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Prevalence and risk factors of hypertension among Fulani herdsmen in Rural Community of Nigeria

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ABSTRACT

Hypertension is progressively becoming more prevalent in Nigeria and has not been studied in some demographics. The purpose of the study was to assess the risk factors and occurrence of hypertension among Fulani herdsmen in Nigeria. A descriptive cross sectional study on hypertension was conducted among Fulani herdsmen residing in rural communities of Ilorin East and Moro Local Government Areas (LGAs) of Nigeria, from the ages of 18 years and above. The eight hundred and seventy–two (872) subjects used in this study were sampled based on convenience as dictated by the inclusion and exclusion criteria and availability of subjects. The consenting subjects completed a standardized questionnaire. Blood pressure, weight and height were measured and recorded using standard calibrated equipment. Descriptive statistics and regression analysis were conducted. Of the 872 herdsmen, 351 (40.3%) were aged 18–30 years and 632 (72.5%) migrated from the North–West zone of Nigeria. Almost all (n=858, 98.4%) of the subjects were ignorant of hypertension. Overweight and obesity were uncommon among the subjects (0%). The occurrence of hypertension was 17.3% with overall average systolic blood pressure (BP) of 128.8±12.3 mmHg and diastolic BP of 84.0±8.0 mmHg. Risk factors of hypertension identified among these Fulani herdsmen were types of diet [OR 0.578; 95% confidence interval (CI) 0.113–1.418, p< 0.028], smoking habit [OR 5.147; CI: 1.023–25.884, p < 0.017] and age [OR 2.656; CI: 0.682–8.556, p < 0.031]. Majority of hypertensive herdsmen were not aware of their status. Public health awareness on the risk factors of hypertension such as smoking and diet type is essential to reduce the burden among this population.

KEYWORDS: Hypertension, Fulani herdsmen, Health awareness, Nigeria

INTRODUCTION

Hypertension like many other non–communicable diseases, is increasingly assuming epidemic proportion among the various populations. Hypertension affects about one billion people worldwide, causing nearly 7.1 million deaths on annual basis [1]. Hypertension is the most frequently encountered cardiovascular disease in Africans with congestive cardiac failure as its usual complication [2]. Other complications include renal failure, stroke, atherosclerosis and even death [3]. The World Health Organization (WHO) reported that cardiovascular diseases remained prominent causes of high morbidity and mortality, in the developed countries, and is constituting a pronounced public health challenge in the developing ones [4]. Between the year 2000 and 2003, the overall adult occurrence of hypertension in Nigeria was 15–36.6% ([5-7]. In Nigeria presently, hypertension is increasing rapidly [8]. A prevalence range of 13.5%–46.4% was observed among the rural dwellers in Nigeria [9, 10]. Also, Omuemu et al. [11] observed 18.5% of hypertensive burden in Edo State of Nigeria. About 28.7% prevalence was reported in Ghana and 16.9% in Cameroon, 10.35% in Ethiopia while 32.6% was recorded for the blacks in the United States of America [10, 12]. In Nigeria, cognizance, control and treatment of hypertension were generally low with attendant high burden and related complications. The asymptomatic nature of

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hypertension, environmental impact and the changing lifestyles are contributing to the increase of the disease [10]. It was also reported that hypertension awareness rate was 14.2% in the rural areas of Nigeria [9]. Most people realized to be hypertensive during medical consultation [13]. This disease is associated with various factors, such as level of education, gender, alcohol consumption, age, smoking, obesity, genetic constitution, family history, and occupation [14]. However, most rural dwellers in Nigeria lack social amenities including access to health care delivery system and standard education [15]. Majority of rural communities consult traditional healers and private health care providers, where routine monitoring of hypertension is lacking. However, rural community–based screening for hypertension can increase the number of people being diagnosed and its management [16].

Fulani herdsmen are traditionally nomadic, pastoralist traders. They herd cattle, goats and sheep across the vast dry hinterlands. They are the largest nomadic ethnic group in the world [17]. The herdsmen are also found in over 26 countries within the African continent. These include Nigeria: 15.3 million, Guinea: 4.6 million, Senegal: 3.2 million, Mali: 2.5 million, Cameroon: 2.5 million, Sudan: 1.9 million, Burkina Faso: 1.7 million, Niger: 1.7 million, Mauritania: 700,000, Benin: 450,000, Guinea Bissau: 333,000, Gambia: 320,000, Sierra Leone: 310,000, Chad: 285,000 and Central African Republic: 265,000 [18]. These herdsmen constitute the major breeders of cattle, the main source of meat; the most available and affordable source of animal proteins consumed by Nigerians [19]. The herdsmen were known to move from one village to another and cross many states before settling for a while, and returned back still trekking. Each return trip may last for several months and is their routine way of life. Cattle herding is a daunting task, not only toilsome, but also strenuous which may predispose herdsmen to hypertension. Furthermore, access to healthcare facilities in their nomadic environment is lacking. Studies on occurrence and awareness of hypertension among herdsmen are limited. On this background, this study was conducted to ascertain the occurrence of hypertension and sensitize the Fulani herdsmen on the risks of the disease.

MATERIALS AND METHODS

Setting of study

The capital city of Kwara State is Ilorin. It is situated 306 km inland from the coastal city of Lagos and 500 km from the Federal Capital, Abuja. There are 16 Local Government Areas (LGAs) in the State: Asa, Baruten, Edu, Ekiti, Ifelodun, Isin, Ilorin East, Ilorin South, Ilorin West, Irepodun, Kaiama, Moro, Offa, Oke–ero, Oyun and Pategi. Major towns include Offa, Omu–aran and Jebba, located on the Niger River. The State has a total population of 2,591,555 [20]. The principal groups residing in Kwara State are the Yoruba, Nupe, Bariba and Fulani. Ilorin East LGA of Kwara State is located in the transitional zone between the Southern and Northern Nigeria.

Study population

Ilorin East LGA has a total population of 204,310 and Moro LGA 108,792 at the year 2006 census [20]. In the Ilorin East LGA, the 14 villages visited for the screening exercise were Woru, Agbeyangi, Lajiki, Ogele, Jolasun, Mantami, Alade, Osin–gada, Beeri, Olooro, Ajelende, Marafa, Ipako–obo and Eleja. In the Moro LGA 10 villages viz; Gbugudu, Alfa, Maraya, Saki, Baako, Eleko–yangan, Gambe Oko, Ogbagba, Budu–Ode, Olo–Ode were visited. The consented subjects in the 24 villages were enrolled for the study.

Study design

This is a rural community–based, descriptive, cross sectional research carried out among Fulani herdsmen residing in 24 villages of Moro and Ilorin East LGAs of Kwara State, in the North–Central zone of Nigeria. The study was conducted from July to October, 2015. This was the peak of rainy season with rich vegetation for the cattle to feed. At this period, Fulani herdsmen were found at their settlements. Meetings with heads of family in the communities were held to discuss the purpose of the study. At each settlement, those members who were eligible and consented to participate were enrolled. The eligibility criteria include male, Fulani herding, and between age of 18 years and over. Those excluded were children below the age of 18 years, women and those who are not Fulani herdsmen.

Data collection

Study Instruments

All adults that were consented and participated in the study had their blood pressure (BP), weights and heights recorded. A pretested questionnaire was interviewer-administered to obtain information on the socio–demographic characteristics, risk factors for hypertension and history of drugs taken

by the respondents. All the respondents were able to speak Hausa language and this was used as a way of communication. The questionnaire was translated to Hausa language which was validated prior to administration. Cut-off values for hypertension is defined as systolic BP ≥ 140 mmHg and/or that of diastolic BP ≥ 90 mmHg based on the World Health Organization guidelines of 2002, and the Seventh Joint National Committee (JNC) on Hypertension of 2007 [21]. An automated BP monitor–Model M2 basic HEM–7116–E8(V) (Omron Healthcare Company Limited, Kyoto, Japan) for BP as well as calibrated Dual weight and height measuring scale–Model RGZ–160 (Medfield Medical, England) were utilized for the physical examinations of the subjects.

Measurements

Following informed verbal and written consent, the socio-demographic details of the participants were obtained. The subjects were allowed to rest for 15 minutes, and BP taken using left arm of each subject in the sitting position. BP measurements were made on three occasions per day at an interval of 5 minutes. The measurements were repeated weekly for three weeks for those subjects found to be hypertensive. The values obtained were averaged as the individual's BP. The grading systems of hypertension by JNC was followed; Normal (SBP < 120 mmHg or DBP 80 mmHg); pre–hypertension (SBP 120–139 mmHg or DBP 80–89 mmHg); stage 1 hypertension (SBP 140–159 mmHg or DBP 90–99 mmHg); and stage 2 (SBP > 160 mmHg or DBP > 100 mmHg). The weight and height of the patients were evaluated while standing on a calibrated Dual weight and height measuring scale. The Body Mass Index (BMI) of the subjects was computed as the weight in kilogrammes divided by the height in metre squared. The values of BMI for the subjects were grouped into four classes: Underweight/thin (BMI<18.5 kg/m^2), normal weight (BMI 18.5–24.9kg/m^2), over weight (BMI 25.0–29.9 kg/m^2) and obese (BMI ≥ 30kg/m^2) [22].

Education/Counselling

The subjects were educated on prevention, symptoms and complication of hypertension. These involve counselling of the subjects on the nature of hypertension, the advantages of BP monitoring as well as adherence to hypertensive medications. Also, lifestyle modification on diet that emphasizes eating fruits, vegetables, and low–fat dairy products, dietary sodium reduction, avoidance of alcohol consumption and smoking cessation were offered. In this study, all the subjects found to be hypertensive were referred to the nearest health institutions around the communities studied for further management. The intervention was conducted after the administration of questionnaires to the subjects.

Ethical Clearance

Ethical clearance for the approval of this study was obtained from Kwara State Ministry of Health, Chairmen of Moro and East Ilorin LGAs of Kwara State and heads of respective rural communities also gave consent for the study to be carried out.

Statistical analysis

The data collected were analyzed using Statistical Package for Social Sciences version–21 (SPSS Inc. Chicago, USA). Categorical data were expressed as frequencies, percentages and chart. Logistic regression analysis was used to assess the relationship between patient factors and hypertension. P–value of < 0.05 was considered to be statistically significant at 95% confidence interval.

RESULTS

The estimated number of herdsmen in the setting of study was 1,111 and 872 subjects participated. The participation rate was 78.5%. Age group of 18–30 years constituted the highest number (n = 351, 40.3%) of the subjects. The average age was 39.7 ± 2.3 years. Majority (n=756, 86.7%) had no formal education. Almost all (n=858,98.4%) of the subjects were ignorant of hypertension. Six hundred and seventy-eight (77.8%) of the subjects had normal weight and none of the subjects in this study were obese or overweight. Four hundred and five (46.4%) earned an average income of NGN40, 000 ($200) to NGN50, 000 ($250) monthly through sales of farm products and cattle (Table 1). Majority 846 (97.0%) migrated from North–West zone of Nigeria to settle in Ilorin East and Moro LGAs of Kwara State (Figure 1). Five hundred and eighty nine (67.5%) were feeding on plant products (vegetarians) and the rest were on plants and animal products (non–vegetarians) (Table 2).

Table 1: General characteristics of the Fulani herdsmen surveyed

Parameter	Frequency	%
Age group (years)		
18–30	351	40.3
31–40	207	23.7
41–50	175	20.1
51–60	89	10.2
60^{+}	50	5.7
Average age 39.7 ± 2.3		
Educational Status		
Illiterates	756	86.7
Quranic education	116	13.3
Language spoken		
Fulfulde and Hausa	872	100.00
Level of Awareness of the hypertension		
Aware	14	1.6
Not aware	858	98.4
Body Mass Index (Kg/m²)		
< 18.5 (thin)	194	22.2
18.5-24.9 (normal weight)	678	77.8
25-30 (overweight)	0	
> 30 (obese)	0	
Income per monthly (NGN)		
20,000.00–30,000.00	276	31.7
40,000.00–50,000.00	405	46.4
50,000.00–60,000.00	87	10.0
70,000.00–80,000.00	104	11.9

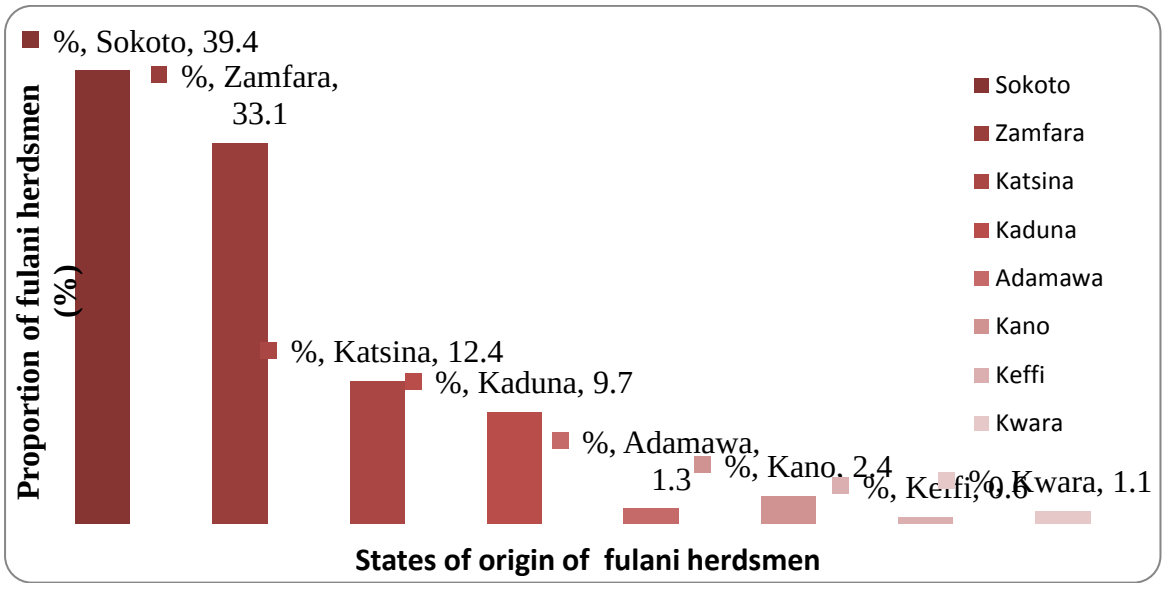

Figure 1: Distribution of herdsmen by states origin

Table 2: The majorly consumed diets of the Fulani herdsmen

Diets	Frequency	%
Tuwo mansara + vegetable/okro/kuka soup	474	54.3
Fura gero + raw cow milk (noonoo)	268	30.7
Guinea corn pap + sugar	79	9.1
Rice + mai–shaanu/palm oil	18	2.1
Rice + beans + mai–shaanu/palm oil	10	1.1
Yam + mai–shaanu/palm oil	8	0.9
Rice + beans + mai–shaanu + meat + egg	10	1.1
Yam + mai–shaanu/palm oil + chicken + fish	6	0.7

Table 3: JNC Classification of hypertension

BP(mmHg)	Frequency	%
Normal (SBP < 120 or DBP< 80)	721	82.7
Pre-hypertension(SBP120–139 or DBP 80–89)	0	0
Stage 1 hypertension (SBP140–159 or DBP 90–99)	151	17.3
Stage 2 hypertension (SBP> 160 or DBP>100)	0	0

The incidence of hypertension among the subjects was 17.3% (n=151). The hypertensive subjects had both elevated systolic and the diastolic BP of moderate grade and 721 (82.7%) were normotensive (Table 3). The overall average BP among the subjects was 128.8 ±12.3 mmHg for systolic and 84.0 ± 8.0 for diastolic (Table 4). The increase in average diastolic and systolic blood pressures were not consistent with age, being highest in age category 18–30 years (148.0 ± 10.4/ 92.0 ± 5.3) and lowest in age group 51–60 years (118.0 ± 12.1/78.0 ±10.2).

Types of diet [OR 0.578; 95% confidence interval (CI) 0.113–1.418, p < 0.028], smoking habit [OR 5.147; 95% confidence interval (CI) 1.023–25.884, p< 0.017] and age[OR 2.656; 95% confidence interval (CI) 0.682–8.556, p < 0.031] were found to be significant predictors of hypertension among Fulani herdsmen (Table 5).

DISCUSSION

The prevalence of hypertension among the herdsmen screened was 17.3%. This was in agreement with the previous studies of [9, 23-24]. The subjects used in these studies [9, 23-24] were rural dwellers in Nigeria and India like Fulani herdsmen. The findings of Cappuccio et al. [25] in Ghana with occurrence of (28.7%), Wamala et al. [26] in Uganda (30.5%) and Adedoyin et al. [27] in Nigeria (36.6%) were higher than the result of this study (17.3%). In a few of the studies, especially in the Eastern part of Nigeria, hypertension was found to be as high in the rural populace compared to the urban [28]. This picture has been documented in some United States and European studies [29-30].

The average age of the herdsmen studied was 39.0 years. One third of the subjects with hypertension were within the age category of 18–30 years. The rationale for the higher prevalence of hypertension among Fulani youths could be that the strenuous cattle herding is dominated by them. While herding, these youths leave the bush to the cities to search for food and veterinary drugs for their cattle. At this period, they feed on fatty meals (such as meat, eggs and chicken), drank alcohol, smoked cannabis and consumed hard drugs which are risk factors for hypertension apart from the inherent stress of the herding process. These results were similar to the studies of [14] in India who observed hypertension to be associated with various factors, such as family history, age, gender, smoking, obesity, alcohol consumption, occupation and level of education.

In the present study, there was an increase in both diastolic and systolic blood pressures among Fulani herdsmen as compared to reference/standard values [21]. This was unlike the results of Abu Sayeed et al. [31] in Bangladesh who reported that high prevalence of hypertension was observed among rural subjects. Also, this study was inconsistent with that of Glew et al. [32] in Nigeria where the normal average BP of 120/74mmHg was observed from the herdsmen. Moderate hypertension was found in the subjects studied, unlike the studies of Oladapo et al. [9] in Nigeria who reported both mild and moderate hypertension. A significant number of herdsmen seek medical consultations from traditional healers where improper examinations of hypertension were conducted. They consulted traditional herbalists

Called Booka (who use glass and sand as means of diagnosis). This was similar to the study of Dolea et al. [15] who reported that bulks of rural populace in Nigeria were marginalized with inadequate access to quality education and health care.

Table 4: Age distribution of subjects with hypertension

Age group (years)	SBP (mmHg) Average ± SD	DBP (mmHg) Average ± SD
18–30	148.0 ± 10.4	92.0 ± 5.7
31–40	119.0 ± 13.7	80.0 ± 8.3
41–50	140.0 ± 11.3	91.0 ± 6.8
51–60	118.0 ± 12.1	78.0 ± 10.2
60+	119.0 ± 13.9	79.0 ± 9.1
Overall average	128.8 ± 12.3	84.0 ± 8.0
F–value	7.324	8.445
P–value	0.007	0.033

Table 5: Logistic regression analysis of predictors of hypertension among Fulani herdsmen

Parameters	p–value	Odd Ratio (OR)	95% C.I for Odd Ratio	
			Lower	Upper
Age (Years)				
18–30	0.031*	2.656	0.682	8.556
31–40	0.442	0.312	0.367	9.927
41–50	0.265	1.910	0.447	14.789
51–60	0.567	0.413	0.097	1.464
60^{+}	0.742	1.000	0.504	4.122
Body Mass Index (Kg/m^2)				
< 18.5 (low)	0.153	0.873	0.979	1.069
18.5–24.9 (normal)	0.998	1.000	0.123	3.145
Alcohol Consumption				
Present	0.493	1.585	0.123	3.145
Absent	0.284	1.000	0.504	10.357
Smoking Habit				
Present	0.017*	5.147	1.023	25.884
Absent	0.265	1.000	1.234	7.134
Types of Diet				
Vegetarian	0.028*	0.578	0.113	1.418
Lacto–vegetarian	0.430	1.000	0.150	86.261

* Statistically significant at P < 0.05

Awareness, treatment and control of hypertension and other chronic diseases are low in developing countries including Nigeria. These diseases are often asymptomatic and in most cases presentation is when complications have set in [33]. This study discovered that only 1.6% of the subjects were aware of hypertension and the information was obtained through relatives receiving treatment for hypertension. In this study, the diet of the subjects was significantly associated with hypertension. Only 12.4% of the vegetarians had hypertension while 31.4% were hypertensive among the lacto–vegetarians. This corroborates with the study of Ophir et al. [34] in Israel whereby 2% of vegetarians had hypertension as compared to 26% in the lacto–vegetarians. This was unlike the previous study of Mahmood et al. [35] who reported that type of diets (vegetarians versus lacto–vegetarians) were not found to be significantly associated with hypertension. In the present work, there was a significant association between hypertension and smoking. This was in line with the findings of Tiwari [36] who reported that smokers have a significantly higher BP than non–smokers, but inconsistent with the results of Mahmood et al. [35]. This study

revealed that BMI was not significantly associated with hypertension. This was contrary to the findings of Agyemang et al. [37] whereby BMI is strongly correlated with diastolic and systolic BP. Unlike the findings of Amoah [38] who reported that obesity and overweight were prevalent in the rural communities in Nigeria, none of the subjects in this study were obese or overweight. Ogah et al. [10] reported that obesity was higher in urban areas than in rural areas because of reduced physical activity and the likelihood to eat processed foods which are high in salt and fat contents.

CONCLUSION

Majority of hypertensive herdsmen were not aware of their status. Risk factors identified were smoking, types of diets consumed and age. Public health education and intensification of awareness of hypertension and its consequences could reduce morbidity and mortality. Also, further research needs to be conducted to measure trends of hypertension among these subjects.

REFERENCES

1. Brundtland GH. From the World Health Organization: Reducing risks to health, promoting healthy life, JAMA, 2002, 288, 19-24.
2. Akinkugbe OO, World epidemiology of hypertension in blacks. In: Hall W.D., Saunders, E., and Shulman, N.B., editors, Hypertension in Blacks. Philadelphia, PA: Chicago Year Book Publishers, 1985.
3. Bloch MJ, Basile, JN, Hypertension in the elderly, In: Black HR, Elliot WJ, editors. Hypertension: A Companion to Braunwald's Heart Disease, 1st ed. Philadelphia, PA: Saunders, 2007.
4. Mukadas AO, Misbau U. Incidence and patterns of cardiovascular disease in North Western Nigeria, Nigerian Medical Journal, 2009, 50, 55–57.
5. Akinkugbe OO. Current epidemiology of hypertension in Nigeria, Archives of Ibadan Medicine, 2000, 19, 1-3.
6. Kadiri S. Tracking cardiovascular disease in Africa, BMJ, 2005, 331, 711–712.
7. Adedoyin RA, Mbada CE, Balogun MO, et al, Occurrence and pattern of hypertension in a semi-urban community in Nigeria, European Journal of Cardiovascular Prevention and Rehabilitation, 2008, 15, 683–687.
8. Egbi OG, Okafor UH, Meibodei KE, Kunle–Olowu OE, Unuigbe EI. Prevalence of hypertension in an urban population in Bayelsa State, Nigeria, Journal of Medical Research and Practices, 2013, 2(1), 12–15.
9. Oladapo OO, Salako L, Sodiq O, Shoyinka K, Adedapo K, Falase AO. A occurrence of cardiometabolic risk factors among a rural Yoruba South–Western Nigerian population: A population based survey, Cardiovascular Journal of Africa, 2013, 21, 26–31.
10. Ogah OS, Okpechil Chukwuonye, II, Akinyemi, JO, Onwubere, BJC, Falase, AO,, Stewart, S, Sliwa, K, Blood pressure, occurrence of hypertension and hypertension related complications in Nigerian Africans: A Review World Journal of Cardiology, 2012**,** 4(12), 327–340.
11. Omuemu VO, Okojie OH, Omuemu CE. Awareness of high blood pressure status, treatment and control in a rural community in Edo State, Nigerian Journal of Clinical Practice, 2007, 10, 208–12.
12. Amoah GB. Hypertension in Ghana: A cross–sectional community occurrence study in Greater Accra. Ethnicity and Disease, 2003a, 13, 310–315.
13. Ayodele OE, Alebiosu CO, Akinwusi PO, Akinsola, A., Mejuini, A., Target organ damage and associated clinical conditions in newly diagnosed hypertensive attending a tertiary health facility. Nigerian Journal of Clinical Practice, 2007, 10, 319–325.
14. Kapoor S, Tyagi R, Saluja K, Chaturvedi A, Kapoor AK. Emerging health threats among a primitive tribal group of Central India, Journal of Public Health and Epidemiology, 2010, 2, 13–19.
15. Dolea C, Stormont L, Braicheta JM. Evaluated strategies to increase attraction and retention of health workers in remote and rural areas, Bulletine of World Health Organization, 2010, 88, 379–385.
16. Risso-Gill I, Balabanova D, Majid F. Keat Ng, K, Yusoff K, Mustapha F, Kuhlbrandt, C, Nieuwlaat R, Schwalm JD, McCready T, Teo KK, Yusuf S, McKee M. Understanding the modifiable health systems barriers to hypertension management in Malaysia: a multi-method health systems appraisal approach, BMC Health Services Research, 2015, 15:254.
17. *AllAfrica.com, Nigeria Going Beyond the Green Wall Ritual.* Retrieved 2016–02–27. http://allafrica.com/stories/201307041283.html, *2013.*

18. Itua F. Outrage over activities of Fulani herdsmen. Available at: http://sunnewsonline.com/new/outrage–activities–fulani–herdsmen 2013 [Accessed on 19-02-2016].
19. Fabusoro E. Key issues in livelihoods security of migrant Fulani pastoralists: Empirical evidence from Southwest Nigeria, AIGIS European Conference on African Studies–African Alternatives: Initiative Current Constraints– African Studies Centre, Leiden, The Netherlands, 2007.
20. Learn About Kwara State. Available at: http:// www.kwarastate.gov.ng, 2013, Retrieved 12 July, 2015.
21. Seventh report of the Joint National Committee on Prevalence, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII): Hypertension, 2007, 63-105.
22. World Health Organization, Obesity: Preventing and managing the global epidemic. WHO, Geneva, 1997, 3–5.
23. Cooper R, Rotimi C, Ataman S, McGee D, Osotimehin, B., Kadiri, S., Muna, W., Kingue, S., Fraser, H., Forrester, T., Bennett, F. and Wilks, R, The prevalence of hypertension in seven populations of West African origin. American Journal of Public Health, 1997, 87, 160–168.
24. Yuvaraj BY, Nagendra GMR, Umakantha, A.G., Prevalence, awareness, treatment, and control of hypertension in rural areas of Davanagere. Indian Journal of Community Medicine, 2010, 35, 138–141.
25. Cappuccio, FP, Micah FB, Lynsey E. et al., Prevalence, detection, management, and control of hypertension in Ashanti, West Africa, Hypertension, 2004, 43, 1017–1022.
26. Wamala JF, Karyabakabo Z, Ndungutse D, Guwatudde D. Prevalence factors associated with hypertension in Rukungiri District, Uganda: A community–based study, African Health Sciences, 2009, 9(3), 153–160.
27. Adedoyin, R.A., Mbada, C.E., Balogun, M.O. et al., Occurrence and pattern of hypertension in a semi-urban community in Nigeria, European Journal of Cardiovascular Prevention and Rehabilitation, 2008, 15, 683–687.
28. Ahaneku GI, Osuji CU, Anisiuba BC, Ikeh, VO, Oguejiofor OC, Ahaneku JE, Evaluation of BP and indices of obesity in a typical rural community in eastern Nigeria, Annals of African Medicine, 2011, 10, 120–126.
29. Mainous AG, King DE, Garr DR, Pearson WS. Race, rural residence, and control of diabetes and hypertension, Annals of Family Medicine, 2004, 2, 563–568.
30. Psaltopoulou T, Orfanos P, Naska A, Lenas, D, Trichopoulos D, Trichopoulou A. Occurrence, awareness, treatment and control of hypertension in a general population sample of 26, 913 adults in the Greek EPIC study. International Journal of Epidemiology, 2004, 33, 1345–1352.
31. Abu Sayeed, M, Banu A, Khan AR, Hussain MZ. Prevalence of diabetes and hypertension in a rural population of Bangladesh. Diabetes Care, 1995, 18(4), 555–558.
32. Glew RH, Kassam HA, Bhanji RA, Okorodudu, A, Vanderjagt DJ. Serum lipid profiles and risk of cardiovascular disease in three different male populations in Northern Nigeria, Journal of Health Population and Nutrition, 2002, 20(2), 166–174.
33. Ogah OS. Hypertension in Sub–saharan African populations: The burden of hypertension in Nigeria, Ethnicity and Disease, 2006, 16, 765.
34. Ophir O, Gilad PG, Blum JM, Aviram A. Low blood pressure in vegetarians: the possible role of potassium, The American Journal of Clinical Nutrition, 2006, 37, 755–762.
35. Mahmood SE, Srivastava A, Shrotriya VP, Shaifali I, Mishra P, Occurrence and epidemiological correlates of hypertension among labour population, National Journal of Community Medicine, 2011, 2(1), 43–48.
36. Tiwari RR. Hypertension and epidemiological factors among tribal labour population in Gujarat, Indian Journal of Public Health, 2008, 52(3), 144–146.
37. Agyemang C. Rural and urban differences in BP and hypertension in Ghana, West Africa. Public Health, 2006, 120, 525–533.
38. Amoah AG. Socio–demographic variations in obesity among Ghanaian adults. Public Health Nutrition, 2003b, 6, 751–757.