Cardiovascular Risk Profile of Post-Menopausal Women in a Semi-Urban Community in Nigeria

**Taofeek O. Awotidebe[1], Rufus A. Adedoyin[1*], Ifedayo L. Olola[1],
Victor O. Adeyeye[2], Odunayo T. Akinola[3], Chidozie E. Mbada[1]
and Babatunde O. Adedokun[4]**

[1]*Department of Medical Rehabilitation, College of Health Sciences, Obafemi Awolowo
University, Ile - Ife, Nigeria.*
[2]*Care Care Clinic, Obafemi Awolowo University Teaching Hospitals Complex, Ile – Ife,
Nigeria.*
[3]*Department of Physiotherapy, Lagos State University Teaching Hospital, Lagos, Nigeria.*
[4]*Department of Epidemiology and Medical Statistics, Faculty of Public Health, University
College Hospital, University of Ibadan, Ibadan, Nigeria.*

Authors' contributions

*All authors collaborated to carry out this study. Author TOA conceived of the study's design,
participated in the data collection, analysis and drafting of the first manuscript. Author RAA
participated in data analysis and final preparation of the manuscript. Author ILO participated
in the design, collection of data and literature review. Author VOA participated in the design
and literature review. Author OTA participated in the review of literature and editing of the
manuscript. Author CEM participated in the design of the study and data analysis. Author
BOA also participated in the drafting, data analysis and final preparation of the manuscript.
All authors read and approved the final manuscript.*

Short Research Article

ABSTRACT

Aims: Menopause is associated with a myriad of chronic health risks. This study
assessed the Cardiovascular Disease (CVD) risk profile of post-menopausal women from
a semi-urban community in Nigeria.
Study Design: Cross-sectional study
Place and Duration of Study: Ife Central Local Government, Ile - Ife, Nigeria
Methodology: One hundred and twenty menopausal women aged 55 years and older
participated in this study. The respondents were recruited using a multistage sampling

_____

Corresponding author: Email: radedoyi@yahoo.com;

technique. The Framingham Heart Study Questionnaire was used to assess CVD risk level. Risk scores were classified as low (0-19), medium (20-29) and high risk (40+). Socio-Economic Status (SES) was assessed using a validated questionnaire while cardiovascular and anthropometric parameters were measured following standard procedures. Data were analyzed using descriptive and inferential statistics. Alpha level was set at 0.05.

Results: The mean age, weight and Body Mass Index (BMI) of respondents were 64.9±8.4 years, 73.4±15.2kg and 27.3±5.4kg/m² respectively. A majority, 84(70.0%) of the respondents had high blood pressure, 77(64.2%) had over five years duration of onset of menopause while 13(10.8%) had high cardiovascular risk. Half of the respondents, 64(53.3%) were in the low SES class. High CVD risk was higher among individuals with over five years of menopause. Pearson Product Moment Correlation revealed significant relationship between CVD risk and each of age (r = 0.507; *P* = 0.01), body weight (r = 0.257; *P* = 0.01), onset time of menopause (0.359; *P* = 0.01), blood pressure status (r = 0.665; *P* = 0.01), occupation (r = 0.330; *P* = 0.01) and SES (r = 0.406; *P* = 0.01) among post-menopausal women.

Conclusion: Prevalence of CVD risk was high among Nigerian post-menopausal women in a semi-urban community. Age, body weight, years of onset menopause, blood pressure, occupation and socio-economic status level had significant relationship with high cardiovascular disease risk.

1. INTRODUCTION

The global upsurge in the prevalence of Cardiovascular Disease (CVD) [1-3] has a skewed propensity towards the female gender [4,5]. The high CVD risk in women is associated with many factors not limited to obesity [6], obesity co-morbid factors such as hyperlipidemia, hypercholesterolemia and hypertension [7-9], tobacco use [10], physical inactivity [4], stress [11] and socio-economic disparity [12]. Women are also at higher risk of developing CVD as age advances [13].

Menopause is an age related transition phase from the reproductive to the non-reproductive phase which often affects the physical, physiological and psychosocial aspects of women's life [14,15]. Menopause is associated with a myriad of chronic health risks. There are evidence that menopause has strong association with hypertension which is the most common related factor for coronary artery disease [16,17]. Assessment of CVD among post-menopausal women has been reported as an important strategic plan for prevention of CVD events [17-19]. Furthermore, establishment of post-menopausal clinic has been proposed as a way of reducing the consequences of menopause [15].

There is no evidence to suggest that cardiovascular health of women is given due attention in the countries of sub Saharan Africa (SSA). Lack of empirical data on cardiovascular risk constitutes a significant shortcoming in health planning and policy formulation for this high risk group. The numerical quantification of risk and its clinical consequences constitute information that might help patients to engage in preventive measures of CVD events [20]. Unfortunately, studies on the assessment of CVD risk of post-menopausal women in SSA are sparse. Therefore, this study assessed the cardiovascular risk profile of post-menopausal women from a semi-urban community in Nigeria.

2. MATERIALS AND METHODS

2.1 Respondents

One hundred and twenty post-menopausal women from Ile – Ife in Ife Central Local Government (LG), Osun state, Nigeria participated in this cross-sectional study.

2.1.1 Inclusion criteria

Eligibility for inclusion were,

1. Self-reported menopausal status.
2. Attainment of age 55years and above.

2.1.2 Exclusion criteria

1. Self-reported medical conditions such as diabetes, stroke or any physical disability were excluded from the study.
2. Self-reported cessation of menstrual flow due to surgical removal of uterus was also excluded from the study.

2.2 Procedure

The study protocol was approved by the health research ethics committee of institute of public health, Obafemi Awolowo University, Ile-Ife, Nigeria. A multi-stage sampling technique was used to recruit respondents from Ife Central Local Government. Ife Central Local Government in the city of Ile – Ife, Osun State, Nigeria. Ile-Ife has an area of 111 km square with 11 political wards and a population of 167, 254. Six out of eleven political wards were purposively selected in each ward based on the population of people living in such streets. Every odd numbered house on each street was selected for survey. An estimate of 20 respondents per ward was calculated to meet the required sample size. Community leaders in the selected political wards were consulted and permission to conduct the study was granted. Respondents that met the inclusion criteria were approached for participation in the study. the respondents were fully informed about the purpose of the study and their consent was obtained.

Data collection took place during the weekend (Sunday) between 13:00 and 17:00 hours. The blood pressure of respondents was measured twice at 5 minutes interval using electronic blood pressure kit in sitting position. Hypertension was classified as ≥140/90mmhg cut-point using the seventh joint national committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC 7) [21]. Average blood pressure was calculated while weight (kg), height (m), waist and hip circumferences (cm) were measured using standard procedure. the Framingham heart study and SES questionnaires were administered after proper instructions have been given as to how the questions were to be answered. Upon completion, the questionnaires were collected on spot.

2.3 The Framingham Heart Study Questionnaire

The Framingham heart study questionnaire was used to assess cardiovascular risk in this study. the questionnaire ask questions on lifestyle such as smoking, type of diet, stress,

participation in regular exercise, body weight, stress, blood pressure and family and personal medical history of diabetes. Based on the result of a previous study in this study locality by Adedoyin et al. [9], the section on diet was used to substitute for cholesterol count because majority did not know their cholesterol count. Socio-demographic, anthropometric characteristics and onset of menopause information about the respondents were also assessed.

Scores were assigned to each answer/response based on the scoring design of the original questionnaire. Male sex is scored one, while, female sex is scored zero; for age, 56 years and older is scored one, while, 55 year olds and below is scored zero. Respondents who had relatives (blood relations) with history of heart attack or stroke before age of 60 are scored 12. If a respondent had history of heart attack or heart surgery, a score of 20 was assigned. The summed up scores from all the items on the questionnaire represents the risk score. The total score obtained was classified as high (40 and above), moderate (20-39) or low risk (19 and below).

2.4 Socio-economic Status Questionnaire

Socio-economic status (SES) was assessed using the socio-economic status questionnaire by Adedoyin et al. [22]. The questionnaire assessed information on the three basic indicators of SES which included occupational status, educational level and income. Information on valuable assets in Nigeria context such as owning a house, car and household equipment (television, video, computer, VCD, refrigerator, fan, generator, radio player, air conditioner, type of furniture etc.) were assessed. Position in the society such as a community leader, religious leader or any other was also enquired. The scoring of the items on the questionnaire was based on their importance in the Nigerian society. The total score obtainable from the questionnaire was 27 with each SES indicator having a maximum of 9 score. Based on the summative score, the respondents were categorized into lower (< 9), middle (10-18) or high (19-27) SES stratum [22].

2.5 Data Analysis

Descriptive statistics of frequency, percentages, mean and standard deviation were used to summarize data. Inferential statistic of Pearson Product Moment Correlation was used to determine the relationship between cardiovascular risk scores and individual factors such as age, body mass index, educational level, occupation, income, socio-economic status, onset of menopause and blood pressure level. Data analysis was carried out using STATA-SE version 11.0 software (STATA Corp, Texas, USA). Level of significance was set at $p<0.05$

3. RESULTS AND DISCUSSION

The mean of each of age, weight, height, Body Mass Index (BMI), waist circumference, hip circumference and waist-hip-ratio (WHR) of respondents was 64.9±8.4years, 73.4±15.2kg, 1.6±0.1m, 27.3±5.4kg/m^2, 94.5±12.5cm, 106.0±12.4cm and 0.9±0.1 respectively. A majority, 89(74.2%) of the respondents had primary education, 64(53.4%) were traders with a majority 84(70.0%) having less than #50,000 as monthly income while half, 64(53.3%) were in low socio-economic status. More than half, 77(64.0%) of the respondents had more than five years of onset duration of menopause. High CVD risk (40+) was reported by 13(10.8%). Of the population with high CVD risk, individuals with over 5 years onset of post-menopause

constituted (92.3%), while those who have high BP, traders, overweight and individuals older than 75 years were 12(92.3%), 9(69.2%), 7(53.8%) and 6(46.2%) respectively (Table 1).

Table 1. Socio-demographic, anthropometric characteristics and cardiovascular risk scores of respondents

Variable	Mean±S.D.
Age (years)	64.9±8.4
Weight (kg)	73.4±15.2
Height (m)	1.6±0.1
BMI (kg/m^2)	27.3±5.4
WC (cm)	94.5± 12.5
HC (cm)	106.0±12.4
WHR	0.9±0.1
Age group	n (%)
55-65	71(59.2)
66-75	31(25.8)
>75	18(15.0)
Educational level	
Primary	89(74.2)
Secondary	22(18.3)
Tertiary	9(7.5)
Occupation	
Housewife	26(21.7)
Trader	64(53.4)
Farmer	6(5.0)
Cleaner	10(8.3)
Civil servant	13(10.8)
Clergy	1(0.8)
Monthly Income	
<#50,000	84(70.0)
>#50,000	36(30.0)
Socio-Economic Status	
Low	64(53.3)
Middle	30(25.0)
High	26(21.7)
Duration of onset	
<2	11(9.2)
3-5	32(26.7)
>5	77(64.2)
Blood Pressure	
Normotensive	36(30.0)
Hypertensive	84(70.0)
Cardiovascular Risk Score	
Low risk (0-19)	73(60.8)
Medium risk (20-29)	34(28.4)
High (40+)	13(10.8)

Key: BMI, Body Mass Index; WC, Waist circumference; HC, Hip circumference; WHR, Waist to hip ratio

Table 2 showed Pearson Product Moment Correlation between cardiovascular risk score and each of cardiovascular risk factor. There were significant relationships between age (r = 0.507; *P* = 0.01), body weight (r = 0.257; *P* = 0.01), onset time of menopause (0.359; *P* = 0.01) blood pressure status (r = 0.665; *P* = 0.01), occupation (r = 0.330; *P* = 0.01) and SES (r = 0.406; *P* = 0.01) and cardiovascular risk score among post-menopausal women. However, no significant relationship was found in each of the socio-economic indicators; education (r = 0.085; p = 0.36) and income (r = 0.079; *P* = 0.39). There was a similar pattern of CVD risk across the age groups Fig. 1.

Table 2. Correlation between age, anthropometric, onset of menopause, cardiovascular parameters and cardiovascular (CVD) risk score of respondents

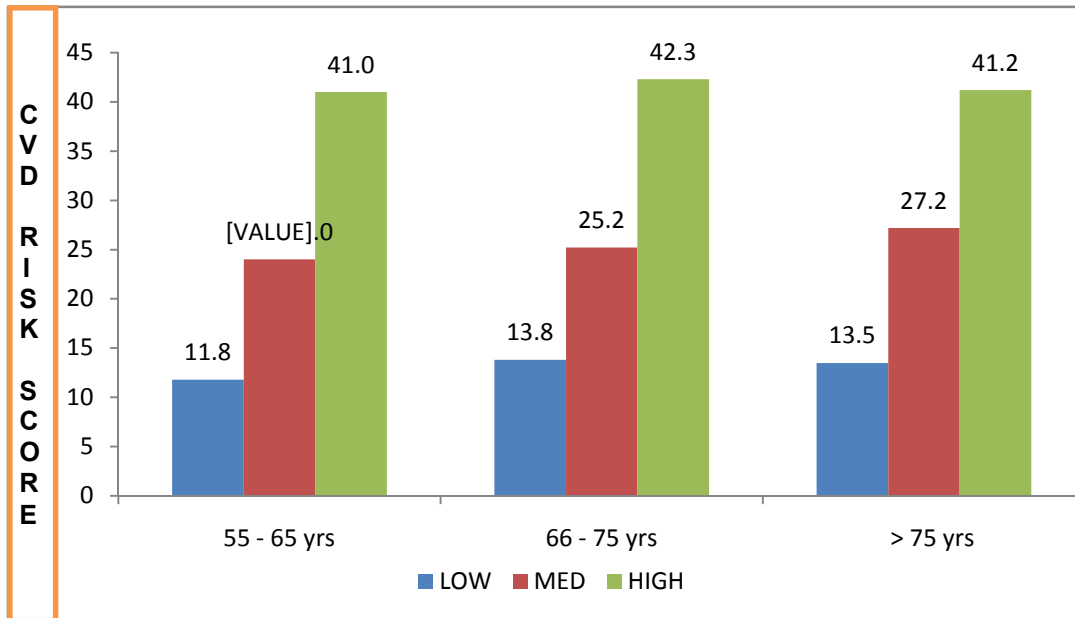| Variable	r	p-value
Age	0.507	0.01*
Weight	0.257	0.01*
Body Mass Index	0.090	0.33
Onset time of menopause	0.359	0.01*
Blood Pressure	0.655	0.01*
Income	0.079	0.39
Education	0.085	0.36
Occupation	-0.330	0.01*
SES	0.406	0.01*

Significant at p<0.05

Fig. 1. Cardiovascular risk score and participants' age groups

This study investigated cardiovascular risk profile of postmenopausal women in a semi-urban community in Nigeria. The result of this study showed that significant percentage (10.8%) of post-menopausal women had high CVD risk. Reports from other SSA experts recorded 7 to 10% [23,24]. The range of high CVD risk in literature varies from one study to

another. The instruments employed to assess CVD risk varied widely and this may account for the difference. The variation in the methodological and mode of assessment may constitute a significant limitation in comparing findings in the field. A common denominator from previous reports is that post-menopausal women are at higher risk of CVD than women in the reproductive years [25-27]. A study by Lerner and Kannel [28] using the Framingham Heart Questionnaire reported that women aged 50–59 years who had experienced natural menopause had 4 times at risk of CVD than premenopausal women.

It is believed that menopause is a risk factor for CVD because estrogen withdrawal has a detrimental effect on cardiovascular function and metabolism [29]. At menopause, there tends to be an increase in the sympathetic nervous system activity [7], changes in the production of serum lipids and lipoproteins, in particular, an increase in low-density lipoprotein (LDL), lipoprotein-α and triglycerides and a decrease in high-density lipoprotein (HDL) [29] and progressive weight gain and consequent increase in blood pressure[30, 31]. The present study also corroborates the findings of previous studies that the relationship between menopause and blood pressure contributes to CVD risk [27,32]. Presence of all these risk factors is believed to contribute to higher CVD risk among menopausal women. Although some studies have reported no consistent causal and effect relationship between menopausal status and CVD risk [33,34] but our finding is in line with findings of previous studies [16,35,36-38].

The result of this study showed that CVD risk has significant relationship with age among post-menopausal women. This finding is consistent with previous reports that age is associated with increased risk for CVD [18,39-41]. Several epidemiological and observational studies also confirm that age remains one of the strongest predictors of CVD risk [13]. A review submitted that the largest apparent increase in CVD mortality in women occurs around age 50 years, coinciding with the time of menopause [19]. Although experts believe that as age advances, degeneration of arterial vessels and formation of plaque play significant role in the CVD risk yet the withdrawal of estrogen at this stage could be as well be detrimental. Our study showed that CVD risk was significantly associated with duration of menopause. Previous study established that CVD risk increases with the postmenopausal duration [40].

Socio-economic status (SES) has been reported to have significant relationship with CVD risk [22,41]. In Nigeria context, SES indicators include occupation, education and income which are universally acceptable criteria for SES categorization. Unfortunately, majority of people are within low socioeconomic class with less than 2 dollars per day. Health and economic inequalities usually affect more women than men globally. Though our study did not show significant relationship between level of education and CVD risk but some studies have reported an unfavorable CVD risk factor in both men and women [42]. In a related study, Engstram et al. [43] posited that short education and low occupation level were both associated with an increased prevalence of smoking, hypertension, hyperlipidemia and diabetes which are risk factors for CVD. Similarly, Cirera et al. [44] concluded that higher educational level in both genders could serve as opportunity to access information for healthy living and imbibe such lifestyle. However, these studies are not specific to post-menopausal populations. It may also be concluded that methods of assessment of socioeconomic status may not be limited to the traditional socioeconomic indicators considering different sociocultural backgrounds.

Similarly, past studies of menopause-CVD risk relations have multifactorial confounding factors which are not mutually exclusive. Confounding factors such as chronologic age,

behavioural and lifestyle factors such as cigarette smoking, alcohol or tobacco use, physical inactivity and obesity and hypertension are associated both with occurrence of menopause and CVD risk [19,45,46].

4. CONCLUSION

Prevalence of CVD risk was high among Nigerian post-menopausal women in a semi-urban community. Age, body weight, length of menopause and blood pressure level were significant risk factors for cardiovascular risk. The high prevalence of CVD risk in this study substantiates the need for concerted efforts to reduce CVD event among post-menopausal women. Policy formulation involving regular physical activity and healthy behaviours may improve women's health in sub-Sahara Africa.

5. LIMITATION OF THE STUDY

Potential limitations of our study included the self-reported menopausal status, and the in-exhaustive assessment of CVD risk factors. Furthermore, biochemical analysis of lipid profiles of the women was not carried out due to some constraints.

CONSENT

Respondents' informed consent was obtained prior participation in this study.

ETHICAL APPROVAL

This study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK: Global burden of hypertension. Analysis of Worldwide Data. 2005;365:217–23. Lancet.
2. BeLue R, Okoror TA, Iwelunmor J, Taylor KD, Degboe AN, Agyemang C: An overview of cardiovascular risk factor burden in sub-Saharan African countries: A socio-cultural perspective. Globalization and Health BMC. 2009;5:10.
3. World Health Organization: Factsheet no. 311: Obesity and Overweight. Geneva; 2011.

4. World Health Organization: The world health report. Reducing Risks, Promoting Healthy Life, Geneva; 2002

5. American Heart Association: Women and cardiovascular disease facts. Am J Epidemiol. 2007;117-245-257.

6. Lambrinoudaki I, Brincat M, Erel CT, Gambacciani M, Moen MH, Schenck-Gustafsson K, Tremollieres F, Vujovic S, Rees M, Rozenberg S. EMAS position statement: Managing obese postmenopausal women. Maturitas. 2010;66(3):323-6.

7. Schnatz PF, Schnatz JD. Dyslipidemia in menopause: Mechanisms and management. Obstet Gynecol Surv. 2006;61(9):608–13.

8. Kanaya AM, Vittinghoff E, Shlipak MG, Resnick H.E, Visser M, Barrett-Connor DE. Association of total and central obesity with mortality in postmenopausal women with coronary heart disease. Am J Epidemiol. 2003;158:1161-70.

9. Adedoyin RA, Balogun MO, Adekanla AA: An assessment of cardiovascular risk among the people of a Nigerian university. Eur J Cardiovasc Prev Rehabil. 2006;13:551-554.

10. World Health Organization: Gender, Women and the Tobacco Epidemic. Geneva; 2010.

11. Kivimäki M, Leino-Arjas P, Luukkonen R, Riihimäi H, Vahtera J, Kirjonen J. Work stress and risk of cardiovascular mortality: Prospective cohort study of industrial employees. BMJ. 2002;325-857.

12. Shah S, Cook DG. Inequalities in the treatment and control of hypertension: Age, social isolation and lifestyle are more important than economic circumstances. J Hypertens. 2001;19:1333–40.

13. D'Agostino RB Sr, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, Kannel WB. General cardiovascular risk profile for use in primary care: The Framingham Heart Study. Circulation. 2008;117(6):743–53.

14. Fugate Woods N, Mariella A, Sullivan Mitchell E. Patterns of depressed mood across the menopausal transition: Approaches to studying patterns in longitudinal data. Acta Obstet Gynecol Scand. 2002;81:623–32.

15. Meeta M, Digumarti L, Agarwal N, Vaze N, Shah R, Malik S. Clinical practice guidelines on menopause. An executive summary and recommendation. J Midlife Health. 2013;4:77-106.

16. Wenger NK. Coronary heart disease. The Female Heart is Vulnerable Prog Cardiovasc Dis. 2003;46:199–229.

17. Sharma S, Tandon VR, Mahajan A. Menopause and cardiovascular disease. J Med Edu Res. 2008;10:1-10.

18. Colditz GA, Willet WC, Stampfer MJ, Rosner. Menopause and the risk of coronary heart disease in women. N Engl J Med. 1987;316:1105-1110.

19. Stampfer MJ, Colditz GA, Willett WC. Menopause and heart disease: A review. Ann NY Acad Sci. 1991;592:286–294.

20. Rojas NBA, Álvarez YCH, Herrera AFD, García RN, Guzmán AC. Cardiovascular risk among older women in a Havana health area. MEDICC Review. 2008;10(2):21-26.

21. Chobanian AV, Bakris GL, Black HL, Cushman WC, Green LA, Izzo JL. The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure. Hypertens. 2003;42:1206-1252.

22. Adedoyin RA, Mbada CE, Awofolu OO, Oyebami OM. The influence of socioeconomic status on casual blood pressures of the adult Nigerians. Eur J Cardiovasc Prev Rehabil. 2005;12(3).

23. Anthony KK. Pattern of cardiac failure in Northern Savannah Nigeria. Trop Geogr Med. 1980;32(2):118-125.

24. Oyoo GO, Ogola EN. Clinical and socio-demographic aspects of congestive heart failure patients at Kenyatta National Hospital, Nairobi. East Afr Med J. 1999;76(1);23-27.
25. Kannel WB, Hjortland MC, McNamara PM, Gordon T. Menopause and risk of cardiovascular disease: The Framingham study. Ann Intern Med. 1976;85(4):447-52.
26. Jacobsen BK, Knutsen SF, Fraser GE. Age at natural menopause and total mortality and mortality from ischemic heart disease: The adventist health study. J Clin Epidemiol. 1999;52:303-307.
27. Bello N, Mosca L. Epidemiology of coronary heart disease in women. Prog Cardiovasc Dis. 2004;46(4):287–95.
28. Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: A 26-year follow-up of the Framingham population. Am Heart J. 1986;111:383–390.
29. Rosano GM, Vitale C, Marazzi G, Volterrani M. Menopause and cardiovascular disease: The evidence. Climacteric. 2007;10(1):19-24.
30. Williams CM. Lipid metabolism in women. Proc Nutr Soc. 2004;63(1):153–60.
31. Kanaya AM, Vittinghoff E, Shlipak MG, Resnick HE, Visser M, Barrett-Connor DE. Association of total and central obesity with mortality in postmenopausal women with coronary heart disease. Am J Epidemiol. 2003;158:1161-70.
32. Fiebach NH, Herbert PR, Stampfer MJ. A prospective study of high blood pressure and cardiovascular disease in women. Am J Epidemiol. 1989;130:646-54.
33. Atsma F, Bartelink ML, Grobbee DE, Van der Schouw YT. Postmenopausal status and early menopause as independent risk factors for cardiovascular disease: A meta-analysis. Menopause. 2006;13(2):265-79.
34. Szmuilowicz ED, Manson JE, Rossouw JE, Howard BV, Margolis KL, Greep NC, Brzyski RG, Stefanick ML, O'Sullivan MJ, Wu C, Allison M, Grobbee DE, Johnson KC, Ockene JK, Rodriguez BL, Sarto GE, Vitolins MZ, Seely EW. Vasomotor symptoms and cardiovascular events in postmenopausal women. Menopause. 2011;18(6):603-10. DOI: 10.1097/gme.0b013e3182014849.
35. Kublickiene K, Svedas E, Landgren BM. Small artery endothelial dysfunction in postmenopausal women: *In vitro* function morphology and modification by oestrogen receptor modulator. J Clin Endocrinol Metab. 2005;90:6113-22.
36. Perez-Lopez FR, Chedraui P, Gilbert JJ, Perez-Roncero G. Cardiovascular risk in postmenopausal women and prevalent related co-morbid conditions: Facing the post-women's health initiative era. Fertility and Sterility. 2009;92(4):1171–1186.
37. Jani B, Rajkumar C. Ageing and vascular ageing. Postgrad Med J. 2006;82(968):357–362. DOI: 10.1136/pgmj.2005.036053.
38. Ezeanyika LUS, Ugwu CE, Nwanguma BC, Onah LE, Ojobo C, Abba V, Okpanachi G. Assessment of cardiovascular disease risk factors of an urban Nigerian hypertensive population using a risk score calculator. Pak J Med Sci. 2008;24(3):390-4.
39. Tandon VR, Mahajan A, Sharma S, Sharma A. Prevalence of cardiovascular risk factors in postmenopausal women: A rural study. J Midlife Health. 2010;1(1):26-9.
40. Alessandri N, Piccioni MG, Isabelli V, Alessandri G, DI Matteo A, Padovani D, Rondoni G, Camardella B, Parlapiano C. Morphological and functional changes of cardiovascular system in postmenopausal women. Eur Rev Med Pharmacol Sci. 2007;11:107-117.
41. Yu Z, Nissinen A, Vartiainen E, Song G, Guo Z, Zheng G, Tuomilehto J, Tian H. Cardiovascular risk factors in an urban population in China. Bulletin of the World Health Organization. 2000;78(11):1296–1305.

42. Luoto R, Pekkanen J, Uutela A, Tuomilehto J. Cardiovascular risks and socioeconomic status: Differences between men and women in Finland. J Epidemiol Community Health. 1994;48(4):348-54.

43. Engstram G, Tydan P, Berglund G, Hansen O, Hedblad B, Janzon L. Incidence of myocardial infarction in women. J Epidemiol Community Health. 2000;54:104-107. DOI: 10.1136/jech.54.2.104.

44. Cirera L, Tormo NJ, Chirlaque MD. Cardiovascular risk factors and educational attainment in Southern Spain. Eur J Epidemiol. 1998;14(8):755-63.

45. Bush TL. The epidemiology of cardiovascular disease in postmenopausal women. Ann NY Acad Sci. 1990;592:263–71.

46. Crawford SB, Johannes CB. The epidemiology of cardiovascular disease in postmenopausal women. J Clin Endocrinol Metab. 1999;84(6):1803-1806.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=581&id=12&aid=5083