Knowledge and lifestyle practices of hypertensive patients attending a primary health care clinic in Botswana

Zungu LI[1]
Professor, Department of Health Studies, University of South Africa, Pretoria Department of Health Studies,
Djumbe FR[2]
Medical officer, Ministry of Health Headquarters, Botswana

Corresponding author: Prof. Lindiwe I. Zungu Email: zunguli@unisa.ac.za

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Abstract

Background: Hypertension is a significant public health problem in many developing countries experiencing epidemiological transition from communicable to non-communicable chronic diseases. The World Health Organization reports that the number of people with hypertension worldwide is estimated at 600 million, of whom 3 million will die annually as a result of hypertension. According to the world health report, hypertension has been identified as the third ranked condition that reduces life expectancy. In the year 2000, there were 972 million people living with hypertension worldwide, and it is estimated that this number will escalate to more than 1.56 billion by the year 2025. The aim of this quantitative cross-sectional descriptive survey was to assess the lifestyle practices of patients with hypertension who were attending a primary health clinic in Botswana.

Methods: A quantitative cross-sectional descriptive survey was conducted among patients with hypertension attending Extension II clinic for follow-up care in Gaborone. A self-administered questionnaire translated from English to Setswana (local language) consisting of both closed and open-ended questions was used to collect data.

Results: A total of 446 participants were recruited, of which 293(65.9%) were females and 285 (63.9%) were aged greater than 40 years. 219(49.1%) of the participant reported a family history of hypertension. Among those, 171(78%) stated that their biological parents had hypertension, 31(14.1%) stated that it was their grandparents and only 8(3.7) indicated others (like their uncles/aunts). Such findings indicate a possible contribution of the family disposition to the prevalence of hypertension. The results showed that non-smokers were however more likely to know more about HPT than smokers (OR = 1.995; CI: 0.639 – 6.225).

Participants' level of knowledge varied from average to high as almost all of them 96% and 97% gave a correct response for practices related to prohibiting/preventing smoking and reducing the levels of stress respectively. Only 37% of the participants scored greater than 75% for assessment of their knowledge regarding the acceptable lifestyle practices for persons with hypertension and cumulatively 59% can be rated as having acceptable knowledge of lifestyle practices in relation to their chronic disease.

A significant relationship between alcohol intake and knowledge of hypertension (χ^2 = 4.140; p = 0.002). Further analysis showed that participants who reported not to drink alcohol had a higher level of knowledge score (39%) compared to those who confirmed to consume alcohol (25%). A majority (91%) of those who reported to be trying to lose weight had a good knowledge of hypertension. Also, a negative association was revealed between participants' knowledge of hypertension and gaining weight recently (χ^2 = 1.171; p = 0.279). This finding could imply that participants' knowledge of hypertension was not adequate to enable them to make healthy choices about weight management.

Conclusion: This study confirms that a relation exists between the knowledge of hypertension, demographic factors and lifestyle practices among participants. Thus, hypertension is a chronic but preventable disease; and thus adequate knowledge of the disease and lifestyle modification are important features in its effective control and management.

Introduction

Hypertension is a chronic but preventable disease, and thus lifestyle modification is one of the important features in its effective control and management. The World Health Organization reports that the number of people with hypertension worldwide is estimated at 600 million, of whom 3 million will die annually as a result of hypertension.[1] According to the world health report, hypertension has been identified as the third ranked condition that reduces life expectancy.[1] In 2000, there were 972 million people living with hypertension worldwide, and it is estimated that this number will escalate to more than 1.56 billion by the year 2025.[2]

Hypertension is a significant public health problem in many developing countries experiencing epidemiological transition from communicable to non-communicable chronic diseases.[3] Cohort studies on hypertension was done to show the growing problem in Africa, Nigeria and Zimbabwe and epidemiological information showed that between 10-20 million people in sub-Saharan Africa may have hypertension and that treatment could prevent around 250 000 deaths per year.[4]

Latest surveys showed that from 65 years of age and above, the prevalence of hypertension is about 30%-40% in rural West Africa, about 50% in semi urban West Africa,[5] and 50% to 60% in a mixed South African population.[6] With sub-Saharan Africa's population of 650 million and increasing longevity and westernization, hypertension has now changed from a relative rarity to a major problem. "Ten million to 20 million may be affected in sub-Saharan Africa; and the African Union has called hypertension one of the continent's greatest health challenges after AIDS.[4]

Methodology

A quantitative cross-sectional descriptive survey was conducted among patients with hypertension attending Extension II clinic for follow-up care in Gaborone. A self-administered questionnaire translated from English to Setswana (local language) consisting of both closed and open-ended questions was used to collect data. Special arrangements were made for participants to be interviewed. Data collected included participants' socio-demographic characteristics, assessment of their knowledge about hypertension as well as their lifestyle practices. Ethical approval was obtained from Medunsa Research and Ethics Committee (Clearance no: MREC/PH/187/2008). Permission to conduct the study was also obtained from the Ministry of Health and from the Gaborone City Council. All participants gave a written informed consent prior to data collection. Descriptive statistics was used to determine frequencies and percentages for the various elements under study. Relationships were explored using Chi-square and Binary logistic regressions. $P \leq 0.05$ were considered statistically significant.

Results

A total of 500 completed questionnaires were retrieved of which 446 were useable, giving a response rate of 89.2%.

Socio-demographics

The results showed that more females 293 (65.7%) participated in this study than males 153 (34.3%) and slightly above half (54.9%) of the participants were married as depicted in Table 1. Most participants (54.7%) were in the age group of 41-50 years and 208 (46.6%) had secondary education compared 29 (6.5%) who had no formal education.

Table 1: Socio-demographic variables

Variable	Category	Frequency	Percent
Age (years)	20 - 30	16	3.6
	31 – 40	144	32.3
	41 – 50	244	54.7
	> 50	42	9.4

Gender	Male	153	34.3
	Female	293	65.7
Marital Status	Married	245	54.9
	Cohabit	34	7.6
	Divorced/separated	16	3.6
	Widowed	62	13.9
	Single	89	20.0
Education	Primary	122	27.4
	Secondary	208	46.6
	Tertiary	87	19.5
	No education	29	6.5
Employment Status	Employed	235	52.7
	Unemployed	168	37.7
	Self-employed	43	9.6

As shown in Figure 1, a total of 217 (48.6%) of the participants reported the presence of a family history of hypertension compared to 229 (51.3%) who did not have a family history of the disease. Of those participants (217) who reported a family history of hypertension, 169 (77.8%) stated that it was related to their parents, 31(14.2%) to their grandparents and only 17 (7.8%) stated that their extended family members like uncles/aunts had the disease; indicating possible contribution of the family disposition to prevalence of hypertension.
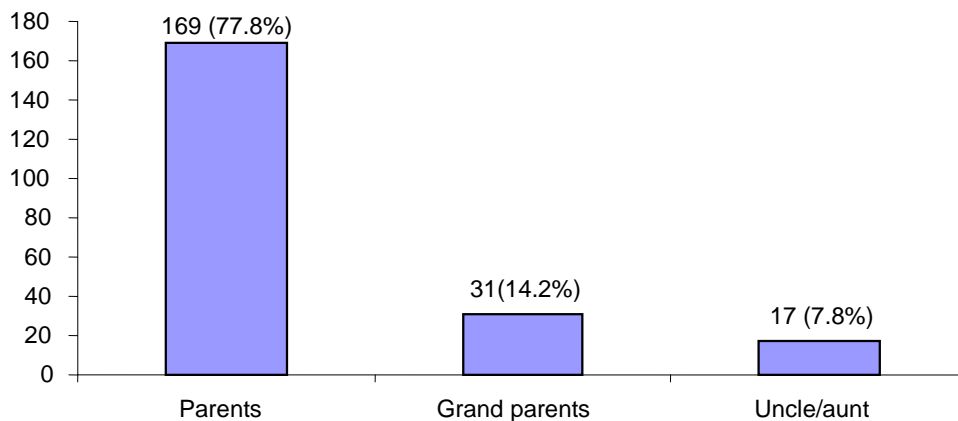
**Figure 1: Participants' family history of hypertension**

Knowledge of recommended lifestyle practices

Participant's knowledge of recommended lifestyle practices for hypertensive individuals was assessed and the results are summarised in Table 2. According to the results participants' level of knowledge varied from average to high as almost all of them 96.4% and 96.6% gave a correct response for practices related to prohibiting/preventing smoking and reducing the levels of stress respectively. However, almost equal proportions were noted of the knowledge related to restricting alcohol intake (65.2%), dietary requirements (66.3%) and physical activity in the form of exercise.

Table 2: Knowledge of recommended lifestyle practices for hypertensive individuals (n=446)

Knowledge of lifestyle practices	Correct Response (n)	Percentage (%)
No smoking	430	96.4
Controlling stress	431	96.6
Maintain weight of 15% or less of desired weight	296	66.3
Restrict Alcohol intake	291	65.2
Restrict sodium intake to 1.5 – 2.5 grams per day	296	66.3
Exercise 5 – 7 days a week for at least 1 hour	293	65.6

Regarding the overall distribution of participants' assessment of their knowledge regarding the acceptable lifestyle practices for persons with hypertension, the results showed that only 37% of the participants scored greater than 75% and cumulatively 59% can be rated as having acceptable knowledge of lifestyle practices in relation to their chronic disease.

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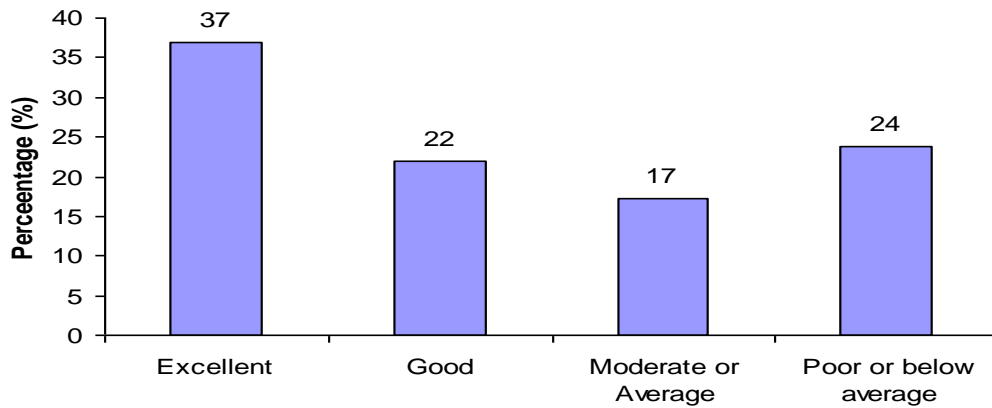
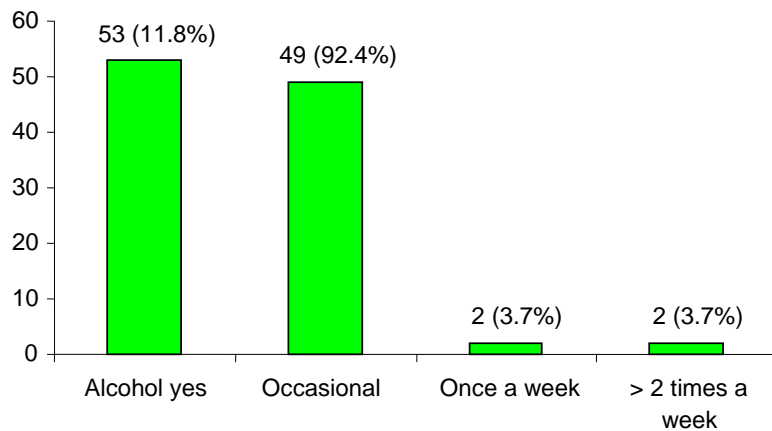**Figure 2: Participants' overall distribution of their knowledge of lifestyle practices**

Participants' lifestyle practices

Tobacco smoking and alcohol consumption

According to Figures 3 and 4 the results showed that 17(3.8%) of the participants indicated that they were smoking tobacco with a higher proportion (64%) who smoked 1 – 5 cigarettes per day. Furthermore the results revealed that 53 (12%) of the participants stated that they consume alcohol with the majority (92%) drinking occasionally. This might be due to fact that more females than males participated in this study.
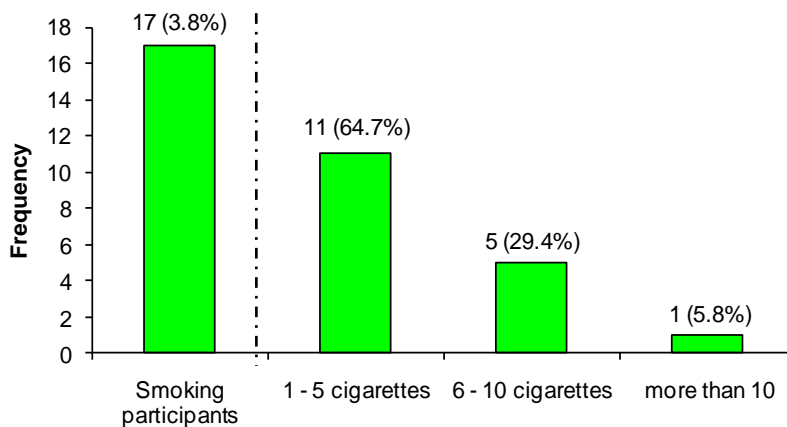

Figure 3: Frequency distribution of cigarette smoking and number of cigarettes per day

Figure 4: Frequency distribution of alcohol consumption and drinking frequency

Physical activity

Figures 5 and 6 present participants' responses on questions about their involvement and frequency of physical activity. The results showed that 300(67.2%) of them indicated that they were involved in some form of physical activity, mostly walking 206(68.7%) followed by jogging 100(33.3%) of which they did at least twice a week (173, 57.6%).

**Physical activity**   **Physical Activity Frequency**
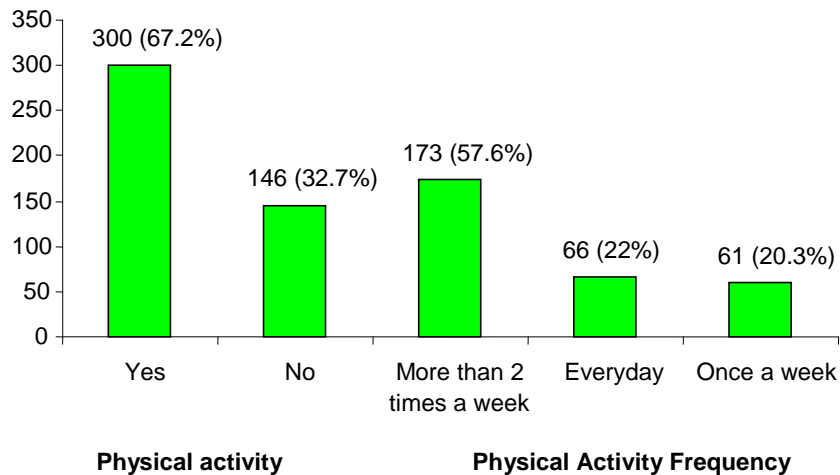
Figure 5: Participants' distribution of the frequency of physical activity
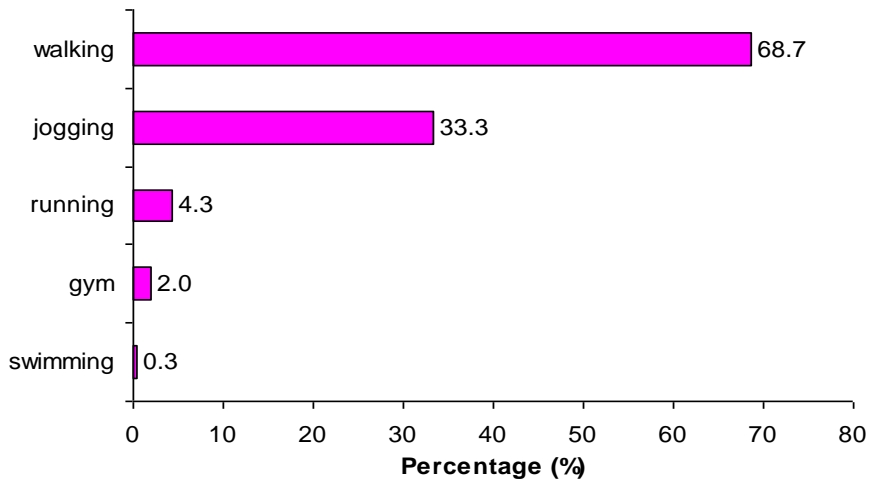
Figure 6: Participants' distribution of the type of physical activity

Dietary and eating practices

Participants were asked about their dietary and eating practices. The results showed that most of them (59.4%) indicated taking low salt and low fat diets, whiles 30.0% were taking a normal diet as shown in Figure 7. Participants were also asked about the frequency of their intake of breakfast, salt, fat and cholesterol foods and meat products. Most of the participants (61%) indicated having breakfast on a daily basis and avoiding the intake of fat and cholesterol foods (57%) everyday, while reported taking meat and food with salt almost everyday (Figure 8). There was a reported increase in the intake of fruits and vegetables (92.8%) and an increase in the intake of low fat dietary foods (78.9%) as shown in Figure 9.
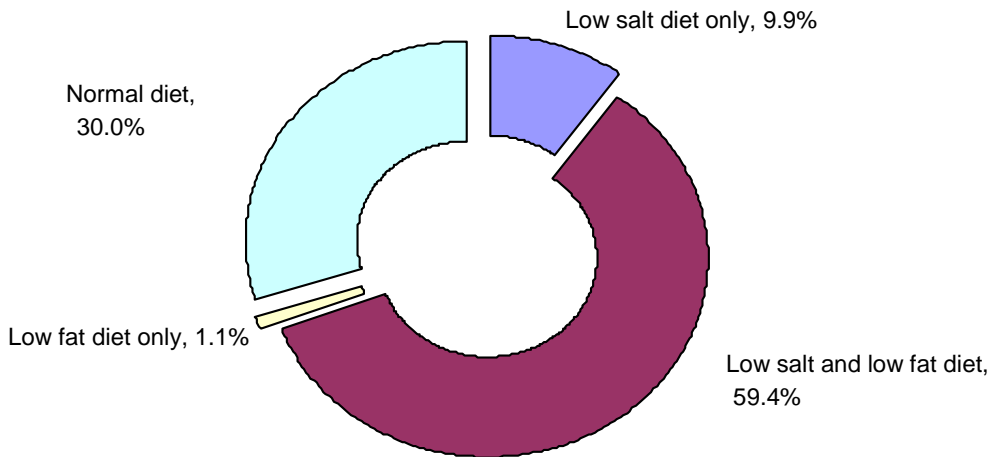
**Figure 7: Distribution of participants' dietary practices**

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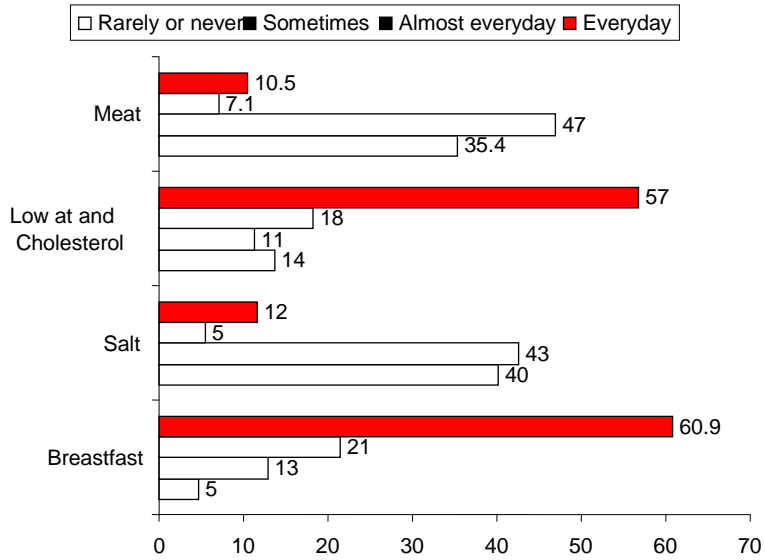
Figure 8: Frequency participants' intake of salt, meat, fat and cholesterol and breakfast
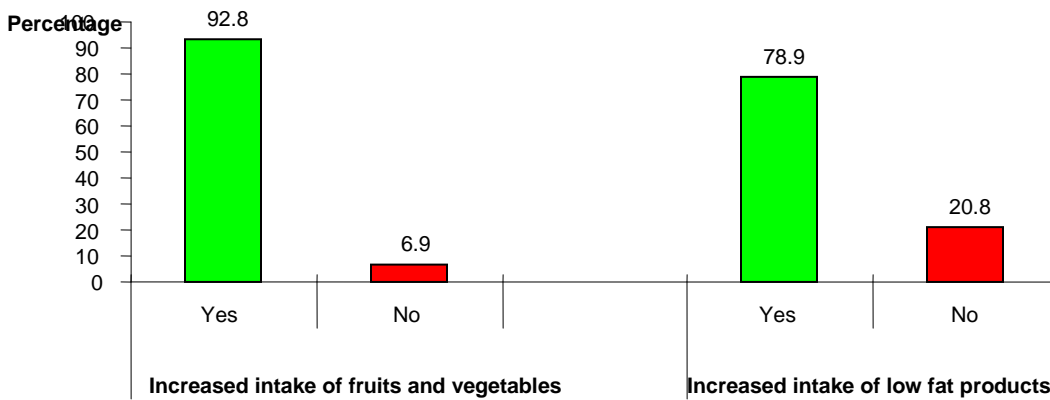
Figure 9: Participants' increasing intake of fruits, vegetables and low fat diet

As shown in Figure 10, the results showed that few participants reported to having gained weight recently (10.9%), trying to lose weight (17.0%) and dieting to lose weight (12%).
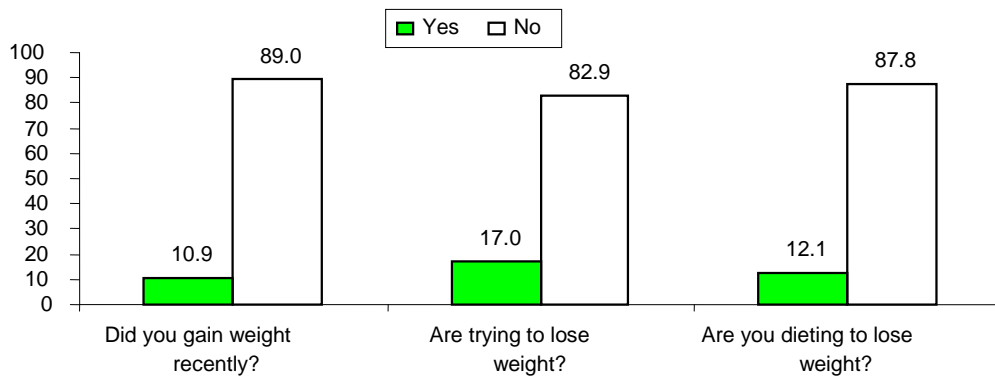
**Figure 10: Participants' weight management and lifestyle practices**

Association between lifestyle practices and knowledge of hypertension

According to the results, there was no significant difference between participants who smoked cigarette and non-smoker in relation to the level knowledge of hypertension (χ^2 = 1.468; p = 0.226). The results also showed that non-smokers were however more likely to know more about hypertension than smokers (OR = 1.995; CI: 0.639 – 6.225). A significant relationship between alcohol intake and knowledge of hypertension was revealed by the results (χ^2 = 4.140; p=0.042). Participants who do not consume alcohol had higher knowledge score (39.0%) than those who consumed alcohol (25.0%).

It was noted that knowledge of hypertension was significantly associated with being involved in physical activity (χ^2 = 4.357; p = 0.037). It was clear that physical activity was not really influenced by knowledge of hypertension or rather contradictory that those not involved in physical activity had higher knowledge score. However those with more than one type of physical activity had a significantly higher knowledge than those who reported less physical activity (80.0% as compared to 31.0%).

Association between dietary practices and knowledge of hypertension

With regards to dietary habits, no patterns of positive associations were observed between the knowledge and various aspects of dietary considerations that included salt intake, frequency of meals, fruits and vegetable intake. Fat and cholesterol contents in the diet was significantly associated with knowledge of hypertension (χ^2 = 13.972; p = 0.003). Those who avoided or ate rarely foods that contained fat and cholesterol had higher knowledge scores of hypertension, as shown in Figure 11.
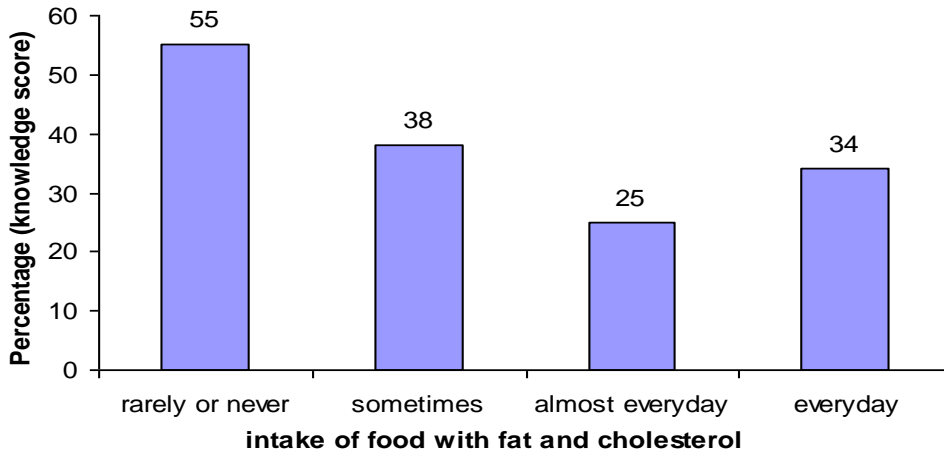
Figure 11: Association between intake of food with fat and cholesterol HPT knowledge

Association between weight gain and knowledge and hypertension

The results revealed no association between the knowledge of hypertension and having gained weight recently (χ^2 = 1.171; p=0.279). This may imply that knowledge of hypertension was not sufficient enough to determine choices about weight management. The results also showed that those who were trying to lose weight however had more knowledge of hypertension than those who did not intend to lose weight, among those who considered themselves as being overweight. Ninety-one percent (91%) of those who reported to be trying to lose weight had a good knowledge about hypertension (Figure 12).
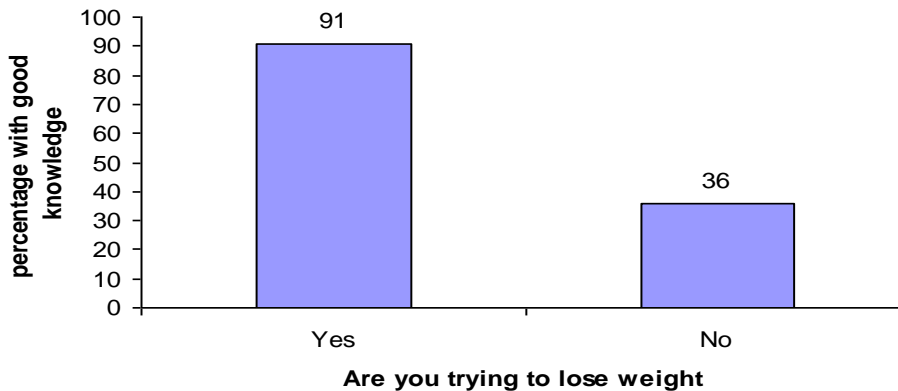
Figure 12: Knowledge of HPT and weight management among overweight participants

Discussion

The results presented indicate that the study sample consisted of more females than males, same result was found with a higher prevalence of hypertension in females in rural India (6.8% women 3.4% men) and Poland (72.5% women, 68.9% in men).[7] Similar findings were also reported in study relating to hypertension in Tanzania.[8] The reason for a higher prevalence of hypertension among females than among males in the current study could be

attributed to a higher attendance by women at the clinic where the sample was taken. Otherwise the disparity could also be attributed to the fact that female population was higher than male population in the study sample.

The present study also had more participants who were aged greater than 40 years of age. Similar finding with the NHSP of Pakistan showed that hypertension affects 18% of adolescents above 15 years of age and 33% of adults above 45 years of age.[9] Most of the participants at this age group are not involved in any form of physical activity or they have very low frequency of exercise. Coupled with other sources of social stress, poor life style practices are also associated with the older ages despite high knowledge of hypertension in these ages.

The results showed that the level of education for the majority of the participants in the present study was low. Out of the total participants, 46.6% had only attained secondary level education, followed by those who attended primary school. Although the findings in studies done in India[10] and Australia[11] reported that the majority of participants in their respective studies had obtained secondary and college level of education. The low level of education reported by participants in the current study could be attributed to the fact that only those with low income are coming to the Government clinics compare to those with higher income who are going to private clinic using their medical aid.

With regards to participants' marital status, the results showed that most of the participants were married, however those who indicated that they were divorced, had a higher knowledge of hypertension. It is assumed that this may be related to the social stress they had to go through and in process appreciated the knowledge of hypertension.

The current study confirms that participants' sources of income were mostly personal (self-employed) and a combination of partner support and some had combined income greater than BWP 2000.00 (approx 250 USD). On the contrary, other studies have shown that hypertension was more common among the urban poor from Ibadan in Nigeria (17%), and substantially more prevalent in salaried workers in Harare, Zimbabwe (26%). [12, 13] However, both lower-income groups (because of socioeconomic stress, lack of access to facilities, and poor diet) and higher-income groups (because of obesity, dietary excess, alcohol consumption, and lack of exercise) may be at increased risk of developing hypertension.

The findings of this study indicate that the overall knowledge of hypertension among the hypertensive patients who participated in the study was average. The participants lacked knowledge relating to general knowledge of hypertension, signs and symptoms of hypertension and some recommended lifestyle practices. Knowledge is a critical determinant of behaviour change and lifestyle practices. Other factors are critical in translating this knowledge to actual practices. The social, economic and environmental factors are also important. Raised knowledge through health education and health promotion heavily influences lifestyles change, which means that people should adapt to behaviours or lifestyles that help them maintain an optimal health status. The health belief model suggests that individual must perceive themselves to be at risk of the health threat before taking actions to reduce risk behaviour or engaging in alternative health behaviour. Since knowledge is often a precondition to understanding the need for lifestyle practices, the individuals with hypertension need to know that they are at risk of getting an uncontrolled hypertension and other related complications, despite the fact that they are already on treatment and, consequently, they need to have sufficient knowledge about hypertension and complications.

The presence of a family history of hypertension was common in almost half of the participants in this study, mostly was related to parents and followed by grandparents indicating possible contribution of the family disposition to prevalence of hypertension. Such findings confirm that the genetic predisposition of hypertension in the community may be higher than expected. On the contrary in most of the developing countries hypertension is strongly influenced by the lifestyle practices and environmental factors other than genetic predisposition.[14, 15]

In this study a small proportion of participants indicated that they were smoking cigarette, mostly 1–5 cigarettes per day, whiles those who reported to consume alcohol indicated to drink it occasionally. Such findings related to participants' low smoking and alcohol consumption levels could be attributed to the fact that these were self-reported responses and some participants might not have disclosed their true lifestyle practices related to cigarette smoking and alcohol consumption.

Regarding participants' involvement and frequency of physical activity, findings of this study showed a high proportion (67%) of participants who were involved in regular exercise for at least twice a week.

Participants were asked about their dietary and eating habits and most indicated taking both low salt and low fat diets. Most of the participants indicated having breakfast on a daily basis and avoiding the intake of foods high in fat and cholesterol foods. Another survey confirmed that after 17 trials; a reduced-salt diet results in a mean systolic blood pressure of 5 mm Hg and diastolic blood pressure 3 mm Hg reductions.[16] Also, a reported increase in the intake of fruits and vegetables and increase in the intake of low fat diet foods among participants was noted.

The current study showed that the few participants reported to: having gained weight recently (11%), trying to lose weight (17%) and dieting to lose weight (12%). Such findings confirm the low level of practice in lifestyle modification to maintain a healthy body weight and a healthy lifestyle, even among those that rated themselves as overweight. Similar studies confirm our concern done with 18 trials and 2611 participants concluded that for overweight hypertensive patients, weight loss of 3% to 9% of body weight is associated with 3 mm Hg decreases in both systolic blood pressure and diastolic blood pressure.[17]

Findings of this study showed a significant association between knowledge and marital status ($\chi^2 = 10.139$; p=0.038). The widowed had the highest knowledge rate with 53% among all others, who scored almost the same rate. The higher knowledge of hypertension among widowed participants could be attributed to experience, of losing a relative or husband who died with this condition.

Although there was no significant association between age and knowledge of hypertension ($\chi^2 = 4.59$; p=0.101), there was evidence that the knowledge of hypertension increased with age. This increase of knowledge with age could be explain in the fact more you get exposed to the condition more you be learning the condition especially when you face some complications.

Findings of this study revealed a positive relationship between participants' knowledge of hypertension and their level of education ($\chi^2 = 24$; p < 0.001). Similarly another study showed that although the health education materials exist but many are written at too high a level for low-literate patients to comprehend essential points.[18] Consequently, with inadequate literacy those patients may not benefit from such educational efforts. Another study showed that patients with hypertension and inadequate functional health literacy level had higher systolic blood pressure readings than literate patients.[19]

Although those with family history of hypertension had higher level of knowledge related to hypertension (41% pass) as compared to 33% pass for those with no family history of hypertension, the association was not significant, but very close (Z statistic = 1.815; p = 0.0695).

There was a significant relationship between number of children and knowledge of hypertension ($\chi^2 = 8.33$; p = 0.04). This implied that the knowledge of hypertension increased with an increase in the number of children. This could be explained by the fact that pregnant women are questioned about a family history of hypertension during antenatal clinic visits or they could have experienced pregnancy induced hypertension during each pregnancy and subsequently received adequate health education related to the disease.

The results showed no significant difference between those who smoked cigarette and those who did not smoke in relation to the knowledge of hypertension ($\chi^2 = 1.468$; p = 0.226). The non-smokers were however more likely to know more about hypertension than smokers (OR = 1.995; CI: 0.639 – 6.225). There was a significant relationship between alcohol intake and knowledge of hypertension ($\chi^2 = 4.140$; p = 0.042). Those who did not consume alcohol had a higher knowledge score (39%) of hypertension compared to those who consumed alcohol (25%). Such findings could be due to the individual knowledge and experience about smoking and alcohol consumption.

This study confirms that knowledge of hypertension was significantly associated with being involved in physical activity ($\chi^2 = 4.357$; p = 0.037). It was clear that physical activity was not really influenced by knowledge of hypertension or rather contradictory that those not involved in physical activity had higher knowledge score. However those with more than one type of physical activity had a significantly higher knowledge level than those who engaged in one form of physical activity (80% as compared to 31%). Although, a study done in USA, showed that physical inactivity and unhealthy nutrition habits are underlying factors for an estimated 300000 deaths each year.[20]

No patterns were observed between knowledge and various aspects of dietary considerations that included salt intake, frequency of meals, fruits and vegetable intake. Fat and cholesterol content in diet was significantly associated with the knowledge of hypertension (χ^2 = 13.972; p = 0.003). The current study confirms our expectation by those who avoided or ate rarely foods that contained fat and cholesterol had higher knowledge scores. A similar study also revealed an association between an individual's knowledge of nutrition and successive dietary behaviour which has not always been directly linear or clear.[18]

There was no association between the knowledge of hypertension and gaining weight recently (χ^2 = 1.171; p=0.279). Such findings could imply that the knowledge of hypertension among participants was not sufficient enough to determine choices about weight management. Participants who were trying to lose weight however had more knowledge of hypertension that those who were not intending to lose weight, more especially among those who considered themselves as being overweight. Interestingly, a high proportion (91%) of those who reported to be trying to lose weight had a good knowledge of hypertension.

Conclusions and recommendations

This study confirms that a relation exists between the knowledge of hypertension, demographic factors and lifestyle practices among participants. Similar findings confirm moderate to strong relation between those factors in others countries, [21] and a cross-sectional study of hypertension had done in Hei Yi Zhuang and Han populations show the association with different dietary habits, lifestyle choices, education level, and demographic level.[22] Thus, hypertension is a chronic but preventable disease; and thus adequate knowledge of the disease and lifestyle modification are important features in its effective control and management.

Genetic disposition was higher than expected, as measured by the family history of hypertension. Family intervention models or packages are necessarily as some hypertension may be related to family social construction than the actual genetic imprint as evidence has shown in developed countries that hypertension is related to lifestyle practices to a greater percentage.

This study discloses the need of a comprehensive health education and health promotion programme targeting patients who are at risk and the community in general. The programme should be based on areas highlighted by the present study including general knowledge of hypertension, signs and symptoms of hypertension and knowledge of the recommended lifestyle practices. Behavioural interventions are required to translate the knowledge to behavioural change in attitudes and life style practices.

References

1. World Health Organization. 2002. *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*. Geneva: World Health Organization.
2. Statistics by country for hypertension, US census bureau, International Data Base, 2004.
3. Local Experts focus on problems of Detecting and treating Hypertension in Africa First Pan-African meeting on Hypertension, which took place December 2-5, 2005 in Yaoundé, Cameroon. *Medscape Cardiology.* 2006; 10(1).

4. Cooper RS, Rotimi CN, Kaufman JS, Muna WFT, Mensah GA. Hypertension treatment and control in sub-Saharan Africa: the epidemiological basis for policy. *BMJ.* 1998; 316: 614–617.
5. Cappuccio FP, Micah FB, Emmett L, Kerry SM, Antwi S, Martin-Peprah R, Phillips RO, Plange-Rhule J, Eastwood JB. Prevalence, detection, management, and control of hypertension in Ashanti, West Africa. *Hypertension.* 2004; 43: 1017–1022.
6. Steyn K, Gaziano TA, Bradshaw D, Laubscher R, Fourie J. Hypertension in South African adults: results from the Demographic and Health Survey, 1998. *J Hypertens.* 2001; 19: 1717–1725.
7. Kearney, P.M., Whelton, M., Reynolds, K., Whelton, P.K and He, J. (2004). Worldwide prevalence of hypertension: a systematic review. *Journal of Hypertension,* 22(1) 11-19.
8. Bovet, P., Ross, A.G., Gervasoni, J.P., Mkamba, M., Mtasiwa, D.M., Lengeler, C., Whiting, D and Paccaud, F. (2002). Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania, and associations with socioeconomic status. *International Journal of Epidemiology,* (31) 240-247.
9. National Health Survey of Pakistan 1990–1994 (1998) Karachi, Pakistan: Pakistan Medical Research Council.
10. Pandian, J.D., Jaison, A., Sukhbinder S.D., Kalra, G., Shamsher, S., Lincoln, D.J and Abraham, G. (2005). Public Awareness of Warning Symptoms, Risk Factors, and Treatment of Stroke in Northwest India. *Journal of American Heart Association (Stroke)*, (36) 644-648.
11. Yoon, S.S., Heller, R.F., Levi, C., Wiggers, J and Fitzgerald, P.E. (2001b) Knowledge of Stroke Risk Factors, Warning Symptoms, and Treatment Among an Australian Urban Population. *Journal of American Heart Association (Stroke),* (32) 1926- 1930.
12. Akinkugbe OO, ed. *Non-communicable diseases in Nigeria: final report of a national survey.* Lagos: Federal Ministry of Health and Social Services, 1997.

13. Cooper RS, Puras A, Tracy JA, Kaufman JS, Ordunez PO, Mufunda J, et al. Evaluation of an electronic blood pressure device for epidemiologic studies. *Blood Pressure Monitoring* 1997; 2: 35-40.

14. Forrester T, Cooper RS, Weatherall D. 1998. Emergence of Western diseases in the tropical world: the experience with chronic cardiovascular diseases. *British Medical Bulletin*; 54: 463-73.
15. Salmond CE, Prior IA, Wessen AF. 1989. Blood pressure patterns and migration: a 14-year cohort study of adult Tokelauans. *American Journal of Epidemiology*; 130: 37-52.
16. He J, Whelton PK et al. Long-term effects of weight loss and dietary sodium reduction on incidence of hypertension, 2000 *Hypertension*; 35:5449.
17. Whelton, PK et al. sodium reduction and weight loss in the treatment of hypertension of older persons, 1998 *Journal of American medical association* 279:839-46
18. Williams MD, Baker DW, Parker RM, Nurss JR. Relationship of Functional Health Literacy to Patients' Knowledge of Their Chronic Disease. A Study of Patients with Hypertension and Diabetes. *Arch Intern Med.* 1998; 158:166-172.

19. Diagnostic update.com. Newsletter, version 12 May2007, p13.
20. McGinnis, J. M. and Meyers, L. D. (1995) Dietary changes and health: policy implications. *Behavioural Medicine*, 20, 165–169.
21. Beilin LJ, Puddey IB, Burke V. Lifestyle and hypertension. *Am J Hypertens* 1999; 12: 934–945.
22. Yin Ruixing, Li Hui, Wu Jinzhen, Lin Weixiong, Yang Dezhai, Pan Shangling et.al. Association of diet and lifestyle with blood pressure in the Guangxi Hei Yi Zhuang and Han populations, 2008 Cambridge journals [Abstract]