

Full Length Research Paper

Prevalence and severity of hypertension and associated lifestyle risk factors in a rural community in west Africa

Barbara A Clark MD¹, Andrew C Shannon², Alexander H Shannon³

¹ Associate Professor of Medicine, Temple University School of Medicine, Division of Nephrology and Hypertension, Allegheny General Hospital, 320 East North Ave, 4th Floor South Tower, Pittsburgh, PA 15212

² Student, University of Pennsylvania, School of Arts and Sciences, Philadelphia, PA

³ Student, Tufts University School of Medicine, Boston, MA 02215

Abstract

Rates of hypertension may be on the rise in Sub Saharan Africa, especially in more urban communities with greater access to high salt foods and a more sedentary lifestyle. Less is known about the prevalence and potential modifiable risk factors in rural Africa. Blood pressure (BP) screening was conducted in the rural community of Ouesse, Benin. 154 persons presented for screening. Of these, 101 had a known history of hypertension and 53 individuals were without known history. All screened were interviewed for other cardiovascular (CV) risk and lifestyle factors. The prevalence of hypertension was 28.3%, in those without known history. Other CV risk factors were low: obesity <10%, smoking 7%, reported diabetes 4%. Life style factors were notable for high level of physical activity, but low intake of daily fruit and vegetable (27%) and high rate of salting of foods (85%). Only 56.5% were on BP medications despite known hypertension and control was poor (only 24.8% <140/90). 67% were not aware of consequences of hypertension. In summary, the prevalence of hypertension is high even in this non sedentary rural community with low rates of obesity. Salt intake is high and fruit and vegetable intake low. The majority of those with known hypertension did not have adequate control and more than half were not taking any medications. Areas for intervention include counseling on diet, consequences of hypertension, regular screening and the importance of continued regular physical activity.

Keywords: Hypertension, lifestyle risk factors, West Africa.

INTRODUCTION

Rates of hypertension may be on the rise in Sub Saharan Africa (Addo et al., 2004; Cappucio et al., 2004; Cooper et al., 1997; Kearney et al., 2005; Mittal et al., 2010; Mybana et al., 1998; Opie et al., 2005; Seedat et al., 1982; Seedat, 2000; Styen et al., 2001). Hypertension has significant associated morbidity and mortality and impacts on individual as well as the health care resources of the community (Ayodele et al 2010, Hossain et al., 2009; Jamerson et al., 2011; Narayan et al., 2010; Saran et al., 2010). Hypertension has genetic as well as environmental influences, (Chobanian et al 2003, Sacks et al., 2010; Seedat, 2000). Desirable lifestyle

modifications may delay the age of onset or severity of hypertension (Chobanian et al., 2003). While lifestyle modifications play an important role in hypertension management in western industrialized societies, less is known about the relevance of the generally recommended lifestyle modifications in the developing world (Ahmad et al., 2005; Dash et al., 1998; Sun et al., 2007; Wang et al., 2004). Establishing the burden of disease and community needs is essential to planning and implementation of public health practice. The burden of hypertension has been proposed to be higher in more urban communities with greater access to highly processed, high salt high fat foods and a more sedentary lifestyle (Addo et al., 2004; Kearney et al., 2005; Opie et al., 2005; Mittal et al., 2010; Mybana et al., 1998). The purpose of the present study was to establish the

*Corresponding Author E-mail: baclarkmd76@hotmail.com

Table 1. Demographics of the subjects screened for the group as a whole and then divided into those who carried a diagnosis of hypertension compared to those who had no known history of hypertension. Percentage in each group with normal blood pressure, pre hypertension, stage 1 and stage 2 hypertension

	Entire Group	Known HTN	No Known HTN
N	154	101	53
Systolic	147±3	158±3	127±2
Diastolic	89±1	94±2	80±2
Age	49.5±1.3	53.3±1.5	42.2±1.9
M/F	60/94	24/77	36/17
BMI	24.6±0.4	24.9±0.5	24.2±0.6
Normal BP	23.4%	10%	49%
Pre HTN	11%	15%	23%
Stage 1	22.1%	22%	23%
Stage 2	37%	54%	5.8%

prevalence and severity of hypertension in the rural community of Ouesse, Benin (where one of the investigators was stationed as a rural health advisor with the United States Peace Corps) and to identify any modifiable risk factors, such as dietary salt use, intake of fruits and vegetables, smoking, obesity and sedentary lifestyle. The community has an estimated population of 10,000. It is located 330km from the commercial capitol of Cotonou and 30 km from the nearest paved road. There is no indoor plumbing and electricity is available for only a few hours each evening. Most of the homes are mud houses with tin or thatched roofs. The official language is French as Benin was a French colony before its independence 50 years ago. However, the majority of those interviewed did not speak French (or English). The interviews were conducted in French and translated into the one of 2 local languages (Nagot or Mahi) with the help of interpreters.

METHODS

One week before the screening took place, the local radio station announced that there would be blood pressure screening available from 8 am to noon for 5 sequential days at the local hospital. Permission was obtained from the local government administrator as well as the local doctor in residence at the hospital. All Blood pressures were taken by the same physician investigator after at least ten minutes of quiet sitting. If the blood pressure was greater than 130/80, it was repeated and the second reading was used for statistical analysis. Normotension was defined as a blood pressure of 120/80 mmHg or below, pre hypertension as systolic blood pressure between 121-139 mmHg or diastolic 81-89 mmHg, stage 1 as 140-159 mmHg or diastolic 90-99 mmHg, and stage 2 as systolic greater than or equal to 160 mmHg or diastolic greater than or equal to 100 mmHg. The

interview questions were approximately 5 minutes in duration and included assessment of other CV risk factors (such as known diabetes or smoking) and lifestyle issues (such as salting food, and intake of fruits and vegetable and level of physical activity). At the end of the interview, all participants in the screening were counseled on the importance of reduced dietary salt, increased intake of fruits and vegetables and continued regular daily physical activity of at least 30 minutes a day. Those with elevated blood pressure were advised to see their doctor or make an appointment with the local doctor in residence. Statistical analysis was performed using Chi-squared proportions with Fishers exact test to compare lifestyle prevalence between the 2 groups. Result were considered statistically significant at p values of <0.05.

RESULTS

One hundred and fifty four persons presented for screening. Of these, 101 (24M/77F; age 53±1.5; BMI 24.9±0.5) had a known history of hypertension and came for assessment of control. 53 individuals (36M/17F; age 42±2; BMI 24.2±0.6) were without known history of hypertension. This was the population used to determine prevalence. The other 101 were evaluated for degree of control, presence or absence of medication use. All screened participated in the interview regarding other CV risk factors and lifestyle issues and were asked if they were aware of the consequences or importance of hypertension. The prevalence of hypertension in this undeveloped community is high at 28.3%, in those with no known history (table 1). Other cardiovascular risk factors were low: obesity 10% with BMI≥30, smoking 7%, reported diabetes 4% (table 2). Life style factors were notable for high level of physical activity (90% walk more than 30 minutes every day). This is generally by necessity as there is limited access to motorized vehicles

Table 2. percentage of: those on blood pressure medication, reported diabetes, smoking, daily addition of salt to food, not consuming fruits and/or vegetables every day, not walking at least 30 minutes a day, and awareness of the importance/consequences of hypertension

	Entire Group	Known HTN	No Known HTN
On meds	43.5%	66%	0
DM	2.6%	4%	0
Smoking	7.1%	5%	11.5%
Salt foods	85.7%	82%	94%
No daily F/V	26.6%	19%	41.5%
Walk <30 min	10.4%	13%	5.6%
Awareness	33.1%	37%	26%

and walking is the primary mode of transportation. However, there was somewhat limited access to daily fruit and vegetable use with 27% reporting no daily fruit and vegetable intake. This is likely related to the remoteness of the location, (with market day only once a week where vendors bring in fresh fruit and vegetables) and lack of refrigeration. Use of salt was also high with 85% regularly adding salt to foods. Alcohol intake was also low with 65% reporting no alcohol intake, 30.5% reporting less than 2 drinks/day, and only 4.5% reporting more than 2 drinks/day. In those with known hypertension, control was poor with only 24.8% with a BP of less than 140/90. 22% had stage 1 hypertension and 54% had stage 2 hypertension (figure 1). Only 56.5% were on BP medications despite known hypertension. This may reflect issues of access to dispensaries as well as cost issues. Although some of it could be to lack of education, as 67% said they did not know why hypertension was important and were not aware of consequences of hypertension. However, in those with known hypertension, there appeared to be an increased awareness of the need for salt restriction (18% reported no added salt as compared with 6% in the group with no known history, $p < 0.05$) and 81% reported daily fruit and vegetable intake as compared to only 54.5% in the group with no known history, $p < 0.01$). This group was also less likely to consume alcohol with 74% nondrinkers 26% less than 2 drinks/day and 0% with greater than 2 drinks/day compared to 47%, 39.6% and 13.2% respectively, in the group with no know hypertension history ($p < 0.05$). Participants were also asked about history of malaria. This was highly prevalent with 100% reporting a history of malaria. This speaks to the importance of this widespread public health risk in relation to that of hypertension.

DISCUSSION

In summary, the prevalence of hypertension is high (at 28%) but obesity, smoking and reported diabetes is low. However, given that testing for diabetes was not

performed and relied on patient history, the true prevalence might be underestimated. This is a rural community with an agrarian life style with many individuals working in the fields and limited access to vehicular transportation. In addition children spend a majority of time out of doors with outdoor games (such as soccer) and do not have regular access to television or computer. Hence the level of regular physical activity is high. This may be why the rates of obesity and reported diabetes are low. However, despite low rates of obesity, one of the major risk factors for hypertension in the western world, the rates of hypertension in this active non obese society are high. One limitation of the study could be that those presenting for screening might have been those more concerned about the possibility of hypertension for a number of reasons (we did not ask about positive family history of hypertension) and may not represent that of a true random sampling. However, even if the prevalence is an over estimate, it is still higher than expected for a non- sedentary, non-obese population. This raises a concern for potential worsening of the overall health of the community with increased development and "modern" conveniences such as automobiles. Thus, the incidence of hypertension has the potential to go even higher, as does the rate of obesity and diabetes. Others have reported the prevalence of hypertension to indeed be higher in an urban Sub-Saharan African population than in a rural one and maybe as high as 50% in those over age 65 (Cappuccio et al., 2004). Similar trends have been observed in other developing nations, such as in India after migration from a rural to urban community (Dash et al., 1994). At present, two of the most important lifestyle modifications, weight loss and physical activity are presently not issues to address in this community other than education to reinforce the continued benefit if circumstance change.

An area that we identified that may represent a potential for intervention is the relatively high salt intake in this community, with most individual regularly adding salt to food. Interestingly those with a known history of hypertension were more likely to avoid salt, although this

still represented the minority of individuals. Since salt sensitivity has been shown to play strong role in hypertension in those of African ancestry, this may represent an important area for education and intervention (Chobanian et al., 2003; Sacks et al., 2010). Another potential area for intervention in this community is the intake of fruits and vegetables. Regular daily intake of at least 3 servings a day of fruits or vegetables has been shown to help control hypertension and is part of the DASH diet recommendations (Chobanian et al., 2003). This may be more problematic in this community, however, given the remoteness of the location (with limited delivery of outside goods), the lack of refrigeration for preservation and the arid climate with periods of drought limiting what can be locally grown. Intake of canned vegetables may contribute to increased sodium intake and furthermore is expensive and considered a luxury item. Promotion and distribution of means to cultivate easily grown, high potassium crops such as tomatoes and squash might be a cost effective public health measure in this community. All participants in the screening were counseled on the importance of reduced dietary salt, increased intake of fruits and vegetables, and continued regular daily physical activity of at least 30 minutes a day. Reported alcohol intake was also low, but could have been under reported due to the nature of the open interview. Intake of more than 2 drinks per day was exclusively in males between the ages of 29-60 without a known history of hypertension. Younger males also tended to be the smokers, with only 2 women in the entire group reported smoking and only 2 men over age 60. Continued education about the harmful effects of smoking to help maintain these low rates (or get them even lower) would also be of value.

Knowledge about the consequences or importance of hypertension was low at 37%, even in those with known history of hypertension and was even lower in those without a known history (26%). While we inquired about the awareness of the importance of hypertension, others have reported that even the awareness of the presence of hypertension is low (41-67% among those with known hypertension in South Africa and similarly 35.6 to 57% in a remote Asian population) (Ahmad et al 2005, Styen et al 2001, Wang et al., 2004). This is compared to awareness rates in the US of 70% (Chobanian et al., 2003). This lack of awareness of hypertension in the developing world has been postulated, in part due to poor access to medical care and less education about health. Increased public awareness and education campaigns may be another area for more aggressive intervention with relatively little overall cost to the community. In our study, however, those with a known hypertension appeared to have better overall dietary knowledge as they were more likely to avoid salt and have fruits or vegetable daily, suggesting at least some awareness of the need for a "healthier"

diet. Increased education about the consequences of hypertension and need for regular screening, especially in a population where prevalence is high represents another area for public health initiatives. The majority of those with known hypertension did not have adequate control and more than half were not taking any antihypertensive medications. This is however, a little better than the rates of medication use (<30%) and control (<20%) reported by Addo et al., in a recent review of hypertension in the Sub-Saharan African population (Addo et al., 2004). Of note, these rates are not much different that in the US population from statistics in 1999-2000 where 59% were on medication (compared with 56.5% in our population) and only 34% had control (as defined as a BP <140/90) (compared with 24.8% of our population) (Chobanian et al., 2003; Mittal et al., 2010). The reasons for lack of medication use were not part of the interview in our study, but the local physician pointed to cost issues as well as the remoteness of some of the homes without close proximity to dispensaries. Salt intake might be predicted to remain high with urbanization; however, there could potentially be increased access to fruits and vegetables not readily available in more remote communities.

In summary, the prevalence of hypertension is high (at 28%) but obesity, smoking, and reported diabetes is low. The majority of those with known hypertension did not have adequate control and more than half were not taking any antihypertensive medications. The prevalence of hypertension has the potential to rise even high if urbanization occurs with a more sedentary lifestyle (which can also lead to obesity) and more access to processed high salt foods. With these changes the rates of hypertension and associated diseases such as CKD and CVD are also likely to rise. However, the salt intake already appears to be high, and fruit and vegetable intake is limited. Increased education about dietary sodium restriction and increased intake of fruits and vegetables represent two potential areas for intervention. Other areas for intervention include education to increase the awareness of the consequences of hypertension and need for regular screening and to continue education about the harmful effects of smoking to maintain low rates (or get them even lower).. Additional strategies aimed at wider availability of the least expensive generic medications are also needed.

ACKNOWLEDGEMENT

The authors wish to acknowledge Victor Kinnagbahoueh and Gilbert-Stephane Sognonvi for serving as interpreters for those participants not able to communicate in French or English. We also wish to thank Dr. Marc Conum, the physician in residence, for his cooperation and patient follow up.

REFERENCES

- Addo J, Smeeth L, Leon DA (2004). Hypertension in sub-Saharan Africa; a systematic review. *Hypertension*. 50 (6): 1012-18.
- Ahmad K, Jafar TH (2005). Prevalence and determinants of blood pressure screening in Pakistan. *J. Hypertens*. 23(11): 1979-84.
- Ayodele OE, Alebiosu CO (2010). Burden of Chronic kidney disease: an international perspective *Advance in Chronic Kid Dis*. 17(3): 215-224.
- Cappuccio FP, Micah FB, Emmett L, (Kerry SM, Antwi S, Martin-Peprah R, Phillips RO, Plange-Rhule J, Eastwood (2004). Prevalence, detection, management and control of hypertension in Ashanti, West Africa. *Hypertension*. 43(5):1017-22.
- Chobanian AV, Bakris G, Black HR, Cushman WC, Green La, Izzo JL, Jones DW, Materson BJ, Oparil S, Wright JT, Roccella EJ (2003). The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure. The JNC 7 Report. *JAMA* 289(19): 2560-2572.
- Cooper R, Rotimi C, Ataman S, McGee D, Osotimehin B, Kadir S, Muna W, Kingue S, Fraser H, Forrester T, Bennett F, Wilks R (1997). The Prevalence of hypertension in seven populations of West African origin. *Am. J. Public Health*; 87(2): 160-8.
- Dash SC, Sundaram KR, Swain PK (1994). Blood pressure profile, urinary sodium and body weight in the "Oraon" rural and urban trial community. *J. Assoc. Phy. India* 42 (11):878-880.
- Hossain MP, Goyder EC, Rigby JE, El Naha M (2009). CKD and poverty: a growing global challenge. *Am. J. Kidney Dis*. 53(1):166-174.
- Jamerson KA, Townsend RR (2011). The attributable burden of hypertension: focus on CKD. *Advance in Chronic Kid Dis*. 18(1): 6-10.
- Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J (2005). Global burden of hypertension : analysis of worldwide data. *Lancet* 365(9455):217-223.
- Mbanya JC, Minkoulou Em, Salah JN, Balkau B (1998). The prevalence of hypertension in rural and urban Cameroon. *Int. J. Epidemiol*. 27 (2):181-185
- Mittal BV, Singh AK (2010). Hypertension in the Developing World: Challenge and Opportunities. *Am. J. Kid Dis*. 55(3): 590-598.
- Narayan KMV, Ali M, Koplan JP (2010). Global noncommunicable diseases: where worlds meet. *N. Engl. J. Med*. 363 (13): 1196-1198
- Opie LH, Seedat YK (2005). Hypertension in sub-saharan African populations. *Circulation*. 112(23):3562-68,
- Sacks FM, Campos H (2010). Dietary therapy in hypertension. *N. Engl. J. Med*. 362(22): 2102-2112
- Saran R, Hedgeman E, Huseini M, Stack A, Shahinian V (2010). Surveillance of chronic kidney disease around the world: tracking and reining in a global problem. *Advance in Chronic Dis*. 17(3):271-281.
- Seedat YK (2000). Hypertension in developing nations in Sub-Saharan Africa. *J Hum Hypertens*. 14 (10-11): 739-747.
- Seedat YK, Seedat MA, Hackland DB (1982). Prevalence of hypertension in the urban and rural Zulu. *J Epidemiol Community Health*. 36 (4): 256-261.
- Styen K, Gaziano TA, Bradshaw D, Laubscher R, Fourie J (1998). South African Demographic and Health Coordinating Team. Hypertension in South African adults: results from the demographic and health survey, *J. Hypertens*. 2001; 19 (10): 1717-25.
- Sun Z, Zheng L, Wei Y, Jue L, Xinzhong Z, Xingang Z, Shuangshuang L, Changlu X, Jiajin L, Fenfen Z, Guanghui D, Dayi H, Sun Y (2007). The prevalence of prehypertension and hypertension among rural adults in Lianoning Province of China. *Clin. Cardiol*. 30(4):183-7.
- Wang Z, Wu Y, Zhao L, Li Y, Yang J, Zhou B (2004). Trends in prevalence, awareness, treatment and control of hypertension in the middle aged population of China, 1992-1998. *Hypertens Res*. 27(10):703-9.