British Journal of Medicine & Medical Research
4(18): 3478-3490, 2014

SCIENCEDOMAIN *international*
www.sciencedomain.org

Adherence to Lifestyle Modifications among Adult Hypertensive Nigerians with Essential Hypertension in a Primary Care Clinic of a Tertiary Hospital in Resource-poor Environment of Eastern Nigeria

Gabriel Uche Pascal Iloh[1*], Agwu Nkwa Amadi[2], Godwin Oguejiofor Chukwuebuka Okafor[3], Augustine Obiora Ikwudinma[4], Frances Udoka Odu[5] and Ezinne Uchamma Godswill-Uko[6]

[1]Department of Family Medicine, Federal Medical Centre, Umuahia, Abia state, Nigeria.
[2]Department of Public Health Technology, Federal University of Technology, Owerri, Imo State, Nigeria.
[3]Department of Community Medicine, Federal Medical Centre, Umuahia, Abia state, Nigeria.
[4]Department of Family Medicine, Federal Teaching Hospital Abakiliki, Nigeria.
[5]General Hospital, Kuje, Federal Capital Territory Administration, Abuja, Nigeria.
[6]Department of Anaesthesiology Federal Medical Centre, Umuahia, Abia State, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author GUPI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors ANA, GOCO and AOI managed the analysis of the study. Authors FUO and EUGU managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

Received 10th February 2014
Accepted 20th March 2014
Published 5th April 2014

ABSTRACT

Background: Lifestyle modifications (LSMs) are indispensable in blood pressure control among hypertensive patients. However, the extent to which patients lifestyles (LS) coincide with clinical prescriptions has become an important management challenge in primary care.

**Corresponding author: Email: ilohgup2009@yahoo.com;*

Aim: To describe adherence to LSMs among adult hypertensive Nigerians with essential hypertension in a primary care clinic of a tertiary hospital in resource-poor environment of Eastern Nigeria.
Study Design: A primary care clinic-based descriptive cross-sectional study carried out on 140 adult patients with essential hypertension who were on treatment for at least 6 months at the primary care clinic.
Place and Duration of study: The study was carried out at the primary care clinic of Federal Medical Centre, Umuahia, Nigeria between April 2011 and November 2011.
Methodology: Data was collected using pretested, structured and interviewer-administered questionnaire. Each item of LS was scored on a five points Likert scale ordinal responses of always, most times, sometimes, rarely and none. Adherence to LSMs was assessed in the 30 days preceding the study and measured from the following domains: physical activity, alcohol and tobacco use, dietary fruits, vegetables, salt and fat consumptions. Each of the domains of LS was given a score of one point for healthy LS and zero point for unhealthy LS. Operationally, patients who scored 7 points in all the assessed domains were considered adherent. Specific adherence to LS factors was also determined.
Results: The overall adherence rate was 16.4%. Specifically, adherence was highest with the uses of tobacco (100.0%) followed by dietary salt (94.3%) and alcohol (90.7%). Other adherence rates were consumptions of dietary vegetables (75.7%), dietary fruits (66.2%), dietary fat and oils (64.2%) and physical activity (16.4%). Adherence was significantly associated with the female gender (p=.036).
Conclusion: This study has shown that adherence to LSMs was 16.4% with no smoking rated highest and physical activity the lowest. Female gender was significantly associated with adherence. There is need to sustain the current level of adherence on smoking while efforts should be made to improve on identified domains of inadequate adherence.

Keywords: Adherence; adult hypertension; LSMs; primary care; Nigeria.

1. INTRODUCTION

Hypertension is a major clinic and public health problem globally and magnifies the risk of cardiovascular diseases morbidity and mortality especially in nations in socio-economic and epidemiological transition [1]. Hypertension is therefore one of the most common causes of disability and death amongst the adult Nigerian population [2,3] and plays an important role in the causation of hypertensive heart failure, heart attack, arteriosclerosis, renal failure and stroke among Nigerians [2,3].

It is now known that the determinants of goal blood pressure control in hypertensive patients are multi-factorial and the guidelines on the management of hypertensive patients are not based on medication adherence alone but also adherence with lifestyle modifications [4-8]. The benefits of adequate blood pressure control was reported to reduce the incidence of stroke by an average of 35% – 40%, myocardial infarction by 20% – 25% and heart failure by more than 50% [9]. With the modernization and adoption of western lifestyle habits in Nigeria, it is likely that lifestyle related factors could predispose to poor blood pressure control in the region [7,10].

Conceptually, lifestyle refers to the pattern of an individual's behavioral choices and practices with respect to daily activities that are related to elevated or reduced risk of

hypertension or serve as adjunct to its treatment [11]. Major lifestyles shown to lower blood pressure include adoption of Dietary Approach to Stop Hypertension (DASH)-eating plans, [12] dietary sodium reduction, [13-15] weight reduction in overweight or obese hypertensive, [16] regular physical activities, [17-19] social habits such as moderation of alcohol consumption [20] and cessation of smoking, [21] adequate dietary fruits and vegetable consumption [22-24] and reduction of saturated fat intake [25]. Adherence with lifestyle modifications among hypertensive patients has been reportedly variable in Nigeria [7,26,27] and other parts of the world [28] and is defined conceptually as the degree to which the patient conforms with prescribed lifestyles [29]. Accumulating evidence has shown that appropriate lifestyle modification serves as an adjunct to the management of hypertension and reduces the risk of hypertension and its primary co-morbidities [10,28]. Lifestyle modification therefore has a great impact on the success or failure of therapeutic management of hypertension [17,26,30].

There is absence of research on adherence to lifestyle modifications among patients with essential hypertension in primary care settings in a resource-poor Nigerian environment despite the fact that LSMs are relatively inexpensive and practicable. The elucidation of the pattern of lifestyle modifications among adult hypertensive Nigerians needs to be explored in order to enable these patients benefit from recommended lifestyles for management of hypertension. Lack of knowledge of lifestyle modifications for hypertension leads to poor understanding of its beneficial effects and what constitutes unhealthy lifestyles. This study therefore provides additional evidence on the contribution of adherence to lifestyle factors in the management of hypertension in primary care. It is against this background that the authors were motivated to determine adherence to lifestyle modifications among adult hypertensive Nigerians with essential hypertension in a primary care clinic of a tertiary hospital in resource-poor setting of Eastern Nigeria.

2. MATERIALS AND METHODS

2.1 Study Design

This was a primary care clinic-based cross-sectional study done on one hundred and forty patients who had essential hypertension in a tertiary health centre in Eastern Nigeria. The study was carried out between April 2011 and November 2011.

2.2 Study Setting

The study was conducted at the primary care clinic of Federal Medical Centre Umuahia, Nigeria.

2.3 Selection Criteria

Adult hypertensive patients with essential hypertension aged ≥ 18 years who gave informed consent, had been on primary care outpatient treatment for hypertension in the clinic for at least 6 months, and who recorded at least three clinic visits were included in the study. Exclusion criteria were critically ill patients, those with an established cause of hypertension and special high-risk patients such as hypertensive patients with diabetes mellitus, renal disease, myocardial infarction and stroke. The eligible patients were consecutively recruited for the study.

2.4 Sampling

Sample size estimation was determined using the formula [31] for estimating minimum sample size for descriptive studies when studying proportions with an entire population size < 10 000 using an estimated population size of 200 adult hypertensive patients, based on the 2010 annual primary care hypertensive patients' attendance records who were managed and provided with continuity of care at the department of Family Medicine. These 200 adult hypertensive patients excluded other hypertensive patients referred to and being followed up in other medical outpatients' clinics in the Medical Centre in 2010. The diabetic hypertensives were also excluded from this recorded number. The authors assumed that 50% of the adult hypertensives would adhere to lifestyle modification at a 95% confidence level with a 5% margin of error. This gave a sample estimate of 132 patients. However, a sample size of 140 adult hypertensive patients was used based on the period of the study.

2.5 Methods

Data collection instrument was designed by the authors to suit resource-poor setting of the country through robust review of relevant literature on lifestyles [7,10,11-25] and previous studies on lifestyle modifications [32-34]. The specific dimensions of lifestyle factors evaluated were physical activity profile, alcohol and tobacco use, dietary use of salt, dietary fruits and vegetables consumption and use of dietary saturated fats and oils.

Adherence to each of the specific dimensions was given an ordinal score thus: adherence to physical activity=1 point, adherence to alcohol consumption=1 point, adherence to tobacco use=1 point, adherence to dietary use of salt=1 point, adherence to dietary fruits consumption=1 point, adherence to dietary vegetables consumption=1 point and adherence to the use of dietary fats and oils=1 point. Adherence to each lifestyle item was scored in a five points Likert scale ordinal response as follows: All times=5 points, most times=4 points, sometimes=3 points, rarely=2 points and none=1 point. The lifestyle factor of physical activity was assessed by inquiring how often the respondents engaged in physical activities in the previous 7 days. Those who engaged in physical activities all times and most times were considered adherent while those who engaged in physical activities sometimes, rarely and none were considered non-adherent. Subject's occupational; transport, leisure-related and activities of daily living were taken into account in assessing for the physical activity. Alcohol consumption was assessed in the previous 12 months preceding the study. Patients who consumed alcohol sometimes, rarely and none were adherent while those who use alcohol all times and most times were non-adherent. Tobacco use was evaluated with respect to the use of smoked and smokeless tobacco in the previous 12 months. Patients who responded none were considered adherent while those who responded all times, most times, sometimes and rarely were considered non-adherent. The dietary fruits consumption was evaluated by asking how many days in the previous 7 days did the respondents eat fruits. Those who responded all times and most times were adherent while those who responded sometimes, rarely or none were non-adherent. The dietary vegetables consumption was evaluated by asking how many days in the previous 7 days did the respondents eat vegetables. Those who responded all times and most times were adherent while those who responded sometimes, rarely or none were non-adherent. The question on dietary saturated fat consumption was inquired in the previous 7 days and those who responded all times and most times are considered non-adherent while those who responded sometimes, rarely and none were adherent. The dietary fats and oils were classified into saturated and unsaturated oils and fats based on the type of oils and fats available in Nigeria. Question on dietary salt

consumption was evaluated in the previous 7 days by inquiring on the addition of raw table salt in addition to the one used to prepare the food item during meal times. Those who responded all times, most times, sometimes and rarely were considered non-adherent while those who responded none were considered adherent.

The information on physical activity and dietary measurements was based on previous 7 days physical activity and dietary recall methods. This method was expected to give required information on physical activity and dietary assessment based on the feasibility and the Nigerian practice population setting. The researchers explained briefly the concept of the study and made vigorous effort to maximize honest response in order to minimize the potential for information bias especially response acquiescence, social desirability response, floor and ceiling responsorial effects.

The pre-testing of the questionnaire was done internally at the primary care clinic using five non hypertensive patients. The pre-testing of the questionnaire lasted for two days. The respondents for the pre-testing of the questionnaire were selected haphazardly from the clinic. The pretesting was done to find out how the questionnaire would interact with the respondents and ensured that there were no ambiguities. However, no change was necessary after the pre-test as the questions were interpreted with the same meaning as intended. The questionnaire instrument was interviewer-administered. Language used was English Language. However, local languages were used to explain verbally to the patients who could not understand the medical language in the questionnaire. The questionnaire was administered once to each eligible respondent.

2.6 Operational Definitions

The authors defined LSM as the hypertensive patients' behavioral daily choices and practices as regards physical activity, alcohol and tobacco use, dietary fruits, vegetables, and salt, fats and oils consumptions. Adherence to LSM by hypertensive patients refers to the extent to which these patients behavior with respect to following dietary regimen and executing other lifestyle changes coincides with clinical prescriptions. Overall adherence to LSM was defined by the authors as score of 7 points in all the seven specific domains of LSM evaluated while non-adherence refers to the score less than 7 points. Specific adherence to LSM refers to adherence to specific lifestyle factor as defined by the 5 points Likert ordinal score described for each lifestyle factor in the methods section and scored as: all times=5 points, most times=4 points, sometimes=3 points, rarely=2 points and none=1 point. Primary care refers to the care provided by physicians specifically trained for comprehensive first contact and continuing care for undifferentiated patients including early detection, management of the patient, health promotion and maintenance [35].

2.7 Statistics

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 13.0, Microsoft Corporation, Inc. Chicago, IL, USA for calculation of percentages for categorical variables. Bivariate analysis involved the use of Chi-Square for testing the significance of associations between categorical variables. The level of significance was set at $p<0.05$.

3. RESULTS

Twenty three out of 140 patients were adherent to lifestyle modifications giving overall adherence rate of 16.4% whilst 117(83.6%) were not adherent (Table 1).

Distribution of the patients based on their adherence to specific domain of lifestyle factors showed one hundred and forty were adherent to non-use of tobacco (100.0%), 132(94.3%) were adherent to use of dietary salt and 127(90.7%) were adherent to consumption of alcohol. Other adherence to specific domains of lifestyle factors are shown in Table 2.

Bivariate analysis of the demographic factors as related to adherence to lifestyle factors showed that female gender(x^2=8.63, p-value=.045) was statistically significant while other demographic variables were not statistically significant (Table 3).

Table 1. Distribution of the hypertensive patients based on their overall adherence to lifestyle modifications (N=140)

Variable	Number	Percentage
Adherence		
Yes	23	16.4
No	117	83.6
Total	140	100.0

Table 2. Distribution of the hypertensive patients based on their adherence to specific domains of lifestyle modifications (N=140)

Variable	Number	Percentage
Adherence		
Non-use of tobacco	140	100.0
Use of dietary salt	132	94.3
Consumption of alcohol	127	90.7
Consumption of dietary vegetables	106	75.7
Consumption of dietary fruits	93	66.4
Consumption of dietary fats and oils	90	64.2
Physical activity	23	16.4

Table 3. Relationship between demographic factors and adherence to lifestyle modifications among the participants (N=140)

Variable	Adherence		X^2	P-value
	Yes	No		
	Number (%)	Number (%)		
Age(years)				
18-39	5(21.7)	5(4.3)		
40-60	8(34.8)	78(66.7)		
>60	10(43.5)	34(29.0)	7.03	.081
Sex				
Male	5(34.8)	51(43.6)		
Female	18(65.2)	66(56.4)	8.63	.045*

Table 3 Continued …….

Marital status				
Single	3(13.0)	1(0.9)		
Married	8(34.8)	93(79.5)		
Separated or divorced	3(13.0)	4(3.4)		
Widowed	9(39.2)	19(16.2)	3.69	.180
Education				
Primary and less	9(39.1)	36(30.8)		
Secondary and more	14(60.9)	81(69.2)	4.15	.213
Occupation				
Trading	2(8.7)	41(35.0)		
Public servant	5(21.7)	26(22.2)		
Farming	7(30.4)	15(12.8)		
Artisans	5(21.8)	6(5.1)		
Driving	0(0.0)	6(5.1)		
Clergy	3(13.0)	1(0.9)		
Retired	1(4.4)	22(18.9)	9.33	.087

**=Significant*

4. DISCUSSION

This study has shown that the overall adherence rate to lifestyle modifications among the study population was 16.4%. The finding of this study has corroborated previous reports on inadequate adherence to LSMs among hypertensive patients in Nigeria [26,27] and other parts of the world [28]. This result supports the report that prevalence of health lifestyle behaviors among patients with hypertension was low in high-income countries [28,36] with even lower levels in poor countries such as Nigeria [26,27]. The inadequate adherence to LSMs among the study population is probably due to misconceptions and health beliefs about hypertensive disorder in a milieu of resource-poor environment of the study area [37]. In addition, lack of emphasis and knowledge of LSMs by Nigerian clinicians may contribute to poor adherence to LSMs by hypertensive patients [38]. Physicians attending to adult Nigerians with essential hypertension should therefore ask specific questions in order to uncover LSMs constraints and problems. To improve adherence to the critical elements of LSMs among hypertensive patients clinicians must continually and periodically evaluate their hypertensive patients for adherence to LSMs in order to ensure that these patients are adherent. The primary care physicians should know that LSMs are effective in management of hypertension and should be recommended to all hypertensive patients and initiated at diagnosis. The primary care strategies to control blood pressure and reduce the risk of cardiovascular events should focus not only on blood pressure control with antihypertensive medications but also on the benefit of LSMs. This will invariably guide the patients into improvement in their quality of life.

The highest adherence rate was on the use of tobacco with 100.0% adherence rate. None of the respondents admitted to the use of tobacco in the previous 12 months. This finding is consistent with rational approach for the non-pharmacological management of hypertensives patients [12-14,26,27]. However, studies have shown that hypertensive patients differ in their use of tobacco and socio-environmental factors influence their use of tobacco [26-28]. In Ilorin, Western Nigeria, 1.8% of hypertensive patients used tobacco [26] while 2.3% used tobacco in Ibadan, South West Nigeria [27] and 18.5% tobacco use was reported in The Prospective Urban Rural Epidemiology(PURE) study [28]. Although the practice of smoking

might have been underreported among the patients, but 100.0% adherence to no smoking could be inferred that some of the respondents who were previous smokers quit smoking not necessarily due to their hypertensive condition or fear of hypertension-related risks but for other reasons such as religious reasons [26,27]. Furthermore, the patients were advised to avoid smoking at the initiation of treatment and this was re-enforced in subsequent follow up clinic visits. In addition no smoking among the female hypertensive patients who constituted larger proportion of the study population could be ascribed to socio-cultural reasons as the society detests smoking especially among the females. This finding therefore makes for a strong call to action for primary care interventions adopting strategies to ensure that those who didn't smoke avoid smoking while those who quit smoking didn't go back to it. This avoidance or cessation of tobacco use is an important modifiable risk factor to avoid adverse tobacco-related cardiovascular events.

The second highest adherence rate was on the use of dietary salt. This level of adherence could be attributed to the wide spread awareness of the role of dietary salt on blood pressure in Nigeria [12,26] and is in consonance with the reports that reduced salt consumption benefit hypertensive patients [12,13,15,24,39]. More so, this could be a reflection of wider social interactions among hypertensive patients who were adherent to dietary use of salt. This finding suggests that health education programs geared towards increasing the awareness of the use of salt should also emphasize other local sources of dietary salt such as food condiments and preservatives. Patient education is an integral part of primary prevention oriented approach to hypertension management and the basis of all education is communication. Without regular feedback on the use of dietary salt and food condiments between clinicians and hypertensive patients, this practice may be overlooked during clinical encounter in primary care.

The third highest adherence rate was consumption of alcohol. This could be a reflection of socio-economic and cultural values in the study area [10]. Of great concern in the study area is the notional belief that alcohol detoxifies antihypertensive medications and makes it ineffective. Moreover, some patients avoided alcohol due to financial constraints involved in purchasing antihypertensive medications in addition to procuring alcoholic drinks. Furthermore, the possible physiological and pharmacological interactions between alcohol and antihypertensive medications are likely to discourage ingestion of alcohol by patients on antihypertensive medications [40]. Awareness of this by physicians is crucial for optimal care of adult Nigerian hypertensive patients and this knowledge needs to be delivered to the patient during clinical encounter as part of comprehensive and continuous use of alcohol-related primary care health package.

The lowest adherence to LSM in this study was with physical activity. This finding is in agreement with the reports that physical activity is inadequate among hypertensives in Nigeria [26,27] and other parts of the world [28]. Although the benefits of physical activity in the management of hypertension are documented [17,41,42] but concerns regarding adherence are growing. However, non-adherence is costly in terms of cardiovascular morbidity and mortality. Counseling hypertensive patients on adherence to physical activity and the consequences of non-adherence should be the most important aspect of hypertensive care in primary care. A better understanding of the relevance of physical activity will result in improved adherence to its practice. However, this aspect of hypertensive care is often neglected by primary care professionals in Nigeria. This finding therefore calls for wider application of evidence-based physical activity hypertensive management guidelines in addition to diverse actions against limitations of physical activities in the study area. Health education of the physically inactive patients can help to increase the needed

knowledge to bring about desired changes in physical activity lifestyles since knowledge determines attitude and attitude determines the behavior. However, education alone may not be sufficient to achieve optimal physical health for these patients. The physically inactive patients must have access to proven and beneficial physical activity programs as there is physical activity for every hypertensive patients.

This study has shown that adherence to lifestyle modifications was significantly higher in females compared to males. This could be due to socio-environmental and cultural reasons [7,30]. The female hypertensives in the study area may not smoke or use alcohol not essentially due to their hypertensive condition but could be attributed to societal culture which frowns at smoking and alcohol use among the female folk. In addition, the females in the study area enjoy wider leisure-time and domestic-time related activities of daily living [43]. This could have force them into indulging unwittingly in a relative physical activity. More so, higher adherence among the females could be due to the accompaniment of the females to the hospital by their husbands, children and relatives. This companionship leads to supervision and monitoring of prescribed hypertension-related lifestyles and other diverse care.

4.1 Study Implications

Blood pressure control is reportedly poor among hypertensive patients in Nigeria [7,30]. This may not be exclusively attributed to non-adherence with antihypertensive medications but not unconnected with non-adherence with lifestyle modifications amidst the strength of the quality of care. Suffice it to say that substantial risk of cardiovascular events still exists despite treatment of hypertension with medications in the absence of adherence to lifestyle modifications. This underscores the relevance of lifestyle modifications as a component intervention for standard hypertension management. Given the rapidity with which lifestyles are changing in the study area, it is pertinent for primary care clinicians to inquire for unhealthy lifestyles during clinical consultations as well as motivate hypertensive patients to adopt and adhere to appropriate lifestyle modifications for hypertension. The health information and education on healthy lifestyle is not limited to the control of blood pressure but also the benefits of lifestyle modifications in prevention of complications of hypertension and other chronic cardio-metabolic disorders associated with hypertension.

4.2 Study Limitations

The limitations of the study are recognized by the researchers: The reliability of the qualitative responses on adherence to specific domains of lifestyles were subject to information bias (systematic error) since some patients couldn't clinically provide true responses to adherence to lifestyle factors. However, effort was made to minimize this threat by pre-testing the questionnaire internally and externally. More so, research assistants received training and instruction on standard interview procedure and respondents were assured of anonymity. In addition, socio-cultural background could explain the rarity of some of the behavioral lifestyle factors among the respondents. In order to minimize recall biases the questions were structured in a manner that will enable the researcher obtain information relevant to the objectives of the study. This objectivity was also maintained by not fielding misleading questions. The researchers ensured that questions were not ambiguous or presented to the respondents in such a way as to communicate different meanings that could generate inaccurate and inconsistent responses.

More so, the sample size for the study was relatively small, but was more than the minimum estimated sample size for the study and was the number of patients seen within the duration of the study.

Furthermore, this study was not an all inclusive study on lifestyle factors for hypertension management but on some selected common lifestyles such as physical activity, alcohol and tobacco use, dietary consumption of fruits, vegetables, salt and fats and oils. More so, the assessment for the lifestyle factors was not quantitative as regards the cardiovascular relevance of Likert ordinal scores for specific domains of lifestyle factors.

5. CONCLUSION

This study has shown that adherence to LSM was 16.4% with no smoking rated highest and physical activity the lowest. Female gender was significantly associated with adherence. This study urges consideration to sustain the current level of adherence on smoking while effort should be made to improve on identified domains of inadequate adherence.

6. FURTHER RESEARCH RECOMMENDATION

Further studies are suggested on quantitative evaluation of adherence to LSMs in order to further explore the effects of adherence to lifestyle factors on blood pressure control. This will provide valuable clinical and epidemiological data for collaborative purposes.

CONSENT

All authors declare that 'written informed consent was also obtained from respondents included in the study.

ETHICAL APPROVAL

Ethical certificate was obtained from the Ethics Committee of the hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yach D, Hawkees C, Gould CL, Hofman KJ. The global burden of chronic diseases: overcoming the impediments to prevention and control. JAMA. 2004;291:2616–2622.
2. Ayodele OE, Alebiosu CO, Salako BL, Awoden OG, Adigun A. Target organ damage and associated clinical conditions among Nigerians with treated hypertension. Cardiovasc J South Afr. 2005;16:89-93.
3. Arodiwe EB, Ike SO, Nwokediuto SC. Case fatality among hypertension-related admissions in Enugu, Nigeria. Niger J Clin Pract. 2009;12:153–156.
4. Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure: The JNC VII report. JAMA. 2003;289:2560–2572.

5. Ayodele OE, Alebiosu CO, Salako BL. Differential control of systolic and diastolic blood pressure in blacks with essential hypertension. J Natl Med Assoc. 2004;96:310–314.
6. Akpa MR, Alasia DD, Emem-chioma PC. An appraisal of hospital based blood pressure control in Port Harcourt, Nigeria. Nigerian Health J. 2008;8:27–30.
7. Iloh GUP, Ofoedu JN, Njoku PU, Amadi AN, Godswill-Uko EU. Medication adherence and blood pressure control amongst adults with primary hypertension attending a tertiary hospital primary care clinic in Eastern Nigeria. African Journal of Primary Health Care & Family Medicine. 2013;5:446
8. Wolf-Maier K, Cooper RS, Krammer H. Hypertension treatment and control in five European countries, Canada and the United States. Hypertension. 2004;43:10– 17.
9. Neal B, MacMahon S, Chapman N. Effects of ACE inhibitors, calcium antagonists and other blood pressure lowering drugs: Results of prospectively designed overviews of randomized trials. Blood Pressure Lowering Treatment Trialists Collaboration. Lancet. 2000;356:1955–1964.
10. Iloh GUP, Chuku A, Obiegbu NP, Ofoedu JN, Ikwudinma AO. Frequency of cardiovascular risk factors in adult Nigerians with family history of non-communicable cardiovascular disease in a primary care clinic of a tertiary hospital in a resource-constrained environment of Eastern Nigeria. American Journal of Health Research 2013;1(1):17-25.
11. Madaki AJK. Lifestyle medicine in primary health care. Nigerian Journal of Family Practice. 2012;2:39-41.
12. Sacks FM, Svetkey LP, Vollmer WM. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. N Engl J Med. 2001;344:3-10.
13. Sacks FM, Ard J. Effects of diet and sodium intake on blood pressure. Ann Intern Med. 2001;135:1019-1028.
14. Olubodun JO, Akingbade OA, Abiola OO. Salt intake and blood pressure in Nigerian hypertensive patients. Int J Cardiol. 1997;59:185-188.
15. Hooper L, Bartlett C, Daveysmith G, Ebrahim S. Systematic review of long term effects of advice to reduce dietary salt for prevention of cardiovascular disease. Br Med J. 2002;325:628-636.
16. Isezuo AS, Njoku CA. Blood pressure control among hypertensives managed in a specialized health care setting in Nigeria. Afr J Med Sci. 2003;32(1):163-70.
17. Lakshminarayanan S, Bala SM, Ramanujam M, Kannan G. Effectiveness of physical activity promotion in blood pressure and blood sugar reduction: A community-based intervention study in rural south India. J Fam Community Med. 2012;19:81-87.
18. Fletcher G. Physical inactivity as a risk factor for cardiovascular disease. Am J Med. 1999;107(2A):10S-11S.
19. WHO. Global strategy on diet, physical activity and health. Bulletins of the WHO. 2006;5:16-18.
20. Ryu M, Kimm H, Jo J, Lee SJ, Jee SH. Association between alcohol intake and abdominal obesity among the Korean population. Epidemiol Health. 2010;32.
21. Paschal B, Ross G, Fre P. Distribution of bold pressure, body mass index and smoking in the urban population of Dares salam, Tanzania. Int J Epidemiol. 2002;31.
22. Rimm EB, Ascherio A, Giovannucci E, Speigelman D, Stampfer MJ, Willet WC. Vegetables, fruits and cereal fibre intake and risk of coronary heart disease among men. JAMA. 1996;275:447-451.
23. US Preventive Services Task Force. Behavioural counseling in primary care to promote a healthy diet. Recommendations and rationale. Am Fam Physicians. 2003;67:2573-2576.

24. Vollmer WM, Sacks FM, Ard J, Appel LJ, Bray GA, Simons-Morton DG, et al. Effects of diet and sodium intake on blood pressure: subgroup analysis of the DASH trial. Ann Intern Med. 2001;135:1019-1028.
25. Willet WC. Diet and health: What should we eat? Science. 1994;264:532-537.
26. Katibi IA, Olarinoye JK, Kuranga SA. Knowledge and practice of hypertensive patients as seen in a tertiary hospital in the middle belt of Nigeria. Niger J Clin Pract. 2010;13:159–162.
27. Salako BL, Ayodele OE, Kadiri S, Arije A. Assessment of blood pressure control in a black African population. Trop Cardiol. 2002;28:3-6.
28. Teo K, Lear S, Islam S, Mony P, Dehghan M, Li W, et al. Prevalence of a Healthy ifestyle Among Individuals With Cardiovascular Disease in High-, Middle- and Low-Income Countries The Prospective Urban Rural Epidemiology (PURE) Study. JAMA. 2013;309:1613-1621.
29. Laurelea E, Roden DM. Principles of prescription order writing and patient compliance. In Gilman G, Hardman JG, Limbard LE, editors. The Pharmacological Basis of Therapeutics. 10th edn. New York: McGraw Hill. 2001;1911–1914.
30. Iloh GUP, Ofoedu JN, Njoku PU, Amadi AN. Blood pressure control among geriatric Nigerians with essential hypertension in a rural hospital in South-Eastern Nigeria. Port Harcourt Medical Journal. 2013;50-58.
31. Araoye MO. Sample size determination. Research Methodology with Statistics for Health and Social Sciences, Ilorin: Nathadex Publishers. 2004;115–121.
32. Appel LJ, Champagne CM, Harsha DW. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. JAMA. 2003;289:2083-2093.
33. Chow CK, Jolly S, Rao-Melacini P, Fox KA, Anand SS, Yusuf S. Association of diet, exercise, and smoking modification with risk of early cardiovascular events after acute coronary syndromes. Circulation. 2010;121(6):750-758.
34. McCullough ML, Willett WC. Evaluating adherence to recommended diets in adults: the Alternate Healthy Eating Index. Public Health Nutr. 2006;9(1A):152-157.
35. Iloh GUP, Ikwudinma AO, Obiegbu NP. Obesity and Its Cardio-metabolic Co-morbidities Among Adult Nigerians in a Primary Care Clinic of a Tertiary Hospital in South-Eastern Nigeria. J Fam Med Primary Care 2013;2:20-26.
36. Appel LJ, Champagne CM, Harsha DW. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. JAMA. 2003;289:2083-2093.
37. Oke DA, Bandele EO. Misconceptions of hypertension. J Natl Med Assoc. 2004;96:1221–1224.
38. Chiazor IE, Oparah AC. Assessment of hypertension care in a Nigerian Hospital. Tropical Journal of Pharmaceutical Research. 2012;11:137-145.
39. Charlton KE, Steyn K, Levitt NS. A food-based dietary strategy lowers blood pressure in a low socio-economic setting: a randomized study in South Africa. Public Health Nutr. 2008;11:1397-1406.
40. Stewart SH, Latham PK, Miller PM, et al. Blood pressure reduction during treatment for alcohol dependence: results from the Combining Medications and Behavioral Interventions for Alcoholism (COMBINE) Study. Addiction. 2008;103:1622-1628.
41. World Hypertension League. Physical exercise in the management of hypertension: A consensus statement. J Hypertens. 1991;9:283-287.
42. Blumenthal JA, Babyak MA, Hinderliter A. Effects of the DASH diet alone and in combination with exercise and weight loss on blood pressure and cardiovascular biomarkers in men and women with high blood pressure: the ENCORE study. Arch Intern Med. 2010;170:126-135.

43. Iloh GUP, Obiegbu NP, Abali Chuku, Ikwudinma AO. Predictors of limitations of physical activities of daily living among geriatric Nigerians with musculoskeletal disorders in under-resourced environment of a primary care clinic of a tertiary hospital in Eastern Nigeria. European Journal of Preventive Medicine. 2013;1:37-45.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=480&id=12&aid=4235