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SYSTEMATIC REVIEW ON RISK FACTORS FOR CARDIOVASCULAR DISEASES

Dr. Evayline Nkirigacha Miriti*

Senior Lecturer, Department of Foods, Nutrition and Dietetics, School of Health and Human, Sciences, Pwani University, P.O BOX 195-180, KILIFI, KENYA.

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***Corresponding Author**
Dr. Evayline Nkirigacha Miriti
Senior Lecturer, Department of Foods, Nutrition and Dietetics, School of Health and Human, Sciences, Pwani University, P.O BOX 195-180, KILIFI, KENYA.

ABSTRACT

There is a rise in cardiovascular diseases in the populations causing a world disease burden. This has led to increased morbidity and premature mortality in developing and developed countries. Several surveys conducted across the country over the past two decades have shown a rising prevalence of major risk factors for cardiovascular diseases in urban and rural populations. By examining similar experiences globally, it outlines the scope of cardiovascular diseases surveillance in globally and more so in developing countries. This was a systematic review of published articles for the period up to 2018. The papers reviewed were cutting across regions from African regions to the Gulf regions and European and United States of America regions. The papers reviewed were on the risk factors for cardiovascular disease between male and females of age between 18 to 90 years. The results showed that the major risk factors for cardiovascular diseases were dyslipidemia, hypertension, smoking and excessive use of alcohol, diabetes mellitus, unhealthy diets, gender and lack of physical exercise. This study will help to point out the need of research so that some advanced diagnosis system may be developed for proper diagnosis of cardiovascular disease and to reduce the growing burden of cardiovascular diseases in the world. There is need to conduct education on the real causes of cardiovascular diseases to populations in order to reduce chances of contracting the disease. Healthy lifestyle and consumption of Mediterranean diets is key to reduction of cardiovascular diseases in all populations.

KEYWORDS: Cardiovascular diseases; hypertension; healthy diets; obesity.

INTRODUCTION

Globally all nations have committed to reduce premature mortality arising from Non Communicable Diseases (NCDs) by 25% by the year 2030 (WHO, 2010). This declaration was reached after World Health Organization global report indicated that out of 57 million deaths; 36 million (63%) were due to non-communicable diseases majorly; mainly hypertension, stroke and heart attack, diabetes, cancer and chronic respiratory disease. Sadly, these are projected to reach 80% of major cause of death by the year 2030(WHO, 2010). A large percentage of non-communicable diseases are preventable through the reduction of the four main modifiable behavioral risk factors; Unhealthy diet, physical inactivity, harmful use of tobacco and excessive alcohol consumption and reducing obesity. Among the adopted strategies are the "Alameda seven"(WHO, 2013). Hypertension is one of the five leading causes of mortality in the world and a major risk factor associated with more than 40% of deaths related to cardiovascular and renal diseases (Danaei *et al*., 2014). Because of its asymptomatic nature, many people with the disease remain undiagnosed and untreated thus resulting in increased premature and sudden deaths due to direct or indirect complications(Ataklte., 2015).

Global perspective

The prevalence of Hypertension is highest in the African region at 46 percent (WHO, 2010). Further the numbers of people with undiagnosed, untreated and uncontrolled hypertension are also high in lower and middle income countries compared to high income countries (who, 2010). Hypertension was mainly associated with well to do and affluent regions in the world. However, studies indicate that hypertension is increasingly becoming an issue in low and middle income countries due to scarce health resources which are stretched by infectious disease burden (Status report on Hypertension In Africa, 2013). According to 2010 WHO estimates, 22% of adults aged 18 years and above were hypertensive, and 9.4 million deaths were estimated to have been caused by hypertension, which is about 7% of the global burden of disease (WHO, 2010). Across the WHO regions, Africa has the highest prevalence of high blood pressure with 30% of the people affected, while the lowest was recorded in the American Region (WHO, 2010, Adeloye and Basquil, 2014). According to a systematic analysis conducted in 2014, prevalence of hypertension increased from 19.7% in 1990 to 30.8% in 2010 in Africa (Bromfield and Muntner, 2013). The changing epidemiology of hypertension is associated with the global economic development resulting in aging

population in some societies, and changing lifestyle resulting in increased prevalence of obesity, alcohol and tobacco consumption and physical inactivity (Yusuf *et al.,*2001). Worse still, the level of awareness, treatment and control of hypertension remain low in Africa, thus most of the affected persons are unaware of their status (Adeloye and Basquil, 2014).

Causes of heart conditions

Type 2 diabetes is associated with substantial cardiovascular morbidity and mortality arising from the high prevalence of cardiovascular risk factors such as hypertension, dyslipidaemia, obesity, poor glycaemic control and albuminuria. Adequacy of control of these risk factors determines the frequency and outcome of cardiovascular events in the patients. Current clinical practice guidelines emphasize primary prevention of cardiovascular disease in type 2 diabetes. Cardiovascular events make about eighty (80%) percent of the morbidity and mortality in the patients with type 2 diabetes (Almdal *et al.,* 2001). Smoking, raised blood pressure, raised serum cholesterol, and diabetes mellitus were established as risk factors in the development of CVDs (Cardiovascular Diseases). Weight management and weight loss, sometimes together with other dietary and lifestyle changes, have resulted in lower levels of blood pressure and lipids, and delayed incidence of diabetes mellitus, which are all established CVD risk factors (Lancet diabetes, 2014). How established CVD risk factors and high BMI(Body Mass Index) vary across countries is complex and their levels are only partly associated with countries' income and urbanization (Danaei *et al.,* 2016). BMI levels are highest in middle-income countries including in the Pacific Island nations, Middle East and North Africa, parts of Latin America and the Caribbean, and, for women, southern Africa;BMI is still relatively low in central and East Africa, and South Asia (LuY *et al.,* 2014) Regional mean BMIs in 2014 for men ranged from 21.4 kg/m^2 in central Africa and South Asia to 29.2 kg/m^2 (95% credible interval, 28.6–29.8) in Polynesia and Micronesia; for women, the range was from 21.8 kg/m^2 (21.4–22.3) in South Asia to 32.2 kg/m^2 (31.5–32.8) in Polynesia and Micronesia (NCR Risk Factor Collaboration, 2016) Among high-income countries, BMI is higher in native English-speaking countries than those in Asia and continental Europe. Diabetes prevalence is also highest in most of the same regions with high mean BMI (Daaei, 2016). For example, age-standardized diabetes prevalence in 2014 was >20% in adult men and women in Polynesia and Micronesia, and ≈15% in Melanesia and in the Middle East and North Africa (NCD Lancent, 2016). Diabetes prevalence is higher than expected based on BMI in South Asia, and lower than expected based on BMI in northwestern Europe. Li (2009) he established risk factors and high BMI are collectively responsible for an estimated 9.7 million annual CVD deaths in the world, after accounting for multicausality and for mediation of the effects of high BMI by blood pressure, total cholesterol, and glucose (Lancent Diabetes, 2014). Of the individuals who died, 3.9 million were between 30 and 70 years of age, and hence, their deaths are considered premature; and the remaining individuals who died were >70 years of age. The majority of the risk factor–attributable cardiovascular diseases' deaths result from elevated blood pressure, followed by smoking for men and by high BMI for women, who, as noted above, smoke less than men in most regions. The largest number of deaths attributable to the established risk factors and high BMI, especially those attributable to high blood pressure, occurred in East Asia followed by the regions of central and eastern Europe and central Asia. Heavy drinking, especially when done in binge drinking episodes, is associated with increased risk of IHD, stroke, and atrial fibrillation (LuY *et al.,* 2014).

Reducing the risk factors for cardiovascular disease

Caseation of tobacco use, reduction of salt in the diet, consuming fruits and vegetables, regular physical activity and avoiding harmful use of alcohol are some of the practices that can be carried out to reduce the risk factor for cardiovascular diseases. In addition drug treatment for diabetes, hypertension and high blood lipids are necessary to reduce the risk factor. Health policies that create conducive environments for making healthy choices affordable and available are essential for motivating people to adopt and sustain healthy behavior (WHO, 2011).

There is need to also build a strong economy that supports everyone in the population to avoid stress brought about by poverty. There is need for changes in cultural set up so that food consumption is not limited by cultural taboos (Mbogoh *et al,* 2018).

Cardiovascular disease a quick and slow killer

- Hypertension is a silent killer disease that can be diagnosed upon physical measurement of blood pressure;
- Hypertension is a non-communicable disease which is preventable through behavioral modification practices;
- Hypertension is slowly becoming an issue in low and middle income countries whose prevalence is highest in Africa region.

Data source and study selection

This was a systematic review of published articles for the period up to 2018. The papers reviewed were cutting across regions from African regions to the Gulf regions and European and U.S.A regions. The papers reviewed were on the risk factors for Cardiovascular disease between male and females of age between 18 to 90 years. A manual search of reference lists of original studies was searched. In addition, checking the review articles, contacting the official website of the African region concerning cardiovascular diseases conditions and the associated risk factors was done. The titles and abstracts of all articles of potential interests were reviewed for

inclusion and exclusion of the studies that indicated the prevalence of Cardiovascular Disease risk factors. Stroke, diabetes type 11, dyslipidemia, dietary habits, smoking, hypertension, obesity and physical activity were the main risk factors for cardiovascular disease that the study targeted. The included studies were not limited by sample size due to the limited number of such studies. A total of 200 full-text papers were identified and further reviewed. Data extracted for each study included the first author, year of publication, sample size, demographic characteristics, the Country of study, study objectives and response rate. The quality assessment checklist of the included studies in the systematic review were as per recommended guidance (WHO, 2012).

The results showed that dyslipidemia prevalence was the most prevalent cardiovascular risk factor. The most prevalent type of dyslipidemia was low HDL-C, ranging between 7.2% to 67.8% (NCR risk factor collaboration, 2016, Danaei *et al*,2016) Most enrolled subjects were diagnosed with dyslipidemia prior to the study, while screening identified an addition number of patients (Geofrey *et al.,* 2017).

Hypertension prevalence

The prevalence of hypertension is highest at the African regions at 46% (Mwagi *et al*, 2018, WHO, 2017).Elevated blood pressure recorded more on patients who had a prior history of hypertension and fewer patients diagnosed with it for the first time ranging between 10% to 80.9% respectively (Roereck and Rehm, 2012), Georfry *et al*,2017). Among these, those who were aware of their condition were ranging between 15.6% to 62.1% while patients who were aware that they were hypertensive ranged between 18.9% to 56.2% Shkuri *et al*., 2018,(NCR risk factors collaboration, 2016). Factors associated with hypertension were older age ranging from 18% to 89.2% (Shkuri *et al, 2018),*higher Body Mass Index (BMI) ranging from 20% to 87% and from 18% to 73% for harmful use of alcohol. While in Africa hypertension was considered non-existent in the early twentieth century (Donnison, 1929).

Diabetes prevalence

Most of the respondents analyzed had diabetes some having a prior diagnosis while others were diagnosed after screening which was conducted in most studies. Most were diagnosed with an abnormal blood glucose level of ≥7 mmol/L and least number had ≥6.6 mmol/L. Majority of respondents with cardiovascular disease were diagnosed with diabetes ranging from 14.6% to 89.6%.

Smoking prevalence

The prevalence of smoking in patients who were hypertensive and had a heart condition was high with some reviews recording 6.3% to 56.7% for both earlier and current smokers.

Age, gender and community (rural vs urban)

Age, gender and community (Rural vs. Urban) as risk factors for hypertension, showed that older patients have higher rates of dyslipidemia, hypertension and diabetes, while younger patients aged <40 years had dyslipidemia or abdominal obesity. Males and females had similar prevalence of diabetes, dyslipidemia and hypertension but males had higher prevalence of obesity and abdominal obesity. Smoking tends to be more on males than females. The prevalence of most cardiovascular risk factors measures was higher in rural centers. Urban centers also demonstrated higher rates of dyslipidemia, hypertension, diabetes and abdominal obesity between 34.5% to 69.9%, 23.4% to 41.2%, 8.6% to 18.7%, and 23.5% to 62.6% respectively (Ruan, 2018,Geofrey *et al*., 2017, Najala and Frank, 2015). The risk of smoking was the same in both situations rural and urban centers. The rate of smoking ranged between 7.6 to 46.9% with frequent heavy drinkers originating from China at 6.4% and was lowest in Mexico at 0.1%. In terms of physical activity involvement countries from Africa recorded lowest rate of involvement.

Obesity prevalence

The prevalence of obesity as defined by waist circumference (i.e abdominal obesity) was found to have median (25^{th}, 75^{th} percentile) waist circumference ranging between 60.5 cm to 89.9cm (82.8 -96.5) in men and between 83.4 -91.5 cm (82.2-101.3) in women and the median BMI ranged between 21.3-25.9 kg/m2. When determining the prevalence of obesity use of waist circumference is 2.5 times more common than the prevalence of obesity when defined by BMI≥30kg/m2 (63.7% vs 24.4% respectively (Geoffrey *et al.,* 2017). The high prevalence of obesity can be associated especially in urban areas by urging lifestyle transformation at the community level characterized especially by sedentary life-style and non-healthy eating habits. In this review sedentary lifestyle was ranging between 32.3% to 67.8%. Multiple pregnancies were reported as sources of sedentary lifestyle ranging between 45.6% to 89% these respondents were women who were housewives.

Diet

Studies with nationally representative data indicated differences across population groups in overall dietary patterns. In this review, the magnitude of the inverse associations between dietary scores and CVD risk was similar across racial/ethnic groups of women. . In terms of fruits and vegetable intake India recorded lowest prevalence of intake. Fruits and vegetables consumption ranged from 20.5% to 68.5% (Ye Ruan, 2018, Onyemeluke *et al.,* 2017, Celermiger *et al.,* 2012).

The findings in this review provide a systematic understanding of the risk factors that bring about cardiovascular disease in the populations and the disease burden that come with it between 2014 and 2018 in a wide range of regions. This has been done using all relevant available data sources that could be assessed.

The review realized a high prevalence of dyslipidemia as a risk factor for cardiovascular disease risk factor which ranged between 7.2% to 67.8%, this is in line with the reports from WHO, 2015, which stated an estimated 17.9 million deaths occurring from cardiovascular diseases in 2016, representing 31% of all global deaths. Of these deaths, 85% are due to heart attack and stroke. Over three quarters of cardiovascular disease deaths take place in low- and middle-income countries.

Most of the cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population-wide strategies. People with cardiovascular disease or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidemia or already established disease) need early detection and management using counseling and medicines, as appropriate (WHO, 2014, Danaei *et al*., 2016, Geofry *et al*, 2017).

Elevated blood pressure recorded more on patients who had a prior history of hypertension and fewer patients diagnosed with it for the first time ranging between 10% to 80.9% respectively (Roereck and Rehm, 2012, Georfry *et al*, 2017).The effects of behavioral risk factors may show up in individuals as raised blood pressure, overweight and obesity and can increase the risk of developing a heart attack, stroke, heart failure and other complications(WHO, 2011). The drug treatment of hypertension and high blood lipids may be necessary to reduce cardiovascular disease risk and prevent heart attack and strokes. Health policies that create conducive environments for making healthy choices affordable and available are essential for motivating people to adopt and sustain healthy behavior (WHO, 2011).There are also a number of underlying determinants of cardiovascular disease or "the causes of the causes". These are the reflection of the major forces driving social, economic and cultural change- globalization, urbanization and population ageing. Other determinants of cardiovascular diseases include poverty, stress and hereditary factors. This especially poverty and stress explains why cardiovascular disease is common in low and middle-income countries (WHO, 2011, Danaeri *et al*, 2016, Stone *et al.*, 2013).

The other risk factor for cardiovascular disease was diabetes which was found to range between 14.6% to 89.6%. A close link exists between diabetes and cardiovascular disease and has been shown to be the most prevalent cause of mortality and morbidity in diabetic populations. A study done by (Matheus *et al.*,2013) reported cardiovascular disease death rates in the United States at 17 times higher among adults (>18 years) with diabetes than those without diagnoses of diabetes, largely because of increased risk of stroke and myocardial infarction. The increased risk of cardiovascular disease mortality in diabetic patients is found both in men and women. The relative risk for cardiovascular morbidity and mortality in adults with diabetes ranges from 1 to 3 in men and from 2 to 5 in women compared to those without diabetes (Matheus *et al.*, 2013, Rivellese et al., 2010, Benjamin *et al.*, 2015).

The rate of smoking ranged between 7.6 to 56.7%. Studies have identified high prevalence of tobacco use in both Asian and African countries which is inform of cigarette smoking and sniffing. Rural people of African and Asian origin used a common form of tobacco, which is dried crushed tobacco flakes (rolled by hand in tendu (*DIOSPHYRUS)* leaf) that contains higher amount of nicotine and tar than cigarette (Rajan*et al.,* 2018, Musinguzi and Nuwaha, 2013, Chasan-Taber *et al.*, 2007, Rahman and Fukui, 2000). This explains why there is greater need for sensitizing communities of the detrimental effect of tobacco use as a risk factor for cardiovascular disease and other non- communicable diseases.

Studies have shown that brewing different types of traditional alcoholic beverages at home especially in rural regions of Africa and India Nepal , most commonly by women, could be one of the common reasons of a high rate of alcohol consumption by men and women. In Nepal, a nationwide study reported that cereals (rice, barley and millet) and sugar are commonly used ingredients to prepare home-brewed alcohol. Ethanol concentration on home-brewed alcohol were 14.0% (3 to 40%) for distilled and 5.2% (1 to 18.9%) for non-distilled forms (Rajan *et al*, 2018,Thapa *et al.*, Musinguzi and Nuwaha, 2013). Locally brewed alcoholic beverages are considered culturally acceptable to drink even by pregnant women in some ethnic groups. This could be due to lack of awareness about the harmful effects of these products to mother and fetus during pregnancy. Health promotion strategies should, therefore, include general awareness programme to reduce these maternal risk behavior risk factors of cardiovascular diseases.

In terms of physical activity involvement countries from Africa recorded lowest rate of involvement.

Fruits and vegetable consumption ranged from 20.5% to 68.5% (Ye Ruan, 2018,Onyemeluke *et al*.,2017, Celermiger *et al.*,2012). %. In terms of fruits and vegetable intake India recorded lowest prevalence of intake. Studies conducted by Rajan *et al*,2018, Alsheikh *et al*, 2014, reported that insufficient fruits and vegetables consumption among people could be attributed to poverty that might have caused urban people not to afford adequate amount of fruits and vegetables. Other studies also supported that low income level prevents people from consuming adequate fruits and vegetables (Rajan *et al*, 2018, Mboi, 2015). In Nepalese culture, fruits consumption is not considered a priority compared to main cereals in their daily meals, most importantly rice and wheat. Cultural practices to

avoid more hot foods during pregnancy is prevalent due to the belief that pregnancy is considered as hot state (Christian *et al*,., 2006,Bhandari *et al,* 2014 Rajan *et al,* 2018).

Dietary intake a risk factor

The review found that diatary intake 45%-91% of respondents with cardiovascular diseases regularly consumed milk. Meat consumption was between 25%-87%, fish 22%-68%. Cakes and cookies were between 45%-31% respectively. In the world Health Survey 20002-20003, prevalence of low fruits and vegetables consumption among individuals aged 18-99 years in Ghana was lowest among 52 countries (Hall *et al.,* 2009), liy *et al.,* 2013). However the prevalence was higher 68.9% among persons aged 50years and oloder (Wu *et al.,* 2015). This review found that insufficient fruits and vegetables intake was associated with agina in Ghana. All these factors contribute to high risk factors for cardiovascular diseases and world disease burden.

The most effective replacement for saturated fatty acids in the diet was polyunsaturated fatty acids (PUFAs) which can lower the risk of developing cardiovascular disease. In particular, they are found in soybean and sunflower oils as well as in fatty fish and plant foods. Polyunsaturated fatty acids have many positive effects, notably on blood pressure, heart function, blood clotting, and inflammatory mechanisms.

Musinguzi and Nuwaha, 2013 found that a group of patients who survived a heart attack were given fish oils over several years. Compared to patients who did not receive fish oil, this group had a 20% reduction in total mortality, a 30% reduction in cardiovascular death and a 45% decrease in sudden death.

Cholesterol which is an essential component of cell membranes and certain hormones is produced by the liver, but it is also present in dairy products, meat and eggs. A high amount of a certain type of cholesterol (Low Density Lipoprotein or LDL) in the blood can lead to its deposition in the arteries that can restrict blood flow and may cause heart problems. It is not clear whether dietary cholesterol is associated with cardiovascular disease, but it is recommended to avoid excessive intake. Cholesterol is not, in fact, required in the diet because it is produced by the liver in sufficient amounts (Bandari *et al,* 2014.

Dietary fibre is also a major factor in reducing total cholesterol in the blood and LDL cholesterol in particular. Eating a diet high in fibre and wholegrain cereals can reduce the risk of coronary heart disease.

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An intake of 0.8 mg of folic acid could possibly reduce the risk of coronary heart disease (reduced blood supply to the heart muscle) by 16% and the risk of stroke by 24%. Flavonoids, compounds that occur in a variety of foods such as tea, onions and apples, could also possibly reduce the risk of coronary heart disease. There is insufficient evidence to support the theory that antioxidants such as vitamin E, vitamin C or b-carotene might reduce the risk of cardiovascular diseases (Christian, *et al,*. 2016).

A high intake of salt (sodium) has been linked to high blood pressure, a major risk factor for stroke and coronary heart disease (Mboi, 2015).

CONCLUSION

This review paper depicts a greater emphasis on integrated health management program that incorporates preventive health and advocacy programs towards modifiable behavioral risk factors such as diet, exercise, and obesity. This review has shown that greater adherence to various healthy eating patterns was consistently associated with lower risk of CVD. These findings support the 2015-2020 Dietary Guidelines for Americans, which recommend multiple healthy eating patterns for individuals to adapt according to personal food traditions and preferences. Emphasis on staff empowerment towards health seeking behaviors is paramount to the success of alleviating rising cases of hypertension. Other strategic approaches towards preventing the rising cases of hypertension include; policy formulation and emphasis on healthy diet, physical activity reduction of alcohol consumption and avoidance of tobacco consumption. Following the expansion of, and advances in, epidemiological research on the behavioral, dietary, environmental, and physiological causes of cardiovascular diseases, the number of cardiovascular disease risk factors in global analyses has increased substantially, from a handful in 1990 to tens in recent analyses.

The review found that diabetes type 11, obesity, smoking, drinking alcohol, Lack of physical activity, poor dietary intake lacking in fruits and vegetables, hyperlipidemia, age, gender and area of residence are the main risk factors for cardiovascular diseases which lead to increased morbidity and mortality in people of all sex in the world. These numbers have in turn helped draw attention to important global or regional public health issues.

Recommendation

"Best buys" or very cost effective interventions are needed especially in low-resource settings so that such interventions are feasible to be implemented to help the common man in controlling and preventing cardiovascular diseases by getting a clear understanding of the cardiovascular diseases risk factors. There are two types of interventions that can be included: population-wide and individual, which will help to reduce the

greatest cardiovascular disease burden. The population-wide interventions which can be implemented to reduce cardiovascular diseases can be taxation to reduce the intake of foods that are high in fat, sugar and salt; building walking and cycle paths to increase physical activity; strategies to reduce harmful use of alcohol; providing healthy school meals to children and comprehensive tobacco control policies. While at the individual level should involve individual health care interventions. The benefits of these interventions are largely independent but when used with cessation of smoking can prevent nearly 75% of cardiovascular diseases not only in low and middle economic stings but even in affluent settings.

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