

LIFESTYLE MODIFICATIONS IN HYPERTENSION: AN ASSESSMENT OF REPORTED ADHERENCE KNOWLEDGE AND ATTITUDES AT MANKAYANE HOSPITAL, SWAZILAND

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Authors contribution

Dr Casper T Murove conceived the study, formulated the study methodology, analysed the data and manuscript design. Statistical analysis done with help of University of Stellenbosch statisticians. Dr Louis Jenkins was the supervisor and gave authorization for Ethics and Final submission. All authors read and approved the manuscript.

DECLARATION

I, the undersigned, hereby declare that the work contained in this document is my original work and that I have not previously submitted it, in its entirety or part, at any university for a degree. I also declare that approval for the study was obtained from the University of Stellenbosch Human Health Research Ethics Committee (Reference number N10/08/281) and from the Swaziland Scientific and Ethics Committee (Reference number MH/599C).

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ABSTRACT

Background

Lifestyle modifications have been shown to lower blood pressure. Many guidelines recommend lifestyle modifications in the management of hypertension. Comprehensive adoption of the relevant lifestyle modifications has the greatest benefit.

Methods

This was a cross-sectional descriptive study with a qualitative component. Information on adherence was collected from 227 participants, using a structured questionnaire utilising Likert scales. In-depth interviews to assess knowledge and attitudes were conducted. Interviews were recorded, transcribed verbatim and analysed.

Results

Reported adherence to salt intake reduction and increased consumption of fruits and vegetables were 81.1% and 90.7% respectively. Reported adherence to exercise and weight reduction were 4.0% and 6.2% respectively. Reported adherence to alcohol intake reduction and smoking cessation were 50.6% and 56.5% respectively. The lifestyle modifications known by most participants were consumption of local vegetables, salt reduction, weight reduction and reduction of fats in the diet. The attitudes towards the recommended lifestyle modifications were mostly positive. Exercise in any form was reported as beneficial but time to exercise was a major limiting factor. Weight reduction was reported as difficult but possible. Salt reduction emerged as the most important lifestyle modification. Alcohol and smoking were reported to be addictive and difficult to stop. Increasing consumption of fruits and vegetables emerged as the easiest to adhere to.

Conclusion

Reported adherences to exercise and weight reduction were very low whilst increased consumption of fruits and vegetables and salt reduction had fairly high reported adherences. Participants had more knowledge about increased intake of fruits and vegetables, salt reduction and weight reduction when compared to the other recommended lifestyle modifications. The attitude to the recommended lifestyle modifications was positive with the participants acknowledging that they are important in controlling blood pressure. Greater emphasis may be required on some lifestyle modifications where knowledge is lacking and different approaches may be required for each lifestyle modification so as to improve adherence.

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INTRODUCTION

The World Health Organisation (WHO) estimates hypertension to cause up to 12.8% of all deaths worldwide.¹ This accounts for 57 million disability adjusted life years.¹ One in three adults worldwide has raised blood pressure.² Hypertension is a high-risk condition that is responsible for approximately 51% deaths from stroke and 45% deaths from coronary heart disease.³ It is one of the most common preventable cause of morbidity and mortality in both developed and developing countries.⁴ In traditional African societies, hypertension was once rare but is fast becoming a major public health concern.⁵

In most patients, hypertension can be diagnosed easily and the blood pressure can be controlled with safe and effective treatment.⁶ The treatment of hypertension consists of drugs and lifestyle modifications. Ideally, drug treatment should build upon effective lifestyle modifications.⁷ Some guidelines internationally recommend lifestyle changes for all patients diagnosed with hypertension.^{8,9}

At Mankayane Government Hospital, Swaziland hypertension is the most common illness in the medical outpatients department.¹⁰ The national guidelines on the management of hypertension recommend lifestyle modifications as the first line management for patients presenting for the first time with elevated blood pressure with systolic and diastolic blood pressures below 160 mmHg and 100 mmHg respectively.⁸ Lifestyle modifications are also recommended as part of treatment for moderate and severe forms of hypertension.⁸

LITERATURE REVIEW

Lifestyle modifications like reduction in weight, regular exercise, reduction in salt intake, increasing consumption of fruits and vegetables, reduction in alcohol intake and cessation of smoking have been proven to lower blood pressure and are valuable in the management of hypertension.^{11,12}

Increased dietary intake of salt has long been associated with hypertension.¹³ Some individuals are said to be salt sensitive, defined as an abnormal increase in blood pressure in response to increased salt intake.¹³

Cigarette smoking has been associated with increased blood pressure, in addition to other cardiovascular risks like coronary heart disease, stroke, sudden death, peripheral artery disease, and aortic aneurysm.¹⁴ On the other hand, cessation of smoking has been shown to lower blood pressure with a response being seen as early as within a week. A randomised trial measuring the effects of one week cessation of smoking showed a significant reduction (4.9 ± 1.2 mmHg systole and 2.7 ± 0.8 mmHg diastole) in 24 hour ambulatory blood pressures.¹⁴

An association between increased weight and increased blood pressure was established as far back as the 1920s.¹⁵ A more recent study has shown differences in blood pressure between the upper BMI (body mass index) quartile and lower BMI quartile to be as high as 16 mmHg on average.¹⁵ Obesity has been found to be a risk factor for pre-hypertension, hence weight loss programs might be effective as a preventive measure to pre-hypertension.⁷ Weight loss of between 2-4 kg has been associated with decreases in blood pressure of 3-8 mmHg.¹⁵ This effect is seen within a few weeks and sustained as long as the weight loss is sustained.¹⁵ It has been proven that despite the difficulty of showing a cause-effect relationship weight loss is associated with reductions in blood pressure.¹⁶ However, a systematic review of long term effects of weight reducing interventions in hypertensive patients did not show a reduction in blood pressure in patients with weight loss achieved by using sibutramine - a weight reducing drug.¹⁷

Increased physical activity has been associated with decreased blood pressure. A meta-analysis of effects of physical activity on blood pressure has shown a decrease of blood pressure of 3-5 mmHg with moderate physical activity.¹⁵

Increasing consumption of fruits and vegetables has been shown to lower blood pressure.¹⁸ The Dietary Approaches to Stop Hypertension Trial demonstrated that a diet high in fruit, vegetable, and low-fat dairy servings could reduce blood pressure by 5.3 and 3.0 mmHg systolic and diastolic blood pressure, respectively, in the absence of either weight loss or sodium restriction.¹⁹

There is a well-known j-shaped association between alcohol consumption and hypertension where there is an initial decrease in blood pressure followed by a sustained increase in blood pressure as the amount of alcohol intake rises from zero. According to a recent population study conducted in China alcohol consumption was associated with elevated blood pressure levels.²⁰ The study showed different sensitivities between elderly men and women recommending consumption in males of not more than two drinks per day and not more than one drink for women.²⁰

Lifestyle modifications have been shown to reduce the incidence of hypertension and lower end-organ damage for patients with pre-hypertension.²¹ Lifestyle modifications are also beneficial for patients with mild hypertension as it has been shown that these patients are at an increased risk of developing atherosclerosis.²² There is still controversy as to whether lifestyle modifications should be used as the only intervention for some stages of hypertension. If so, for how long before medications are introduced given that the blood pressure remains elevated? Some authors are of the view that it is not wise to delay commencement of treatment for patients diagnosed with hypertension on the basis of lifestyle modifications.²³ Of note is that, lifestyle modifications have also been shown to have a significant effect on resistant hypertension, defined as uncontrolled blood pressure on three or more antihypertensives.²⁴

Lifestyle modifications in the management of hypertension have been recommended in different ways in different guidelines.²³ The South African guidelines for hypertension recommend the use of lifestyle modifications for a specified period for some patients depending on their risk stratification before commencing on drug treatment.²⁵ The Namibian guidelines recommend the use of lifestyle modifications for pre-hypertension defined as systolic blood pressure of 120-140 mmHg or diastolic blood pressure of 80-90 mmHg. For mild hypertension, defined as systolic blood pressure of 140-160 mmHg or diastolic of 90-100 mmHg the guidelines recommend the use of lifestyle modifications for 6 months. If the blood pressure remains elevated antihypertensives are then commenced.²⁶

A study done in Nigeria on the knowledge, perception and practice of lifestyle modifications showed a poor level of perception of hypertension and the lifestyle modifications. However, the level of those willing to adopt lifestyle modifications was high.²⁷ A Canadian study showed that three quarters of those diagnosed with hypertension were taking medications after 2 years while adherence to lifestyle modifications was low, showing an over reliance on medications compared with lifestyle modifications.²⁸ The lifestyle modification most likely to be adhered to in the study was cessation of smoking. One factor that has been shown to affect adherence was the quality of counselling on lifestyle modifications given by the physician.²⁸ Another study done in North Carolina showed similar results, where patients who recalled being given advice were more likely to adhere to lifestyle modifications.²⁹ A study conducted in Poland showed that general practitioners rarely give complete advice on lifestyle modifications.³⁰ Similar results were obtained from a South Australian study, which showed that less than a third of overweight/obese patients received lifestyle advice that could assist in weight loss and about a third of the hypertensive patients reported that they had received advice on reducing salt intake.³¹

It is clear that lifestyle modifications should be recommended to all patients whether they are on antihypertensives or not.²³ Lifestyle modifications and patient education

are the cornerstones in the management of every patient with raised blood pressure.

²⁶ There is no doubt that adoption of the entire package of lifestyle modifications yields the greatest likelihood of success. ^{15,32} The aim of this study was to assess self-reported patient adherence, knowledge and attitudes of hypertensive patients towards the recommended lifestyle modifications in hypertension.

METHODS

Study design

Mixed methods were used, consisting of a cross sectional descriptive component and a qualitative component.

Setting

The study was set in the Outpatients Department at Mankayane Government Hospital. It is a regional referral hospital located in the Manzini region in Swaziland.

Study Population

All adult hypertensive patients attending the Outpatients Department from mid-July 2012 to mid-August 2012. The study was conducted over a one month period as hypertensive patients are reviewed every month.

Sample size

Estimates of reported adherence of the six lifestyle modifications were made. These six estimates were then used to calculate six sample sizes which were such that there would be a 95% chance for the reported adherence to lie within 5 participants (2.2%) of the actual reported adherence. The highest figure of 225 was the targeted sample size. Two hundred and thirty participants were invited and 3 declined. For the qualitative part, the sample size of 8 that was used was determined during the course of data collection. Data was saturated after 8 interviews.

Sampling method

For the quantitative part, systematic sampling was used. Every third hypertensive patient recorded in the daily register was invited to participate in the study. This was done every week day for a month. The patients had to have been on hypertensive treatment or being followed up for at least three months. Those with other cardiovascular illnesses and diabetes mellitus were excluded from the study.

Purposeful sampling was used for the qualitative part. The qualitative part began concurrently with the quantitative part but by the end of the first week the qualitative part was finished. As the interviews would take longer a maximum of two participants were interviewed on each day. After collecting demographic details the participants were asked if they could participate in the qualitative part which would be longer. The first one to agree was then selected for the qualitative part. Thereafter the research assistant would invite those participants with different demographic features based on age, literacy levels and location of residence. Sex was also taken in to consideration. This was done in order to get a broader perspective on the knowledge and attitudes towards lifestyle modifications. The patients had to meet the same criteria as those for the quantitative part, and in addition they provided consent to being audio recorded.

Written consent was offered in the local language and those who provided consent were engaged in the study.

Data collection and measurement

A qualified nursing assistant was recruited to conduct the interviews. The nursing assistant had training in interviewing skills and had previously played a similar role in a knowledge, attitudes, practices and behaviour study.

For the quantitative part, structured interviews were conducted. A questionnaire which utilised a Likert scale was used to collect data. Participants were asked about adherence to each of the lifestyle modifications and the responses were graded according to the perceived extent of adherence (Table 1).

Table 1. Perceived adherence to lifestyle modifications

Lifestyle Modification	Perceived adherence	Grading
Exercise	None	1
	Occasional	2
	Regular (30 mins or more for 3 or more days per week)	3*
Weight Reduction	None	1
	<10%	2*
	>10%	3*
Salt Reduction	No change	1
	Mild reduction (<50%)	2*
	Significant reduction (>50%)	3*
	No added salt	4*
Alcohol Reduction	No change	1
	Mild reduction (alcohol intake remains above safe limit of 3 and 2 standard drinks for males and females respectively for not more than five days per week)	2
	Significant reduction (within safe limits)	3*
	Complete cessation	4*

Smoking Cessation	No change	1
	Ceased smoking	2*
Fruits and Vegetables	No change	1
	Increased intake	2*

**The researcher considered these scores as being adherent to the respective lifestyle modification.*

For the qualitative part, in depth interviews were conducted in two phases. The purpose of the first phase was to assess knowledge. The participants were asked, "Tell me about other measures besides drugs that can help control blood pressure?" The purpose of the second phase was to assess for attitudes. Open ended questions on each of the lifestyle modifications were asked. For example, "Tell me about exercise as a lifestyle modification to control blood pressure?" The participants were given ample time and not interrupted. Open ended questioning techniques like familiarisation, non-verbal cues and summarising were used. A tool which served as a reminder was provided to the interviewer which had a list of the following questions:

- How do you feel about them?
- What is your opinion regarding their usefulness?
- How important do you think they are in controlling blood pressure?
- What is your opinion regarding the practicality of the recommended lifestyle modifications?

The questions were only used when the interviewer felt that an important aspect had not been discussed. To reduce bias on assessing knowledge, in depth discussions on each of the lifestyle modifications were held only after the research assistant was satisfied that the participant had described all the lifestyle modifications they knew in the first phase. The rationale for this was that discussing each of the lifestyle modifications in the second phase the research assistant had to mention the lifestyle modification. Therefore, the information obtained from this phase of the interview was not used to contribute to the analysis of knowledge.

A voice recorder was used to obtain audio recordings of the interviews. The audio recordings were transcribed verbatim and translated to English. Verification of the translation was done by another nursing assistant. The data was then analysed through the Framework method, using the following steps: familiarization with the data, developing a thematic index, coding, creation of charts and interpretation of the themes.

RESULTS

DEMOGRAPHIC AND CLINICAL FEATURES

In the quantitative part of the study 230 participants were invited to participate. Three participants declined the invitation to participate whilst 227 hypertensive patients consented to participate. Out of the 227 participants, 137 (60.4%) were females and 90 (39.6%) were males. One hundred and eighty two participants (80.2%) were between the ages of 45-75 years. The participants had an age range of 30-90 years with a median age of 62 years. The mean duration of treatment was 9.5 years with 137 (60.4%) of the participants having been on antihypertensive treatment for over 5 years. One hundred and forty eight of the participants had a BMI of over 25 implying that 65.2% of the participants were either overweight (36.1%) or obese (29.1%).

Blood pressure recordings over the past three months were collected from the health cards of the participants. One hundred and nine participants (48%) had a current mean systolic blood pressure (SBP) above 140 mmHg whilst 64 (28.2%) had a current diastolic blood pressure (DBP) above 90 mmHg. A summary of the demographic and clinical features is provided in table 2.

Table 2: Demographic and Clinical Features

	Mean	Median	Range
Age	60.8	62.0	30.0-91.0
BMI	27.8	26.9	19.9-49.6
Current SBP	146.8	140.0	100.0-227.0
Current DBP	86.8	90.0	49.0-120.0
Mean SBP over the Past 3months	145.8	144.5	111.8-198.0
Mean DBP over the Past 3months	85.5	85.5	57.5-111.5

QUANTITATIVE SECTION: REPORTED ADHERENCE

Reported adherence to the specific lifestyle modifications showed wide differences. One hundred and eighty four (81.0%) of the participants said they did not exercise at all, 34 (15.0%) said they occasionally exercised, while only 9 (4.0%) said they

regularly exercised. Reported adherence to weight reduction was similarly low as 213 (93.8%) of the participants said they had not reduced weight, 14 (6.2%) had a slight reduction of weight estimated to be < 10% of body weight and none had significantly reduced weight estimated to be >10% of body weight. Most of the participants seemed to have paid attention to salt reduction. Only 43 (18.9%) said they had not made any effort to reduce salt intake, 71 (31.3%) slightly reduced salt intake, 80 (35.2%) significantly reduced salt intake, while 33 (14.5%) no longer added salt to their food.

One hundred and forty seven (64.8%) of the participants did not take any alcohol. Of those who took alcohol, 40 (50.6%) had completely stopped, 11 (13.8%) had significantly reduced, 18 (22.5%) had slightly reduced and 10 (12.7%) had not changed their alcohol intake. One hundred and eighty one (79.7%) of the participants did not smoke. Of those who smoked, 26 (56.5%) had ceased smoking. The lifestyle modification of increasing consumption of fruits and vegetables had the highest reported adherence with 206 (90.7%) of the participants reporting that they had increased their intake of fruits and vegetables.

QUALITATIVE SECTION

KNOWLEDGE

The most common response to the question, "Tell me about other measures besides drugs that can help control blood pressure?" related to the use of local vegetables called 'inshubaba' and 'inkaka'. This was mentioned by all the participants. Inshubaba and inkaka are green leafy vegetables like spinach that are bitter in taste. It is believed by some that this bitter taste is the one that helps to lower blood pressure. They are thought to have a cleansing effect on the body. One participant said "when you have drank their juices they flush your system and lowers the high levels of blood pressure." Other vegetables mentioned by a few participants which were said to have a blood pressure lowering effect were 'emahala' and 'moringa.' Other common mentioned measures included reducing salt in the diet, reducing body weight and reducing fats in the diet. Most of the participants described salt as having a direct effect on the heart. Reducing body weight was said to reduce the amount of blood that the heart has to pump by a few participants.

Minor themes that emerged were exercise, avoiding stress, consumption of herbs, eating vegetables in general and drinking plenty of water.

None of the participants mentioned reduction of alcohol intake, smoking cessation and increased intake of fruits.

ATTITUDES

Exercise

Participants believed that exercise helps to lower blood pressure. Running was the commonest form of exercise that was mentioned, followed by going to the gym, although most felt that these were not practical. Running was mentioned by a few participants as being not productive and they preferred doing household chores. Household chores were viewed by most as being as good as exercise. Some participants mentioned that increasing physical activity in the form of running or household chores is beneficial for hypertensive patients and they referred to it as 'living an active life'. One participant in particular mentioned that the lack of physical activity in her life was a major contributor to her high blood pressure. She said,

"We are too busy and preoccupied these days we find going to the gym as a waste of time. We are even lazy to walk and prefer to pay transport even for a short walkable distance. In our homes we hire helpers for home chores."

Participants felt it was not easy to commit time for a regular exercise schedule. One participant felt that the young people who go out running on the roads are wasting time. Few participants mentioned that they had enough time for exercise. The excessive use of cars was also mentioned as a factor that discourages exercise. Few participants who were over 65 years of age said they experienced chest pain and aches all over the body following exercise. At times the pain was said to be so bad it would keep them from exercising. These elderly participants felt that they were too old to engage in exercise citing painful bones which if broken by any chance would take too long to heal.

Exercise was regarded as being practical when it comes to affordability as it could be done at no extra cost. The participants were of the view that the benefits of exercise extend beyond helping to control blood pressure. The other benefits mentioned were decreasing stress, reducing chances of developing blood pressure, controlling body weight and reducing cardiovascular diseases.

Weight reduction

This was viewed as an important factor with obesity and overweight being associated with elevated blood pressure. The elderly participants attributed overweight as one of the causes of blood pressure in some of the younger patients that they often queued with in OPD. The young women were described as being 'obese' while the men as having 'big stomachs'.

A major theme was that weight reduction is very difficult but possible. A few of the participants mentioned that they did not know how to reduce weight. The gradual decrease in weight following attempts to reduce weight was viewed as a discouraging factor. As a result, they gave up after a short while. Consumption of fast foods was a common factor which made reducing weight difficult. One participant said that the emergence of shops selling traditionally prepared food which is healthy was a positive development.

The extended benefit of reducing weight was a major theme. Participants mentioned other benefits of reducing weight apart from helping to control hypertension. These included reducing chances of developing diabetes mellitus, reducing cardiovascular illnesses, decreasing joint pains, improved physical appearance and enhanced sexual performance.

Salt reduction

This theme emerged as the most important lifestyle modification. It was described as affecting the manner in which the heart beats. The participants believed that too much salt led to palpitations. One participant said, "Salt causes the heart to beat hard and at a pace you are not used to." Having to prepare food for the whole family in one family pot is a difficulty. Other family members felt that they did not have to reduce or eat salt-less food. The participants mentioned that the family members would say 'salt-less food is for funerals'. In the Swazi culture, salt is not supposed to be added to food prepared on funerals.

Most of the participants found adjusting to less salt or salt-less food difficult at first, but with time it became easier as one gets used to the food with minimum salt or none at all. This is what one of the participants said,

"Initially the food is tasteless but after some time if you are keen on doing it, then you get used to it."

The participants also said it is easier when the changes are made in a gradual manner as opposed to an abrupt change. Salt intake control was difficult when attending functions like weddings, parties and braais. Reducing or omitting salt was easier with porridge and most difficult with vegetables. It was easier to reduce salt intake when their spouse was also hypertensive and also wanted to reduce salt intake. This made the aspect of preparing meals easier and they also supported one another in the effort to reduce salt intake.

Alcohol Reduction

Alcohol usage and abuse was described as compounding social and financial problems, leading to psychological stress, thereby elevating blood pressure. Most of the participants did not take alcohol but they knew that it is difficult to stop or reduce intake through experiences of family members, friends and acquaintances. It was described as a habitual behaviour which becomes part of the person and their way of life. One participant said, "Habits conquer the mind."

Alcohol abuse led to a vicious cycle where people take alcohol to try to reduce the stress of social problems only to realise that the problems are worse the following morning when they realise that they spent much more money, and or their behaviour while they were drunk worsened social relationships. They then try to forget these problems by resorting to alcohol and the cycle continues. One participant said,

"Funny enough because some drink under the mind-set that they want to forget about their problems, only to sober up to magnified problems due to their drinking."

This psychosocial stress was said to raise blood pressure.

Some believed that the fear of developing withdrawal symptoms kept people away from trying to reduce or stop alcohol. One participant said he had tried to stop but found it difficult after he developed withdrawal symptoms and decided to restart taking alcohol.

Peer pressure was important. If a patient decides to reduce or stop alcohol consumption the friends would pressurise him to take alcohol. One of the participants said,

"Drinkers are very reluctant to stop drinking; instead they fight a lot against the idea. For example there was one man who was sick and admitted here recently. His friends even smuggled alcohol into the hospital for him."

A misconception mentioned was that if one reduced salt intake you need not to reduce alcohol intake. Two of the participants described the new manner of daily drinking according to the western type of alcohol by men, women and children as particularly unhealthy. The participants described the traditional African brew as being homemade and nutritious. It was for men only, did not cost money and was not taken daily.

Smoking cessation

All the participants mentioned that they were not aware of an association between smoking and blood pressure. Cessation of smoking was viewed as a good idea as it would also reduce the risk of vascular diseases and lung cancer. The health risks with smoking were said to be much worse when compared with alcohol. Taking of snuff was also regarded to be as bad as smoking.

The social effect of smoking was described as being similar to that of alcohol in that it is also a vicious cycle where people smoke to try and get their minds off stressful circumstances but the financial impact of buying cigarettes leads to more psychosocial stress.

All of the participants were of the opinion that smoking is very difficult to stop. Some compared it with the recommendation of alcohol reduction and said smoking cessation was much more difficult. Two of the participants suggested gradual reduction, with eventual complete cessation. The participants said smokers are afraid of withdrawal symptoms. They described these as 'shakes', 'restlessness' and 'palpitations'

Increased intake of fruits and vegetables

This theme emerged as the easiest lifestyle modification to adhere to. The feelings towards increasing fruits and vegetables were generally positive. The indigenous bitter vegetables were regarded as having the most significant effect on blood pressure. The exotic vegetables which are sold in shops were not considered as having a positive effect on blood pressure. They felt that the manner in which they were grown using fertilisers and additives made them less healthy.

Most of the participants said they could grow vegetables in their own gardens and that they had some fruit trees at their homes. Some participants did not mind buying fruits and vegetables while, a few said some of the fruits and vegetables were expensive.

DISCUSSION

In this study the mean SBP and mean DBP were 145.4 mmHg and 85.5 mmHg respectively. Patients with persistently elevated BP at any level are at risk of developing micro- and macro-vascular complications which can lead to cerebrovascular accidents, renal failure, retinopathy and left ventricular failure.^{21,22,33}

Reported adherence to the lifestyle modification of exercise was only 4.0%. Low rates of adherence to exercise have been reported in other studies as well,^{34,35} though the reported adherence in this study is by far the lowest. Few of the participants in the qualitative part of the study knew that exercise was a recommended lifestyle modification in hypertension. Lack of time to exercise was mentioned as a challenging factor by most participants. In addition to lack of time, some of the factors mentioned as challenges like, excessive use of cars, use of maids or helpers and coexisting diseases are similar to the factors reported in some studies.^{34,35} It is encouraging that attitude towards exercise was generally positive with some participants mentioning additional benefits beyond BP control.

The reported adherence to weight reduction was very low with only 6.8% reporting some reduction of weight and none of the participants reporting significant weight reduction. This is of great concern considering that 65% of the participants were either overweight or obese. In the qualitative part most of the participants knew of weight reduction as a recommended lifestyle modification in hypertension. Not surprising, this was viewed as very difficult but possible. The consumption of fast foods and the lack of knowledge on effective ways of reducing weight were raised as important challenges.

Reported adherence to reducing salt was comparatively high with 81.1% of the participants reporting that they had reduced salt intake. Most of the participants in the qualitative part knew of the recommendation. The attitude towards reducing salt was generally positive with most participants viewing it as the most important lifestyle modification in controlling BP. Factors affecting adherence negatively were similar to those reported in a similar study which were food being prepared for the whole family and the difficulty in controlling salt intake at functions or gatherings.³⁴ In addition, adherence was reported to be difficult with certain foods like vegetables as they taste badly without salt.

Reported adherence to reducing alcohol intake was reasonable with 65.1% of those who took alcohol reporting a significant reduction or complete cessation. When asked openly about lifestyle modification none of the participants in the qualitative part mentioned alcohol intake. Most of these participants reported that it was very difficult to stop or reduce alcohol intake, although most of them did not take alcohol. The inconsistency of the findings with respect to alcohol probably implies that the participants who took alcohol probably gave a response that would not paint a bad image of themselves.

Cessation of smoking was described as perhaps the most difficult lifestyle modification to adhere to. It was apparently not known to have an effect on blood pressure, although all the participants agreed that this could be expected. In view of these comments the reported adherence to cessation of smoking amongst smokers was surprisingly high with over half (55%) reporting that they had ceased smoking.

Increased intake of fruits and vegetables had the highest reported adherence with 91.2% of the participants reporting an increase in their consumption. The taking of inkaka and inshubaba was mentioned first by most of the participants in the qualitative part. However, when discussing this recommendation it seemed most of them did not know that fruits and vegetables in general were a recommended lifestyle modification. It is likely that when participants were being asked about increasing consumption of all fruits and vegetables their response was in reference

to the local vegetables and not necessarily increased consumption of fruits and vegetables.

Study limitations

Systematic sampling could have introduced some bias. It is possible that the adherence profile of those who were not sampled may differ. Adherence was reported in the patients' own perspective and not specifically measured. The patients would know what is expected of them and this could have affected their responses. Despite being counselled on that their response would not affect the standard of care it is possible that some participants could have given responses that they felt would impress the research assistant.

The study was conducted over a period of a month. It is possible that as the study began it could have stimulated discussion amongst community members thus influencing responses given by participants interviewed later.

Purposeful sampling used for the qualitative component of the study could have introduced bias as the selection of participants was done on the discretion of the research assistant. Targeted selection of participants based on sex, age and literacy level does not necessarily make the sample representative. The small sample size of the qualitative component implies that the results are not generalisable as per nature of qualitative studies.

The community in which the study was set is mainly rural with most people sharing similar backgrounds, values and cultural beliefs. This could further limit its generalizability.

CONCLUSION

Reported adherences to exercise and weight reduction were very low. Increased consumption of fruits and vegetables and salt reduction had fairly high adherences rates. Participants had more knowledge about increased intake of fruits and vegetables, salt reduction and weight reduction when compared to the other recommended lifestyle modifications. None of the participants knew of the full set of recommended lifestyle modifications. Considering the high mean duration of treatment of 9.5 years, the participants could have had a higher level of knowledge as this implies that they were multiple opportunities for obtaining or receiving knowledge on lifestyle modifications.

The attitude to the recommended lifestyle modifications was positive with the participants acknowledging that they are important in controlling blood pressure. However, the participants were not confident about being able to adhere to the

lifestyle modifications of weight reduction, exercise, alcohol reduction and smoking cessation. Different approaches may be required for the specific lifestyle modifications as the factors affecting adherence to each of the lifestyle modifications are different. In view of the high mean SBP and DBP, comprehensive adoption of the recommended lifestyle modification could improve control of blood pressure.

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