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Hypertension and associated factors in Atlantic region of Benin in 2015: A community-based study

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Hypertension is a major public health problem that does not spare Sub-Saharan Africa and especially Benin. There is scarce data on the factors associated with this condition in areas of high population pressure in Benin. We investigated factors associated with hypertension in Atlantic region. We conducted a cross-sectional survey in Benin in the Atlantic region for people aged 18 and over. This was an analysis of data collected during the STEPS Chronic Disease Risk Factor Surveillance Survey during the last quarter of 2015. We estimated the overall prevalence of hypertension and determined associated factors using a logistic regression model including factors with a p-value less than 0.20 in the univariate analysis. The overall prevalence of hypertension was 33.2% [95% CI (29.8-36.7)]. Age was associated with hypertension (global p-value ≤ 0.001). In addition, obesity and high salt intake were independently associated with hypertension AOR; 95%CI were 4.89 (2.74 - 8.73) and 1.54 (1.07 - 2.21), respectively. In the Atlantic region of Benin, factors associated with hypertension were age of at least 35 years, obesity and high salt consumption. Strategies that promote physical activity, reducing salt intake and fat could decrease the burden of the disease.

Key words: Hypertension, associated factors, age, obesity, salt, Benin.

INTRODUCTION

Although hypertension is known to be a cardiovascular disease, it is also identified as a major risk factor for cardiovascular complications. Indeed, in 2008, the number of deaths worldwide from cardiovascular diseases was estimated at 17 million per year, or nearly a third of total mortality. Of these deaths, 9.4 million are attributable to

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complications of hypertension (World Health Organization, 2011; Organisation Mondiale de la Santé, 2013). Hypertension is responsible for at least 45% of deaths from heart disease and 51% of deaths from cerebral vascular accidents (Organisation Mondiale de la Santé 2013). In Africa, hypertension is a major and independent risk factor for heart failure, stroke and kidney failure (Organisation Mondiale de la Santé, 2013). These conditions degrade the quality of life of patients and have significant health, psychosocial, and economic consequences for families and countries further degrading the already precarious living conditions of populations in developing countries (Organisation Mondiale de la Santé, 2013; Kayima et al., 2013).

According to the Global Report on the State of the World's Noncommunicable Diseases in 2014, the global prevalence of hypertension (defined as systolic blood pressure ≥ 140 mmHg and / or diastolic blood pressure ≥ 90 mm Hg) was estimated at 22% among those aged 18 and over (Organisation mondiale de la santé, 2014). Overall, high-income countries have a lower prevalence of hypertension (35%) compared to that of other countries (40%) (Organisation Mondiale de la Santé, 2013). In India, a rural study found a prevalence of 14.1% in Delhi (Kishore et al., 2016). In the African Region, the prevalence of hypertension in the general adult population (aged ≥ 25 years) is the highest (46%). The main modifiable risk factors for hypertension in Africa are smoking, excessive alcohol consumption, lack of physical activity, high salt intake, lack of fruits and vegetables intake and obesity (Organisation Mondiale de la Santé, 2013; van de Vijver et al., 2014). In a study pooling data from Tanzania, South Africa, Uganda and Nigeria, Guwattude and al. in 2015 found a prevalence of 25.9% with disparities in subgroups (Guwatudde et al., 2015). In Ethiopia, Kenya, and Uganda, other studies have found hypertension's prevalence of 27.9, 22.8 and 15%, respectively (Joshi et al., 2014; Abebe et al., 2015; Kayima et al., 2015). Factors independently and commonly associated with hypertension are advanced age and overweight or near-constant obesity, high salt intake (Ofili et al., 2015), urban area of residence, sex, age and education level (Okpechi et al., 2013).

In West Africa, the prevalence of hypertension has been steadily increasing in mid-urban areas since the last decade and varies from one country to another with prevalence rates of 24.8% in Burkina Faso (Soubeiga et al., 2017), 43.6, 38.2 and 36.7% in Guinea, Nigeria, and Togo (Iwelunmor et al., 2014), respectively, 27.5% in Senegal (Duboz et al., 2016), and 44 and 31.4% in two Nigeria states (Okpechi et al., 2013; Ofili et al., 2015). In Benin, the available data are mainly related to the 2008 STEPS survey which revealed that the standardized national prevalence of hypertension in adults aged 18 and over was 27.5 and 24.1% for Atlantic region (Ministère de la Santé du Benin, 2008).

In 2015, data collection for the second STEPS survey on common risk factors for NCDs in Benin was conducted. In the STEPS report, the prevalence of each major NCD risk factor was determined by age and sex. However, this classic report of the STEPS analysis did not make it possible to know specifically the factors associated with each NCD. To fight effectively against hypertension, it is useful to know the factors that are specifically associated with it. According to the last general census of population and housing (RGPH) of 2013, the most populated region of Benin is Atlantic with a demographic weight representing 14% at the national level, and with the highest intercensal growth rate of the country (5.03% between 2002 and 2012) compared to 3.52% for the whole country (Institut National de la Statistique et de l'Analyse Economique Benin, 2015). For Atlantic region, two municipalities (Abomey-Calavi and Ouidah) represent large peripheral dormitory towns because of their proximity with Cotonou, Benin's economical capital city. With rapid population growth and urbanization, the prevalence of NCDs could increase if appropriate interventions are not carried out in this region. Then, this study helps identifying factors associated with hypertension especially in this region so that public health actions should be effectively implemented. We aim at estimate the prevalence of hypertension and identify the associated risk factors in Atlantic region of Benin in 2015.

MATERIALS AND METHODS

Study framework

The study took place in Atlantic region in Benin. Located in the south of the country, the region is divided into three health zones and eight municipalities. With an area of 3233 km^2, Atlantic region has a total population estimated at 1481664 inhabitants in 2015, and a density of 458 inhabitants per square kilometer. The proportion of people aged 18 and over in the total population is estimated at 47% (Institut National de la Statistique et de l'Analyse Economique Benin, 2015).

Study design and population

We carried out a cross-sectional study that ran from January 1st to June 30th, 2017. This was an analysis of data collected in Atlantic region during the STEPS survey that took place in Benin from October to December 2015. Our study population consisted of all subjects recorded in the database as resident of Atlantic region. Sampling was exhaustive and the study sample consisted of 717 participants aged from 18 to 69 years.

Sociodemographic and bioclinical information

Both sociodemographic and bioclinical were defined and collected according to WHO's STEPS guidelines. We collected sociodemographic data such as health district of residence, sex,

education level, marital status, salt intake, fat consumption, physical activity, fruit and vegetables consumption, alcohol consumption and tobacco smoking. We also collected bioclinical data such as Blood pressure measurements (systolic and diastolic blood pressure (SBP and DBP)), weight (Kg), height (m), fasting blood glucose (high value defined as ≥1.26 g/L (≥7 mmol /L)), and total cholesterol (high when ≥2.50 g/l (6.5 mmol/L)).

Blood pressure measurement and hypertension definition

Blood pressure was measured thrice in each participant in sitting position after 5 min rest and we considered the blood pressure based on systolic and diastolic averages respectively. Hypertension was defined as participant with SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg and/or reported anti-hypertensive medications for raise blood pressure at the time of study (Whitworth, 2003; Ministère de la Santé du Benin, 2008; Organisation Mondiale de la Santé, 2013).

Statistical analyzes

The collection technique was a data extraction from the STEPS 2015 database. We identified the variables that were related to our study objectives and recorded them accordingly and we performed the analyzes on participants with complete data for our variables of interest. For the current analysis, we used Epi Info® 7 software (version 2.1.0, Centers for Disease Control and Prevention, Atlanta, United States) and Microsoft Excel® 2010. We computed proportions and prevalence ratios with their respective 95% confidence intervals for the description of the study population. Then, we performed a multivariate logistic regression model to identify factors associated with hypertension. For this purpose, we only included variables for which p-values for prevalence ratio (PR) were less than 0.20. All statistical associations were considered significant at a p-value <5%.

Ethical considerations

The study protocol has been validated by Health Sciences Department at Ouaga I Professor Joseph KI-ZERBO University. It has obtained approval of the authorities of the Ministry of Health of Benin through the National Program for the Control of Non-Communicable Diseases. The data analyzed in our study do not contain personal information of the respondents.

RESULTS

Prevalence of high blood pressure

For all respondents (n = 717), the median age was 35 years with an interquartile range of 28 to 46 years. Of these, 238 people had hypertension leading to a prevalence of 33.2% [95% confidence interval (29.84 - 36.72)]. The prevalence of new hypertension cases was 27.1% whereas it was 6.14% among already confirmed cases. Prevalence of hypertension was 33.3% in urban areas. It was high in Abomey-Calavi-Sô-Ava (34.6%) and Ouidah-Kpomassè-Tori-Bossito health district (32.9%). The socio-demographic characteristics are presented in Table 1.

The prevalence of hypertension was higher (57.4%) in the 55 to 64 age group, among people with none education level (37.4%) and among married people (36.0%). 39 single persons (23.9%) had hypertension. Hypertension's prevalence is respectively 30.1, 31.8 and 38.8% related to limited, moderate and high physical activity respectively. Among those who reported alcohol consumption or smoking tobacco, the prevalence of hypertension was 34.1 (78/229) and 48.1% (13/27), respectively. It should be noted that hypertension prevalence increases with body mass index ranging from 27.6% for underweight to 68.9% for obesity.

Factors associated with high blood pressure

The prevalence ratio (PR) of hypertension by age ranges from 1.99 to 2.87 for all age groups of 35 years and above (Table 1). Sex is not associated with hypertension. HTA was more prevalent among none education level than other groups (PR = 1.35 with 95% CI 1.09 to 1.69). The "Fon or related" ethnic group with a PR at 1.19 is not a factor associated with hypertension. With regard to marital status, married persons are globally hypertensive compared to single persons such as never married, divorced, widowed or separated (PR = 1.50 95%CI 1.12 to 2.02). The evaluation of behavioral factors showed a significant association of hypertension with high salt intake (PR = 1.24 with a p-value of 0.02). Other factors such as smoking, alcohol consumption, insufficient consumption of fruits and vegetables, insufficient physical activity are not significantly associated with hypertension. Prevalence ratios for living environment and health district of residence are not significantly associated with hypertension (p-value> 0.05). In terms of weight status, overweight and obesity increased the risk of having hypertension, but only the association with obesity is significant (PR= 2.38 with p-value <0.001). High blood glucose and high total cholesterol are significantly associated with hypertension.

Based on the multivariate logistic regression analysis (Table 2), obesity is a factor associated with hypertension with an Adjusted Odds Ratio (AOR) (95% confidence interval) of 4.89 (2.74 - 8.73). We also found a significant association between age in category with hypertension (global p-value=0.0000) and the association were stronger with increasing age (i) 35 to 44 years [AOR = 2.64; (95% CI, 1.63 - 4.29)], (ii) 45 to 54 years [AOR = 3.05; (95% CI, 1.78 - 5.26), iii) 55 to 64 years [AOR = 6.54; (95% CI, 3.40 - 12.56), iv) 65 years and older [AOR = 4.80; (95% CI, 1.95 - 11.84)]. High salt intake is also a significant factor associated with hypertension (AOR = 1.54 with 95% CI ranging from 1.07 to 2.21).

Table 1. Prevalence ratio of hypertension according to population's characteristics in Benin, Atlantic region, 2015.

Characteristics	Number of respondents	HTA number	Prevalence (%)	Prevalence ratio (95% Confident interval)	p-value
Sex					
Male	327	107	32.7		
Female	390	131	33.6	1.03(0.83-1.26)	0.40
Age in years					
25 - 34	235	47	20.0	1	
< 25	100	21	21.0	1.05(0.66-1.66)	0.41
35 - 44	181	72	39.8	1.99(1.46-2.72)	0.00
45 - 54	114	50	43.9	2.19(1.58-3.05)	0.00
55 - 64	61	35	57.4	2.87(2.05-4.01)	0.00
≥ 65	26	13	50.0	2.50(1.58-3.97)	0.00
Education level					
None	409	153	37.4	1.35(1.09-1.69)	0.00
Other	308	85	27.6	1	
Fon and related ethnicity					
Yes	621	211	34.0	1.19(0.85-1.67)	0.13
No	95	27	28.4		
Marital status					
Single	163	39	23.9	1	
Married	553	199	36.0	1,5(1.12-2.02)	0.02
High salt intake					
Yes	344	127	36.9	1.24(1.00-1.52)	0.02
No	373	111	29.8	1	
Excessive consumption of fatty substances					
Yes	19	13	68.4	0.95(0.49-1.86)	0.45
No	698	466	66.8	1	
Physical activity					
Limited	193	58	30.1	1	
Moderate	336	107	31.8	1.06(0.81-1.38)	0.33
High	188	73	38.8	1.29(0.97-1.71)	0.04
Fruit and vegetable consumption per day					
< 5 servings	693	232	33.5	1.34(0.66-2.70)	0.20
≥ 5 servings	24	6	25.0	1	
Alcohol consumption					
Yes	229	78	34.1	1.04(0.83-1.29)	0.37
No	488	160	32.8	1	
Tobacco consumption					
Smoker	27	13	48.1	1.48(0.98-2.22)	0.05
Non-smoker	690	225	32.6	1	
Body Mass Index					
Normal weight	380	110	28.9	1	
Underweight	58	16	27.6	0.75(0.47-1.19)	
Overweight	158	52	32.9	1.14(0.87-1.49)	
Obesity	74	51	68.9	2.38(1.91-2.96)	
Fasting blood glucose					
Glycemia ≥1.26 g/l	53	28	52.8	1.67(1.26-2.20)	0.00
Glycemia <1.26 g/l	664	210	31.6	1	

Table 1. Contd.

Total Cholesterol					
Total Cholesterol ≥2.5 g/l	50	23	46.0	1.81(1.36-2.41)	0.00
Total Cholesterol <2.5 g/l	667	215	32.2	1	

Table 2. Multivariate analysis of factors associated with hypertension, Atlantic region, Benin, 2015.

Characteristics	Adjusted odds ratios (95% confidence interval)	p-value
Age in categories, years		0.00
< 25	1.47(0.72 - 2.99)	0.28
25-34	1	
35-44	2.64(1.63 - 4.29)	0.00
45-54	3.05(1.78 - 5.26)	0.00
55-64	6.54(3.40 - 12.56)	0.00
≥ 65	4.80(1.95 - 11.84)	0.00
High salt intake (yes versus no)	1.54(1.07 - 2.21)	0.02
High total cholesterol (yes versus no)	2.07(0.94 - 4.54)	0.07
High blood sugar (yes versus no)	1.89(0.95 - 3.75)	0.07
Married persons (yes versus no)	1.48(0.89 - 2.48)	0.13
Smokers (yes versus no)	1.60(0.69 - 3.69)	0.27
Fon and related ethnicity (yes versus no)	1.23(0.72 - 2.12)	0.45
BMI in categories		0.00
Normal BMI	1	
Underweight	0.76(0.40 - 1.46)	0.42
Overweight	1.05(0.68 - 1.61)	0.84
Obesity	4.89(2.74 - 8.73)	0.00

BMI: Body Mass Index, in kg/m^2; Underweight: defined as BMI < 18.5; Normal BMI: defined as BMI >= 18.5 and < 25; Overweight: defined as BMI ≥ 25 and < 30; Obesity: defined as BMI ≥ 30.

DISCUSSION

Prevalence of hypertension

According to our results, the overall prevalence of hypertension in Atlantic region in Benin is 33.2%. It is higher than that observed in the same region in 2008 after the previous STEPS survey (24.07%) (Institut National de la Statistique et de l'Analyse Economique Benin, 2015). The increase in the prevalence of HTA could be explained by significant demographic pressure in this region, dormitory area of the workers of Cotonou, with a rapid growth and increasing urbanization. Various difficulties, including those related to traffic, contributed to increase stress, the latter being known to promote the onset of hypertension. It is also higher than the rates observed in Cameroon and India (Midha et al., 2009; Pancha Mbouemboue et al., 2016). This prevalence is comparable to that observed by Ofili and Adeloye in Nigeria (Adeloye and Basquill, 2014; Ofili et al., 2015). However, it is lower than that observed in other studies, particularly in South Africa 77% and in Nigeria 44% (Peltzer and Phaswana-Mafuya, 2013; Ofili et al., 2015). The difference could be explained by age of persons included in those studies (35 to 74 years for Nigeria and more than 50 years for South Africa) and by the fact that these two countries are overpopulated and relatively highly industrialized compared to Benin.

Factors associated with hypertension

According to our results, in Atlantic region, age of 35 years and above, obesity and high salt intake are the three factors significantly associated with hypertension. This is comparable to the results obtained in previous studies (Houinato et al., 2012; Ogah et al., 2012; Ofili et al., 2015). Previous studies have already established the role of advanced age as a risk factor for hypertension in many countries including Nigeria, South Africa and India (Midha et al., 2009; Houinato et al., 2012; Okpechi et al., 2013; Peltzer and Phaswana-Mafuya 2013; Pancha

Mbouemboue et al., 2016).

As for obesity, its association with hypertension is also described in several studies in Africa and around the world (Midha et al., 2009; Peltzer and Phaswana-Mafuya, 2013; Kayima et al., 2015; Pancha Mbouemboue et al., 2016). The growing obesity epidemic in sub-Saharan Africa has been largely attributed to increasing consumption of diets high in sugar and fats. Cultural perceptions that value heavier body weight as a sign of wellbeing and health cannot be underestimated.

High salt intake was also found as a risk factor for hypertension in a study in Nigeria (Ofili et al., 2015). High salt intake in Atlantic region is likely due to the local diet in these communities as this region is a riverine area that is rich in fish, and the main method of preservation is salting and smoking.

High blood sugar and high cholesterol are known as risk factors for hypertension. The association was marginally significant (p=0.07) and try to explain it. We think this may probably explained by a lack of enough power

Limitations of the study

This study has some limitations: Firstly, as in many studies, our blood pressure levels were based on the average of two measurements during a single visit, which may have overestimated prevalence rates. Secondly, cross-sectional design did not allow us to exclude reverse causality as the main explanation of associations. Finally, geographical data were not collected by municipalities. It would have been interesting to estimate how municipalities with high demographic pressure and high-speed urbanization such as Abomey-Calavi and Ouidah account for in the prevalence of hypertension in the health district to which they belong.

Conclusion

In Benin especially Atlantic region, hypertension is a public health problem that affects at least one in three adults aged 18 to 69 years and this rate is increasing compared to the rate obtained in 2008. Age of 35 years and above, high salt intake and obesity are independent factors significantly associated with hypertension. Measures such as systematic yearly blood pressure control, promotion of physical activity, reducing salt and fat intake could help reducing the burden of the disease in Atlantic region communities.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Abebe SM, Berhane Y, Worku A, Getachew A (2015) Prevalence and associated factors of hypertension: a crossectional community based study in northwest Ethiopia. PLoS ONE 10:e0125210. https://doi.org/10.1371/journal.pone.0125210

Adeloye D, Basquill C (2014). Estimating the prevalence and awareness rates of hypertension in Africa: a systematic analysis. PLoS ONE 9:e104300. https://doi.org/10.1371/journal.pone.0104300

Duboz P, Boëtsch G, Gueye L, Macia E (2016). Hypertension in the Ferlo (Northern Senegal): prevalence, awareness, treatment and control. The Pan African Medical Journal 25:177. https://doi.org/10.11604/pamj.2016.25.177.10105

Guwatudde D, Nankya-Mutyoba J, Kalyesubula R, Laurence C, Adebamowo C, Ajayi I, Bajunirwe F, Njelekela M, Chiwanga FS, Reid T, Volmink J (2015). The burden of hypertension in sub-Saharan Africa: a four-country cross sectional study. BMC Public Health 15(1):1211. https://doi.org/10.1186/s12889-015-2546-z

Houinato DS, Gbary AR, Houehanou YC, Djrolo F, Amoussou M, Segnon-Agueh J, Salamon R (2012). Prevalence of hypertension and associated risk factors in Benin. Revue d'épidémiologie et de Santé Publique 60(2):95-102. https://doi.org/10.1016/j.respe.2011.09.010

Institut National de la Statistique et de l'Analyse Economique Benin (2015). RGPH4 : que retenir des effectifs de population en 2013. https://www.insaebj.org/images/docs/insaestatistiques/demographiques/population/Resultats%20definitifs%20RGPH4.pdf. Accessed 12 Aug 2019

Iwelunmor J, Airhihenbuwa CO, Cooper R, Tayo B, Plange-Rhule J, Adanu R, Ogedegbe G (2014). Prevalence determinants and systems-thinking approaches to optimal hypertension control in West Africa. Globalization and Health 10(1):42. https://doi.org/10.1186/1744-8603-10-42

Joshi MD, Ayah R, Njau EK, Wanjiru R, Kayima JK, Njeru EK, Mutai KK (2014). Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: a population-based survey. BMC Public Health 14(1):1177. https://doi.org/10.1186/1471-2458-14-1177

Kayima J, Nankabirwa J, Sinabulya I, Nakibuuka J, Zhu X, Rahman M, Kamya MR (2015). Determinants of hypertension in a young adult Ugandan population in epidemiological transition—the MEPI-CVD survey. BMC Public Health 15(1):830. https://doi.org/10.1186/s12889-015-2146-y

Kayima J, Wanyenze RK, Katamba A, Leontsini E, Nuwaha F (2013). Hypertension awareness, treatment and control in Africa: a systematic review. BMC Cardiovascular Disorders 13(1):54. https://doi.org/10.1186/1471-2261-13-54

Kishore J, Gupta N, Kohli C,Kumar N (2016).Prevalence of hypertension and determination of its risk factors in rural Delhi. International Journal of Hypertension. https://doi.org/10.1155/2016/7962595

Midha T, Idris MZ, Saran RK, Srivastav AK, Singh SK (2009). Prevalence and determinants of hypertension in the urban and rural population of a north Indian district. East African Journal of Public Health 6:268-273

Ministère de la Santé du Benin (2008). Rapport final de l'enquête STEPS au Benin. https://www.who.int/ncds/surveillance/steps/2008_STEPS_Report_Benin.pdf. Accessed 12 Aug 2019

Ofili MI, Ncama BP, Sartorius B (2015). Hypertension in rural communities in Delta State, Nigeria: Prevalence, risk factors and barriers to health care. African Journal of Primary Health Care and Family Medicine 7(1):1-7. https://doi.org/10.4102/phcfm.v7i1.875

Ogah OS, Okpechi I, Chukwuonye II, Akinyemi JO, Onwubere BJ, Falase AO, Sliwa K (2012). Blood pressure, prevalence of hypertension and hypertension related complications in Nigerian Africans: A review. World Journal of Cardiology 4(12):327-340. https://doi.org/10.4330/wjc.v4.i12.327

Okpechi IG, Chukwuonye II, Tiffin N, Madukwe OO, Onyeonoro UU, Umeizudike TI, Ogah OS (2013). Blood pressure gradients and

cardiovascular risk factors in urban and rural populations in Abia State South Eastern Nigeria using the WHO Stepwise approach. PloS ONE 8(9):73403. https://doi.org/10.1371/journal.pone.0073403

Organisation Mondiale de la Santé (2013). Panorama mondial de l'Hypertension : Un «tueur silencieux» responsable d'une crise de santé publique mondiale. https://apps.who.int/iris/bitstream/handle/10665/85334/WHO_DCO_WHD_2013.2_fre.pdf?sequence=1&isAllowed=y. Accessed 12 Aug 2019

Organisation mondiale de la santé (2014). Global status report on noncommunicable diseases 2014: Attaining the nine global noncommunicable diseases targets; a shared responsibility. World Health Organization, Geneva.

Pancha Mbouemboue O, Derew D, Tsougmo JON, Tangyi Tamanji M (2016). A community-based assessment of hypertension and some other cardiovascular disease risk factors in Ngaoundéré, Cameroon. International Journal of hypertension. https://doi.org/10.1155/2016/4754636

Peltzer K, Phaswana-Mafuya N (2013). Hypertension and associated factors in older adults in South Africa. Cardiovascular Journal of Africa 24(3):66. https://doi.org/10.5830/CVJA-2013-002

Soubeiga JK, Millogo T, Bicaba BW, Doulougou B, Kouanda S (2017). Prevalence and factors associated with hypertension in Burkina Faso: a countrywide cross-sectional study. BMC Public Health 17(1):64. https://doi.org/10.1186/s12889-016-3926-8

van de Vijver S, Akinyi H, Oti S, Olajide A, Agyemang C, Aboderin I,Kyobutungi C (2014). Status report on hypertension in Africa-Consultative review for the 6th Session of the African Union Conference of Ministers of Health on NCD's. Pan African Medical Journal 16(1). https://doi.org/10.11604/pamj.2013.16.38.3100

Whitworth JA (2003). World Health Organizatio (WHO)/International Society of Hypertension (ISH) statement on management of hypertension. Journal of Hypertension 21(11):1983-1992. https://doi.org/10.1097/01.hjh.0000084751.37215.d2

World Health Organization (2011). Causes of death 2008: Data sources and methods. https://www.who.int/healthinfo/global_burden_disease/cod_2008_sources_methods.pdf. Accessed 12 Aug 2019