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Hypertension prevalence and awareness among a health workforce in Nigeria

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ABSTRACT: Hypertension is now being widely reported in Africa and it is a major factor in the high mortality of adults in sub-Saharan Africa. Unfortunately hypertension is often unnoticed and undiagnosed because it is usually asymptomatic. As such, many people with hypertension are unaware of their condition. The aim of the study was to determine the prevalence of hypertension and related risk factors and to assess the level of awareness of hypertensive status among the health workers. This study is a descriptive survey carried out among the health workers at the Baptist Medical Centre Ogbomoso, Nigeria. A total of 324 consenting health workers of the institution were enrolled for the study. A standardized questionnaire was used to collect socio-demographic data. Measurements of blood pressure, weight and height were carried out and body mass indices were calculated.The prevalence of hypertension is 20.1% in the studied population. A strong association was found between the prevalence of hypertension and increasing age, body mass index, alcohol consumption and duration of employment. Awareness of hypertensive status was good as 64.7% of the hypertensive subjects in this study were aware of their status.There is a higher awareness of hypertensive status among the health workers in this study than in the general populace. Approximately a third of the health workers were however unaware of their hypertensive status. This demonstrates the asymptomatic nature of the disease and as such routine screening is very important even among health workers.

KEY WORDS: *Awareness; Health workers; Hypertension; Nigeria; Prevalence*

INTRODUCTION

According to a World Health Organization publication, hypertension and other cardiovascular diseases are among the main chronic diseases in the developed and developing countries consuming an important proportion of their public health budget[1]. It is estimated to affect about 20% of the adult population in most countries of the world, and accounts for 20 – 50% of all deaths[1].

Hypertension is defined as a persistent elevation of blood pressure (BP) above the normal range[2]. The acceptable cut off point currently used according to the seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of systemic hypertension (JNC-7) is systolic blood pressure (SBP) of ≥140 mmHg and or diastolic blood pressure (DBP) of ≥90 mmHg[3]. Hypertension prevalence rate is high among people exposed to such risk factors as smoking, excessive alcohol consumption, obesity, excessive sodium consumption and undue stress[4]. A literature search of MEDLINE of studies published from January 1980 through July 2003 reported a varied prevalence of hypertension around the world, with the lowest prevalence in rural India (3.4% in men and 6.8% in women) and the highest prevalence in Poland (68.9% in men and 72.5% in women)[5]. In developing countries, studies have projected an increase of 80% in the number of hypertensives by the year 2025[6]. In a study of seven populations of

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West African origin by Cooper *et al*[7] in 1997, the prevalence of hypertension was 15% in Nigeria and Cameroon. In the 2003 Cameroon Burden of Diabetes Baseline Survey the prevalence of hypertension in the study population was 24.6%[6]. In 2003, Cappuccino *et al*[8] in Ghana found a hypertension prevalence of 28.7 %. In 2004 Erhun *et al*[9] carried out a study in a university community in South-western Nigeria, and the overall crude prevalence of hypertension was 21% in the respondent population. Oghagbon *et al*[10] in 2008 found a prevalence of 27.1% in a study carried out among a group of workers in southwest Nigeria. In all the above studies hypertension was defined as systolic blood pressure of ≥140mmhg and or diastolic blood pressure of 90mmHg. Hypertension is thus now being widely reported in Africa and it is a major factor in the high mortality of adults in sub-Saharan Africa.

Unfortunately hypertension is often unnoticed and undiagnosed because it is usually asymptomatic, and as such, many people with hypertension are unaware of their condition. The level of awareness of hypertension varies considerably between countries and regions. In economically developed countries, there were relatively high levels of awareness, with approximately one-half to two-thirds of hypertensives aware of their diagnosis[5]. Report from the non-comminucable disease survey study of 1997 showed that only about a third of Nigerians who were hypertensive were aware of their condition[4]. In a study carried out in urban Cameroon, in 2003 only 23% of all hypertensive patients were aware of their status[6]. In 2003, Cappuccino *et al*[8] in Ghana found that out of the 291 respondents diagnosed with hypertension, only 22% had prior knowledge of their condition. While in a Brazilian city population study a total of 72.9% of the hypertensives knew about their disease[11].

Hypertension is on the increase in Africa but it appears that awareness of this condition remains very poor in most parts of Africa. The aim of this study was therefore to determine the prevalence of hypertension and the associated factors and to find out the level of awareness of hypertensive status among the health workers of the Baptist Medical Centre Ogbomoso, Nigeria.

METHODOLOGY

Approval for the study was obtained from the hospital's committee on the ethics of human experimentation before the commencement of the study, which was conducted between July 2008 and January 2009. The study was carried out in the work place and informed consent was obtained from all the subjects before being enrolled for the study.

Ogbomoso is a town located about 100 kilometres north of Ibadan, the capital of Oyo State, in the south-western part of Nigeria. Baptist Medical Centre, which was the hospital base for this study, is a two hundred bed mission hospital founded in 1907.

The study was a cross-sectional descriptive survey. All pregnant women were excluded from the study. The age, sex, marital status, religion, nationality, occupation, educational status, physical activity, family type, history of alcohol consumption or cigarette smoking, history of hypertension, family history of hypertension, history of diabetes, ethnic group, and level of education were obtained from the subjects using a structured questionnaire. The blood pressure, weight and height were measured and filled into a recording schedule.

The blood pressure was measured using the same mercury sphygmomanometer (Accoson®) with appropriate cuffs and a Littmann® stethoscope on the left arm of all the subjects in the sitting position after 5 minutes of rest. The cuff (about 12.5cm wide) of the sphygmomanometer was applied evenly and snugly around the bare arm with the lower edge at least 2.5cm above the ante-cubital fossa[2,3,9,10,12]. The cuff was inflated rapidly to about 30 mmHg above the level at which the radial pulse was no longer palpable. Thereafter the cuff was deflated slowly. As the cuff was being deflated slowly the investigator listened with a stethoscope placed over the brachial artery in the ante-cubital fossa. The onset of the first tapping sound (phase I) was taken as the systolic pressure, while the point of complete disappearance of the sound (phase v) was taken as the diastolic pressure for each subject[2,9,10]. The blood pressure of subjects was measured on two different occasions at least 5 minutes apart and the average was used for all the subjects[2,9,10,12]. The participants were considered to be hypertensive if they had a systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg, if they gave the history of hypertension or if they were on prescription medications for hypertension[9].

Body weight was measured using a bathroom weighing scale (Boss® made in China) that was calibrated for each patient. Subjects were weighed bare-footed in light clothing, same weighing scale was used for all the subjects and readings expressed in kilograms (kg) to the nearest 0.5kg. Height was also measured with the subjects standing upright, bare footed, back and heel against the wall facing forward using a collapsible standard metal ruler mounted against the wall, while the height was read by placing a ruler at the highest point of the subject's scalp and expressed to the nearest centimetres. The body mass index (BMI) (kg/m2) was used to define obesity[9,10]. The BMI was classified as follows: Underweight = BMI <18.5, Normal weight = BMI 18.5-24.9, Overweight = BMI 25.0-29.9 and Obesity = BMI ≥30.0. The subjects who engaged in leisure time physical

activity such as walking fitness training and sports for greater than or equal to three times per week lasting for thirty minutes on each occasion, were classed as being physically active[13].

Health workers were grouped according to World Health Organization global atlas of health workforce aggregated data[14]. Using this, the health workforce was classified into the following six(6) broad categories: Physicians and Dentists, Nursing and midwifery personnel, Pharmaceutical personnel, Laboratory personnel, Other health workers and Health management and support worker.

The Statistical Package for the Social Sciences® version 11 (SPSS Inc., Chicago, USA) was used for data analysis. Chi-square tests were performed to analyze the relationship between hypertension prevalence and other variables. A p-value of < 0.05 was set as the level of statistical significance.

RESULT

A total of three hundred and twenty four (324) health workers were enrolled for the study. This consisted of one hundred and forty three (44.1%) males and one hundred and eighty one (55.9%) females. The subject population consisted of more females than males with a female to male ratio of 1.2:1. The ages of the subjects ranged from 20 years to 65 years with a mean age of 41.1years ± 10.1 years standard deviation.

The single highest percentage of subjects in the study was represented by the age range 40 - 49 years old (35.8%), while there was a lower representation at the extreme age ranges; 20 - 29 years age range (15.1%) and 60 - 65 years age range (4.3%). The subjects were all Nigerians, the overwhelming majority (94.1%) were from the Yoruba ethnic group and most were married (83.1%). More than half of the study population (62.6%) had tertiary education (**Table 1**).

Almost thirty percent (29.9%) of the subjects were Health management and support workers, twenty five percent (25.0%) were nurses, a little over twenty four percent (24.1%) were other health workers, almost nine percent (8.6%) were Laboratory Personnel, almost seven percent (6.8 %) were Pharmacy personnel while slightly over five percent (5.6 %) were doctors (**Table 1**).

More than half (56.5%) of the subjects were physically active. Alcohol consumption was low as majority of the subjects 70.4% did not drink alcohol, most of the subjects (92%) were also non smokers (**Table 2**). About a quarter (25.6%) of the subjects had a positive family history of hypertension, while only a few (0.6%) had a history of diabetic mellitus. The prevalence of obesity was 9.9% in the study population (**Table 2**).

Of the 324 subjects 79.9% were normotensive while 20.1% were hypertensive. Thus the prevalence of hypertension is 20.1% among the studied population. Of the 65 hypertensive subjects, 42(64.7%) of them were aware of their status. The male to female ratio of hypertension is 2:1. The association between gender and systemic hypertension in this study was statistically significant (P< 0.05) (**Table 3**).

Of the 305 Yoruba subjects in the study 20.7% were hypertensive, both of the 2 Bini subjects were hypertensive (100%) while none of the subjects from the other ethnic group were hypertensive. The association between ethnic group and systemic hypertension was statistically significant (P< 0.05) (**Table 3**).

The highest percentage (34.4%) of hypertensive subjects came from among the subjects who had been in employment for 26-30 years, while the least percentage 8.0% of hypertensive subjects was seen among subjects with duration of employment of 1-5 years. Subjects with duration of employment of >25years had a significantly higher prevalence of hypertension (p<0.05) (**Table 3**).

Subjects from broken home had statistically higher prevalence of hypertension than those who were single (P< 0.05). The only widow in the study was not hypertensive. There was no significant association between hypertension and religion (P> 0.05). The highest percentage of hypertensive subjects was seen among the group with low academic qualification, (that is, subjects with primary and secondary education) which was 31.0% and 30.8% respectively. The association between level of education and hypertension was statistically significant (p<0.05) (**Table 3**).

There was a graded increase in the prevalence of hypertension with increasing age. Whereas none of the subjects in the 20-29 years age range were hypertensive, the prevalence of hypertension reached its peak with 36.0% among the 60-65 years age range. The association between increasing age and hypertensive status in this study was statistically significant P<0.05 (**Table 3**). The highest prevalence of hypertension (27.3%) was seen among pharmacy personnel, followed by other health workers (26.9%), followed by the health management and support workers (22.7%), then laboratory personnel (21.4%), doctors (11.1%) and nurses (9.9%). This finding was not statistically significant P>0.05 (**Table 3**).

The association between some risk factors and hypertension is shown in **Table 4**. The difference in hypertensive status between the physically active and the not physically active was not statistically significant. Subjects who were ex-alcohol drinkers had statistically higher prevalence of hypertension (34.7%) than those who drink occasionally (19.0%) and those who had never drank (15.4%) (P<0.05). In this study the only subject who was a daily smoker was also hypertensive, but smoking was not

found to be significantly associated with hypertension (P>0.05).

Only two subjects gave a positive history of diabetes mellitus and both were hypertensive. Also a positive family history of hypertension was

statistically associated with a higher prevalence of hypertension (P<0.05). Among the obese subjects 37.5% were hypertensive. Obesity was significantly associated with increased prevalence of hypertension (P<0.05) (**Table 4**).

Table 1: Socio-demographic characteristics of the subjects

Variables	Frequency (n)	Percentage (%)
Age		
20 - 29	49	15.1
30 – 39	90	27.8
40 – 49	116	35.8
50 – 59	55	17.0
60 – 65	14	4.3
Total	324	100
Sex		
Male	143	44.1
Female	181	55.9
Total	324	100
Ethnicity		
Yoruba	305	94.1
Others(Ibo, Ishan, Urhobo, Bini, Fulani)	19	5.9
Total	324	100
Marital status		
single	50	15.5
married	269	83.0
separated	4	1.2
widowed	1	0.3
Total	324	100
Level of Education		
No formal education	1	0.3
Primary education	29	9.0
Secondary education	91	28.1
Tertiary	203	62.6
Total	324	100
Occupational groups		
Doctor	18	5.6
Nurses	81	25.0
Pharmacy personnel	22	6.8
Laboratory personnel	28	8.6
Other heath workers	78	24.1
Health management and support workers	97	29.9
Total	324	100

Table 2: Risk factors and lifestyle characteristics of the subjects

Variables	Frequency (n)	Percent (%)
Physical activity of subjects		
Active	183	56.5
Inactive	141	43.5
Total	324	100
Alcohol		
Never	228	70.4
Ex-drinker	75	23.1
Occasional	21	6.5
Daily intake	–	–
Total	324	100
Smoking status		
Never smoked	298	92.0
Ex-smoker	24	7.4
Daily smoker	1	0.3
Occasional smoker	1	0.3
Total	324	100
Self reported history of Diabetes		
No	322	99.4
Yes	2	0.6
Total	324	100
Family History of Hypertension		
No	241	74.4
Yes	83	25.6
Total	324	100
Body Mass Index		
Normal	195	60.2
Overweight	80	24.7
Obese	32	9.9
Underweight	17	5.2
Total	324	100

Table 3: Association between some socio-demographic characteristics & hypertensive status

Variables	Hypertensive n₁(%)	Non Hypertensive n₂(%)	χ^2	p
Age range				
20 – 29	0(0.0%)	49(100.0%)		
30 – 39	12(13.0%)	78(87.0%)	24.91	0.001
40 – 49	30(26%)	86(74.0%)		
50 – 59	18(33%)	37(67.0%)		
60 – 69	5(36%)	9(64.0%)		
Sex				
Male	40(28.0)	103(72.0)	9.988	0.002
Female	25 (13.8)	156 (86.2)		
Ethnicity				
Yoruba	63(20.7)	242(79.3)		
Ibo	0(0.0%)	10 (100.0)		
Ishan	0(0.0%)	2(100.0)	12.303	0.03
Urhobo	0(0.0%)	4(100.0)		
Bini	2(100.0)	0(0.0%)		
Fulani	0(0.0%)	1 (100.0)		
Marital Status				
Single	1(2.0)	49(98.0)		
Married	63(23.4)	206(76.6)	12.375	0.006
Separate	1(25.0)	3(75.0)		
Widowed	0(0.0%)	1(100.0)		
Religion				
Christianity	64(19.9)	258(80.1)	1.125	0.289
Islam	1(50.0)	1 (50.0)		
Level of Education				
No formal education	0(0.0%)	1(100.0)		
Primary education	9 (31.0)	20(69.0)		
Secondary education	28(30.8)	63(69.2)	13.90	0.003
Tertiary	28(13.8)	175(86.2)		
Duration of employment in years				
1-5	10 (8.0)	115 (92.0)		
6-10	12 (24.5)	35 (74.5)		
11-15	13 (30.2)	30 (69.8)	24.965	0.002
16-20	12 (27.3)	32 (72.7)		
21-25	4 (17.4)	19 (82.6)		
26-30	11 (34.4)	21 (65.6)		
31-35	3 (30.0)	7 (70.0)		
Occupational groups				
Doctor	2(11.0%)	16(89.0%)		
Nurses	8(9.9%)	73(90.1%)	9.589	0.088
Pharmacy personnel	6(27.3%)	16(72.7%)		
Laboratory personnel	6(21.4%)	22(78.6%)		
Other heath workers	21(26.9%)	57(73.1%)		
Health management & support workers	22(22.7%)	75(77.3%)		

Table 4: **Association between some risk factors and systemic hypertension**

Variables n(%)	Hypertensive n$_1$(%)	Non Hypertensive n$_2$(%)	χ^2	P
Physical activity of subjects				
Yes 183(56.5)	41(22.4)	142(77.6)	1.439	0.230
No 141(43.5)	24(17.0)	117(83.0)		
Use of Alcohol				
Occasional use 21(6.5)	4(19.0)	17(81.0)		
Never 228(70.4)	35(15.4)	193(84.6)	13.144	0.001
Ex-drinker 75(23.1)	26(34.7)	49(65.3)		
Daily use 0(0.0)	0(0.0%)	0(0.0%)		
Smoking status				
Daily smoker 1(0.3)	1(100.0)	0(0.0%)		
Ex-smoker 24(7.4)	7(29.2)	17(70.8)		
Occasional smoker 1(0.3)	0(0.0%)	1(100.0)	5.638	0.131
Never smoked 298(92.0)	57(19.1)	241(80.9)		
Self reported history of Diabetes				
Yes 2(0.6)	2(100.0)	0(0.0%)		
No 322(99.4)	63(19.6)	259(80.4)	8.019	0.005
Family History of Hypertension				
Yes 83(25.6)	24(28.9)	59(71.1)	5.455	0.020
No 241(74.4)	41(17.0)	200(83.0)		
Body Mass Index				
Underweight 17(5.2)	5(29.4)	12(70.6)		
Normal 195(60.2)	28(14.4)	167(85.6)		
Overweight 80(24.7)	20(25.0)	60(75.0)	12.165	0.007
Obese 32(9.9)	12(37.5)	20(62.5)		

DISCUSSION

The prevalence of hypertension in this study is 20.1%. This is similar to the prevalence of 21% that was found in a worksite study by Erhun et al[9] in 2003 in a university community in Nigeria. It was however higher than the prevalence of 15% reported by Cooper et al[7] in Nigeria a little over a decade ago. Oghagbon et al[10] in a more recent study (2008) in Ilorin Nigeria, using the same criteria to define hypertension, found a much higher prevalence (27.1%).

The prevalence of hypertension was higher among the male subjects than among the female subjects. Male to female ratio of hypertension is approximately 2:1. Several studies support the finding that indicates that males were more likely to be hypertensive than females[9,10,15,16]. In contrast, some other studies did not find any gender difference in hypertension prevalence[8,17]. While van Rossum et al[18] in a study carried out among the Dutch elderly found that the prevalence of hypertension was higher among women than among men. Participants in their study were 55 years and above, this could account for the gender reversal in hypertension status seen in the study as studies have shown that females around this age tend to have more hypertensives than their male counterparts[18].

There is a significant association between the prevalence of hypertension and advancing age (P <0.05) in this study. Most other studies world-wide have also shown that the prevalence of hypertension increases with advancing age[10,15,16,19]. This has been attributed, in part, to increased peripheral vascular resistance due to the high

prevalence of atherosclerosis and arteriosclerosis in the elderly[10,16,17,20]. Hypertension prevalence also increased significantly with BMI (P<0.05). Such findings have been reported in many previous studies in Nigeria and in the MONICA project that involved 14 countries[9,10,15.20,21].

The prevalence of obesity of 9.9% was lower than 13.2% found among a group of workers in Ilorin by Oghagbon et al[10] but higher than the 2-8 % reported in earlier studies in Nigeria[10,21,22]. The slight increase in hypertension prevalence seen among the underweight subject in this study is at variance with the study carried out by Méndez-Chacón et al[23] whose study showed that being underweight is associated with lower risk of being hypertensive. The reason for the increase in prevalence of hypertension seen among the underweight subjects in this study was not immediately obvious.

Though the association of hypertension with the various healthcare groups was not statistically significant, it is pertinent to note here that the highest percentage of hypertension in this study was seen amongst healthcare workers who were not doctors and nurses.

In this study, the prevalence of hypertension was highest among the Bini subjects when compared to the other ethnic groups. The smaller representation of the Bini ethnic group (0.6%) in this study may have skewed the association between ethnicity and systemic hypertension unfairly in favour of the Bini tribe. There may be need however for assessment of BP pattern among the different ethnic groups in Nigeria.

Subjects who are from broken homes had the highest prevalence of hypertension (25.0%) when compared to the others. This could be due to other psychosocial factors associated with worries and increased family burden and this may have contributed to the increase in the prevalence of hypertension among these subjects.

In this study, as in most other international studies to date[24,25], the prevalence of hypertension was highest among the subject with primary and secondary education, 31.0%, 30.8% respectively (P< 0.05). Studies have shown that cardiovascular risk factors are known to vary inversely with level of education and to cluster among those with the lowest level of education[24,25].

There was no statistically significant difference in the prevalence of hypertension among the physically active and the not physically active subjects. In contrast other studies, both international and local have reported an association between being physically active and reduction in the prevalence of hypertension[26].

Though the only subject who was a current smoker was hypertensive, smoking was not statistically associated with hypertension in this study. Olatunbosun et al[16] in their study similarly found no relationship between smoking and hypertension.

Other studies however have reported a relationship between smoking and hypertension[26].

None of the subjects in this study gave a history of daily consumption of alcohol. Thirty-four point seven percent (34.7%) of those that were ex-drinkers were hypertensive and this was statistically significant. Studies have shown positive association between significant alcohol consumption (>2 units per day) and increase in the prevalence of hypertension[26].

The highest prevalence of hypertension (34.4%) was seen among the subjects who had duration of employment of 26-30 years. The association between the duration of employment and increased prevalence of hypertension has previously been documented by Landsbergis et al[27]. This finding is possibly due to the cumulative effect of exposure to high job strain resulting subsequently in the increase in hypertension prevalence. It may also be as a result of age-related effect of hypertension.

The prevalence of hypertension was 28.0% in those with positive family history of hypertension and 17.0% in those with no family history of hypertension. Family studies of hypertension and associated risk factors by Rotimi et al[28] showed that elevated blood pressure is more common in relatives of hypertensives than in relatives of normotensives, indicating a genetic input in the development of hypertension. Hypertension is a common accompaniment of diabetes mellitus[29]. In this study, all the subjects who were diabetic based on history were also hypertensive.

Among the hypertensive subjects in this study, 64.7% of them were previously aware of their hypertensive status. Awareness of blood pressure status is higher than what was found in the general populace. Kadiri et al[15] in a study carried out among urbanised workers in Nigeria found that 51.6% of hypertensive subjects were aware of their status. There thus is a higher awareness of hypertensive status among health workers in this study than the general populace but a significant percentage (35.3%) of health workers were unaware of their hypertensive status, this demonstrates the asymptomatic nature of the disease and as such routine screening is very important even among health care workers.

CONCLUSION

The prevalence of hypertension was high in this study. The highest percentage of hypertensive subjects was seen among subjects with low academic qualification. A strong association was found between the prevalence of hypertension and increasing age, body mass index, alcohol consumption and duration of employment. Awareness of hypertensive status was high as 64.7% of the hypertensive subjects in this study were aware of their hypertensive status. This is not

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surprising given that the study was conducted in the hospital and among health workers most of who are knowledgeable about hypertension. About a third of the hypertensive subjects were however unaware of their status. This is quite significant given the setting of the study. The diagnosis and monitoring of treatment of essential hypertension therefore requires accurate and repeated measurements of blood pressure[7,11]. Prevention and management of hypertension requires not only an increase in the awareness of hypertensive status, but also lifestyle modifications such as stopping cigarette smoking, increased physical activity, weight reduction, and healthy eating habits.

REFERENCES

1. Houtma I, Jettinghoff K, Cedillo L. Protecting workers: raising awareness of stress at work in developing countries, a modern hazard in a traditional working environment; advice to employers and workers. Geneva: World Health Organization publication; 2007. (Health series; No 6). Available from: http://www.who.int/occupational_health/publications/raisingawarenessofstress.pdf

2. A global brief on hypertension. World Health Day 2013. (Cited December 2014) Available from: http://www.who.int/cardiovascular_diseases/publications/global_brief_hypertension/en/

3. Chobanian AV, Bakris GL, Black HR, Cushman WC, et al. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*. 2003;42:1206-52.

4. Appel LJ, Champagne CM, Harsha DW, Cooper LS, et al. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. *JAMA*. 2003;289:2083-93.

5. Kearney PM, Whelton M, Reynolds K, Whelton PK, et al. Worldwide prevalence of hypertension: a systematic review. *J Hypertens*. 2004;22(1):11-9.

6. Kamadjeu RM, Edwards R, Atanga JS, Unwin N, et al. Prevalence, awareness and management of hypertension in Cameroon: findings of the 2003 Cameroon Burden of Diabetes Baseline Survey. *J Hum Hypertens*. 2006;20(1):91-2.

7. Cooper R, Rotimi C, Ataman S, McGee D, et al. The prevalence of hypertension in seven populations of west African origin. *Am J Public Health*. 1997 Feb;87(2):160-8.

8. Cappuccio FP, Micah FB, Emmett L, Kerry SM, et al. Prevalence, detection, management, and control of hypertension in Ashanti, West Africa. *Hypertension*. 2004;43(5):1017-22.

9. Erhun WO, Olayiwola G, Agbani EO, Omotoso NS. Prevalence of hypertension in a university community in south-west Nigeria. *Afr J Biomed Res*. 2005;8:15-9.

10. Oghagbon EK, Okesina AB, Biliaminu SA. Prevalence of hypertension and associated variables in paid workers in Ilorin, Nigeria. *Niger J Clin Pract*. 2008;11(4):342-6.

11. Moreira GC1, Cipullo JP, Martin JF, Ciorlia LA, et al. Evaluation of the awareness, control and cost-effectiveness of hypertension treatment in a Brazilian city: populational study. *J Hypertens*. 2009;27(9):1900-7.

12. Ofili AN, Omuemu VO. Knowledge and prevalence of risk factors for hypertension among workers in the banking industry in Benin City, Nigeria. Tropical J Health Sci. 2005;12:21-5

13. Physical activity and health: A report of the surgeon general. US department of health and human services. Centers for Disease Control and Prevention. Available from: http://www.cdc.gov/nccdphp/sgr/pdf/execsumm.pdf

14. World Health Organization. Global Atlas of the Health Workforce: definitions of the Health Workforce Data. [Online]. 2006 [cited 2008 July 28]; Available from: http://www.who.int/entity/hrh/en

15. Kadiri S, Walker O, Salako BL, Akinkugbe O. Blood pressure, hypertension and correlates in urbanized workers in Ibadan, Nigeria: a revisit. *J Hum Hypertens*. 1999;13(1):23-7.

16. Olatunbosun ST, Kaufman JS, Cooper RS, Bella AF. Hypertension in a black population: prevalence and biosocial determinants of high blood pressure in a group of urban Nigerians. *J Hum Hypertens*. 2000;14(4):249-57.

17. Kadiri S, Salako Bl. Cardiovascular risk factors in middle aged Nigerians. *East Afr Med J*. 1997;74(5):303-6.

18. van Rossum CT, van de Mheen H, Witteman JC, Hofman A, et al. Prevalence, treatment, and control of hypertension by sociodemographic factors among the Dutch elderly. *Hypertension*. 2000;35(3):814-21.

19. Franklin SS, Gustiti W, Wang ND. Haemodynamic pattern of age-related changes in blood pressure: the Framingham Heart Study. *Circulation*. 1997;96:308-15.

20. Wolf HK, Tuomilehto J, Kuulasmaa K, Dormakiene S, et al. Blood pressure levels in the 41 populations of the WHO MONICA project. *J Hum hypertens*. 1997;11:733-42.

21. Lawoyin TO, Asuzu MC, Kaufman J, Rotimi C, et al. Prevalence of cardiovascular factors in an African urban inner city community. *West Africa J Med*. 2002;21(3):208-11.

22. Okesina AB, Oparinde DP, Akindoyin KA, Erasmus RT. Prevalence of some risk factors

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of coronary heart disease in a rural Nigeria population. *East Afr Med J*. 1999;76(4):212-16.

23. Méndez-Chacón E, Santamaría-Ulloa C, Rosero-Bixby L. Factors associated with hypertension prevalence, unawareness and treatment among Costa Rican elderly. *BMC Public Health*. 2008;8:275.

24. Amoah AG. Hypertension in Ghana: a cross-sectional community prevalence study in greater Accra. *Ethn Dis*. 2003;13(3):310-5..

25. Cooper R, Rotimi C, Ataman S, McGee D, et al. The prevalence of hypertension in seven populations of West African origin. *Am J Public Health*. 1997;87(2):160-8.

26. Desai MH, Kavishwar A. A study on effect of life style risk factors on prevalence of hypertension among white collar job people of Surat. The Internet Journal of Occupational Health. 2009;1(1). https://ispub.com/IJOH/1/1/7310

27. Landsbergis PA, Schnall PL, Pickering TG, Warren K, et al. Life-Course exposure to job strain and ambulatory blood pressure in men. *Am J Epidemiol*. 2003;157:998-1006.

28. Rotimi CN, Cooper RS, Cao G, Ogunbiyi O, et al. Maximum-likelihood generalized heritability estimate for blood pressure in Nigerian families. *Hypertension*. 1999;33:874-8.

29. Arije A, Kuti M, Fasanmade A, Akinlade K, et al. Control of hypertension in Nigerians with diabetes mellitus: a report of the Ibadan Diabetic / Kidney Disease Study Group. *Int J Diabetes Metabolism*. 2007;15:82-6.