looking after my brother's child as he died" (female, 47 years).
"Missing my child causes me stress" (female, 50 years).
"Worries about life" (female, 65 years).
Diet
"Fatty meat" (female, 65 years).
"Feeling hungry" (female, 60 years).
Physical symptoms
"Having a stroke" (female, 52 years).
"Headaches, my heart beating, feeling dizzy" (female, 38 years).
"Stomach pain" (female, 62 years).
Social factors
"My husband is drinking too much alcohol and is not supporting me at home" (female, 67 years).
"Not working because this means you do not exercise" (male, 49 years).
"The situation at home is not good" (male, 42 years).
Loss of a loved one
"It started when I lost my children and husband" (female, 53 years).
"Thinking about the loss of my child" (female, 38 years).

Table 3: Participants' views about taking antihypertensive medication: results from the Beliefs About Medicines Questionnaire (%)

Statement	Disagree or strongly disagree	Uncertain	Agree or strongly agree
Concerns about medication			
Having to take medicine worries me	66	11	22
I sometimes worry about the long-term effects of my medicine	52	14	34
My medicine disrupts my life	69	16	15
I sometimes worry about becoming too dependent on my medicine	51	13	36
Doctors place too much trust in medicine	12	6	82
Necessity of medication			
My current health depends on my medicine	6	11	83
My life would be impossible without my medicine	12	6	82
My health in the future depends on my medicine	15	11	74
My medicine protects me from becoming worse	8	6	86
Harm caused by medication			
Most medicines are addictive	28	17	55
Medicine does more harm than good	81	10	9
All medicine is poison	79	14	7
Overuse of medication			
Doctors use too many medicines	55	30	15
People who take medicine should stop their treatment for a while every now and then	63	32	5
If doctors had more time with patients, they would prescribe fewer medicines	22	56	22

Results of particular interest are highlighted in bold

Table 4: Responses to the Hill-Bone Compliance to High Blood Pressure Therapy Scale (%)

Questions	None of the time	Some of the time	Most or all of the time
How often do you forget to take your high BP medication?	90	8	1
How often do you decide not to take your high BP medication?	94	6	0
How often do you eat salty food?	65	33	2
How often do you miss scheduled appointments?	86	14	0
How often do you run out of high BP pills?	91	9	0
How often do you skip your high BP medicine 1–3 days before you go to the clinic?	95	4	0
How often do you miss taking your high BP pills when feeling better?	95	4	1
How often do you miss taking your high BP pills when feeling sick?	98	2	0
How often do you take someone else's high BP pills?	96	3	0
How often do you miss taking your high BP pills when you are careless?	95	2	3

BP: blood pressure

Results of particular interest are highlighted in bold

Commonly reported causes of hypertension, including stress, diet, physical symptoms and social factors, were similar to those found in other studies in South Africa.^{4,15} Obesity was also reported as a cause of hypertension in Henbest et al's study on participants from a large black township near Pretoria.¹³

Having diabetes was associated with good BP control, perhaps because such participants attend the clinics more regularly, and so more time is spent educating them. A family history of a stroke was associated with good BP control, possibly because such participants were more aware of the potential complications of hypertension. Being prescribed only one antihypertensive medication was also associated with having controlled BP, a finding reported elsewhere.⁷ Explanations for this include the fact that simple regimens improve compliance with medication, participants who are prescribed one medication may be more responsive to treatment, and

additional medications may be added for patients with inadequately controlled BP without checking for compliance with their current medication.

Being a pensioner was associated with poor BP control, after adjusting for other variables. One explanation for this is that pensioners lead a more sedentary lifestyle, and spend less time ploughing the fields and walking to work.

Overall, participants reported good compliance with their medication, assessed using the Hill-Bone Compliance to High Blood Pressure Therapy Scale. However, some participants reported eating salty food and missing scheduled appointments. Poor compliance with their medication was associated with poor BP control, although this was not significant after adjusting for other variables. Dennison et al used the same tool and reported similarly good adherence to medication, with the exception that just over

Table 5: Odds ratios for controlled blood pressure (< 140/90 mmHg) versus uncontrolled blood pressure (≥ 140/90 mmHg) by socio-demographic factors, number of prescribed antihypertensive medications, self-reported medical history, patient perception of own health, reported visits to a traditional healer and reported compliance with medication using logistic regression analysis

Variable	Unadjusted OR			Adjusted OR*		
	OR	95% CI	p	OR	95% CI	p
Age (years)**						
20-39	1	0.35-1.49	0.378	1	0.35-1.49	0.374
40-49	0.72	0.30-1.22	0.163	0.72	0.30-1.22	0.162
50-59	0.61	0.31-1.27	0.194	0.61	0.32-1.28	0.202
60-69	0.63	0.22-1.09	0.080	0.63	0.22-1.09	0.082
70-79	0.49	0.25-1.67	0.367	0.49	0.25-1.69	0.378
≥ 80	0.64			0.65		
Gender***						
Male	1	0.56-1.41	0.604	1	0.56-1.43	0.640
Female	0.88			0.90		
Marital status						
Married	1	0.61-1.48	0.815	1	0.56-1.64	0.890
Never married	0.95	0.44-3.83	0.631	0.96	0.49-6.05	0.397
Separated	1.30	0.59-2.20	0.691	1.72	0.52-2.54	0.735
Widowed	1.14			1.14		
Level of schooling						
Never went to school	1					
Grades 1-7	1.07	0.44-1.99	0.870	0.98	0.26-1.73	0.260
Grades 8-12	0.94			0.67		
Employment status						
Employed	1	0.19-1.42	0.202	1	0.17-1.96	0.379
Unemployed	0.52	0.18-1.19	0.110	0.58	0.15-1.55	0.221
Full-time homemaker	0.46	0.13-0.85	0.022	0.48	0.07-0.97	0.045
Pensioner	0.33	0.09-0.96	0.042	0.27	0.10-1.73	0.229
Receiving a disability grant	0.29			0.42		
Drinks alcohol						
No	1	0.31-1.12	0.015	1	0.32-1.54	0.374
Yes	0.59			0.70		
Smoker						
Current	1	0.87-6.84	0.091	1	0.43-5.17	0.524
Ex-smoker	2.44	0.85-4.19	0.121	1.49	0.46-3.19	0.703
Never smoked	1.88			1.21		
Number of prescribed antihypertensive medications						
1	1	0.37-0.80	0.002	1	0.39-0.96	0.032
> 1	0.54			0.61		
Self-reported past medical history						
Hypertension	0.65	0.30-1.44	0.292	0.60	0.22-1.62	0.313
Myocardial infarction	0.99	0.55-1.76	0.964	1.18	0.57-2.44	0.663
A stroke	1.02	0.41-2.55	0.966	1.57	0.51-4.88	0.431
High cholesterol	0.54	0.15-1.93	0.341	0.34	0.08-1.47	0.150
Diabetes	2.09	1.15-3.80	0.015	3.62	1.73-7.56	0.001
Asthma	0.31	0.11-0.89	0.030	0.18	0.05-0.71	0.014
Epilepsy	1.57	0.49-5.04	0.445	0.96	0.21-4.34	0.954
HIV	0.76	0.42-1.38	0.373	0.69	0.35-1.36	0.286
Mental health illness	1.03	0.53-2.00	0.934	0.71	0.29-1.74	0.456
Self-reported family history						
Hypertension	1.33	0.89-1.99	0.165	1.29	0.80-2.08	0.304
Myocardial infarction	1.26	0.52-3.06	0.613	0.95	0.32-2.86	0.631
A stroke	2.27	0.96-5.35	0.062	2.90	1.01-8.28	0.047
Diabetes	1.80	0.89-3.63	0.104	1.60	0.69-3.71	0.276

(Continued)

Table 5: (Continued)

Variable	Unadjusted OR			Adjusted OR*		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Patient perception of own health						
Poor	1	0.95–2.14	0.089	1	0.79–2.07	0.309
Average	1.42	0.16–4.13	0.810	1.28	0.08–3.30	0.488
Good	0.82			0.52		
Visited a traditional healer about BP in last 12 months						
Yes	1	0.64–2.81	0.444	1	0.54–3.20	0.554
No	1.33			1.31		
Compliant****						
No	1	1.01–2.61	0.045	1	0.87–2.58	0.148
Yes	1.63			1.31		

CI: confidence interval, HIV: human immunodeficiency virus, OR: odds ratio

*With the exception of age and gender, each variable has been adjusted for all the other tabulated variables

**Adjusted for gender

***Adjusted for age

****Compliant: Hill-Bone Compliance to High Blood Pressure Therapy Scale score ≤ 11 . Noncompliant: Hill-Bone Compliance to High Blood Pressure Therapy Scale > 11

Significant associations are highlighted in bold

Table 6: A sample of participant suggestions on how to improve hypertension management, grouped according to themes

Not running out of treatment
"People should get enough medication because they sometimes come to the clinic to find that the clinic is running short of pills" (female, 54 years).
"Please make sure that the medication is always available as sometimes we run out of pills" (female, 52 years).
Improve education
"People must be educated so that they will know and understand that they can live with this as long as they don't forget to take their medication" (male, 60 years).
"Provide trained people who will teach people about hypertension" (male, 58 years).
"They must thoroughly teach us about blood pressure in order for us to understand it well" (female, 42 years).
Reduce or stop medication
"They must find a better way of treating, but not giving us pills" (female, 40 years).
Lifestyle modification
"I think they should teach young people to avoid obesity and to exercise to reduce the fat in their bodies. The nurses should make sure people learn more about hypertension" (male, 49 years).
"The government should take care of old people, and tell them what to eat and what they must not eat" (female, 78 years).
Improve the social situation
"I am unemployed, poor and have nothing to give my children. If they can help me, maybe my blood pressure can be lowered" (female, 57 years).

half of the participants did not take antihypertensive medication on the morning of the visit.⁷ Iloh et al's study in Nigeria reported that only 43% of hypertensive participants complied with treatment and found that forgetfulness was the most common cause of noncompliance.¹⁴ Peltzer's study on a rural area of the Limpopo province, South Africa, found that 35% of hypertensive participants were not compliant with treatment.¹⁵ Different tools were used to measure compliance in these studies, and so it is difficult to draw comparisons. In part, the high rate of compliance found in the present study may have been because the fieldworkers administered the questionnaire, resulting in information bias.

Only 6% of the participants reported seeing a traditional healer for their hypertension, and only 3% reported the use of a herbal or traditional remedy for hypertension in the past 12 months. This was quite different to the findings in Peltzer's study in which it was reported that 80% of participants took traditional remedies or over-the-counter medications for hypertension.¹⁵ Perhaps participants perceived that the fieldworkers would not approve of the use of traditional healers and remedies.

It is surprising that the association of compliance with medication and BP control was not significant after adjusting for other variables. One reason for this was that according to the sample

size calculation, it was estimated that 50% of the participants would report compliance with the hypertensive treatment. This study found that 76% of participants were compliant.

When asked what changes the clinics could make to improve high BP control, a number of participants asked for better patient education and highlighted the issue of the clinics sometimes running out of medication. Similar issues were reported by nurses elsewhere.^{4,5}

In response to requests for improved education, the principal investigator returned to the Manguzi District eight months after the study to teach the PHC nurses how to facilitate an education session with a group of 10 hypertensive patients. Several nurses commented that the group sessions gave them insight into what patients endured on a daily basis, and found it useful hearing suggestions from patients on how the situation could be improved. Patients found it helpful knowing that others with hypertension experienced similar problems and found sharing tips useful, i.e. how to remember to take their daily medication.

Conclusion

Only one third of participants had adequately controlled BP in this study. A poor understanding of hypertension and

antihypertensive medication was common. Participants suggested that improving patient education and ensuring that medication was available in the clinics would improve hypertension control. Group education sessions, facilitated by nurses, were positively received. Further studies are needed to investigate whether or not nurse-led group education sessions would improve BP control in patients living in South Africa.

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