Risk Factors for Cardiovascular Diseases in Ghana

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ABSTRACT

Background: Over three quarters of Cardiovascular Diseases (CVDs) deaths occur in the low and middle income countries (LMICs). In sub - Saharan Africa, CVDs has risen to become the leading cause of death and morbidities. This review sought to find the modifiable risk factors of CVDs among Ghanaians and suggest measures to help curb this menace. **Methods:** Searches were done in google, google scholar and Pubmed to obtain the literature and findings on CVDs risk factors in Ghana. **Results:** High intake of salt as a result of increase in the use of seasonings, processed foods such as salted fish and meat, poor intake of fruits and vegetables (consumption of fruits was 1.5 portions and vegetables was 2.3 portions on a daily basis which is less than the five portions daily requirement), 43% of Ghanaian adults are either overweight or obese; regionally, 43.4%, 36.9%, 32.4% and 55.2% of residents in Ashanti, Central, Northern and Greater Accra region, respectively were overweight or obese. Prevalence of lipid abnormalities were found to be 60% for high Total Cholesterol, 32% for high Triglycerides, 17% for low High density lipoprotein and 61% for high Low density lipoprotein. With lifestyle practices, 25.81% of tertiary students in Accra consume alcohol, prevalence of smoking among male adults in Ghana was 13.1%, and there is a high prevalence of physical inactivity. Prevalence of diabetes was 450,000 and that of hypertension among males and females was 29.9% and 27.6%, respectively.

Conclusion: There is high prevalence of modifiable risk factors among Ghanaian populace hence measures such as increasing awareness about these risk factors at the various gatherings and periodic health screenings will go a long way to help curb this menace.

Keywords: Cardiovascular diseases, low density lipoprotein, high density lipoprotein, overweight, obesity

Introduction

Cardiovascular diseases (CVDs) are a group of diseases that affect the blood vessels and the heart. They are related to atherosclerosis (a build-up of plaque in the vessels) which causes blood to flow through the blood vessels under high pressure. CVDs include stroke, heart failure, cerebrovascular diseases, coronary heart disease etc. (WHO, 2018). CVDs are associated with numerous risk factors; the modifiable and the non- modifiable. The modifiable risk factors include overweight/ obesity, excessive alcohol intake, smoking of tobacco, poor dietary practices, physical inactivity, and stress among others while the non- modifiable risk factors are ethnicity/genetics, age, gender etc. However, having a risk factor or risk factors does not cause you to develop CVDs automatically but the higher one's risk factors the higher the person's chance of developing the diseases if efforts are not made to modify the factors (WHF, 2017).

Behavioral risk factors such as intake of unhealthy diet, physical inactivity, tobacco use and harmful alcohol use account for 80% of coronary heart disease and cerebrovascular disease (WHO, 2010). In addition, unhealthy diet and physical inactivity may lead to intermediary or metabolic risk factors such as raised

blood pressure, raised blood glucose, raised blood lipids, overweight and obesity (WHO, 2012). There are also certain underlying determinants of CVDs which include globalization, urbanization, population growth, stress, heredity and poverty (WHO, 2012).

Globally, according to WHO, CVDs are number one cause of death and an estimated 17.7 million people die from CVDs every year representing 31% of the global death. Over three-quarters of CVD attributable deaths occur in the low- and middle-income countries (LMICs) of which Ghana is one with 80% of these deaths due to heart attacks and stroke (WHO, 2018).

In Ghana, statistics from the National Cardiothoracic Center indicated that 60% of deaths among adults in the country are as a result of heart-related health conditions with 6 to 7% being diabetic and 13 to 25% being hypertensive (Modern Ghana, 2011). Findings of autopsies at Korle Bu Teaching Hospital (KBTH) between January 2006 and December 2010, indicated that 22.2% of all deaths were due to CVDs (Sanuade *et al.*, 2014). According to medical experts at KBTH, there is a rise in CVDs and its related risk factors such as high blood pressure and obesity among even children (Daily Guide, 2014).

A consultant cardiologist Dr. Isaac Kofi Owusu of the Komfo Anokye Teaching Hospital (KATH) has sounded a warning about the upsurge of CVDs among Ghanaians especially the middle - aged women even in the northern Ghana which used to have very low prevalence of CVDs. He further said that heart diseases top all the cases recorded at the accident and emergency centers in the KATH (Myjoyonline.com, 2017). This review, therefore, tends to find out the possible modifiable risk factors of CVDs among Ghanaians and suggest measures to help curb these menaces.

Modifiable Risk Factors of CVDs among the Ghanaian Populace

Unhealthy Dietary intake

Diets which are high in saturated fats, sodium (salt), animal flesh and low in fruits, vegetables, whole grain (dietary fiber) and fish content place people at a high risk of developing heart- related conditions. Saturated fats cause 31% of coronary heart disease and 11% of stroke (WHF, 2017); saturated fat and Trans-fat raise the blood cholesterol levels which leads to the development of atherosclerosis whereas the unsaturated; monounsaturated, polyunsaturated fats found in nuts, fish are protective against cardiovascular diseases. However, it must be noted that although unsaturated fats are healthy, intakes of more than 37% of one's total calories increases the risk of cardiovascular diseases (WHF, 2017).

Diets high in sodium (salt) increases one's risk of developing hypertension. It is known that a reduction of 1g in sodium (3g of salt) will lead to a 50% reduction in the risk of developing hypertension, 22% deaths due to stroke and 16% for coronary heart disease (WHF, 2017). Excessive sodium intake is associated with transient increase in blood pressure which returns to primary values after pressure – natriuresis and regulation of extracellular volume (ECV). The sodium retention causes the expansion of the ECV causing higher cardiac output leading to tissue perfusion that exceeds metabolic needs. The peripheral tissue vasculature responds by activating auto regulatory vasoconstriction causing further increase in peripheral resistance (Guyton *et al.*, 1972; Guyton, 2011).

In Ghana, salt is readily available in foods such as fish "momoni", "koobi", "kako", beef, "toloo beef", pig feet, plantain chips, cocoyam chips, etc. These are consumed every day by at least an individual in almost every

household. For instance, salted fish "momoni", "koobi", "kako" is a delicacy in the average Ghanaian home even for the hypertensive such that the average Ghanaian cannot prepare stew or soup without it. In 2014, the Ghana Demographic Health Survey indicated that 84% of women in the survey reported that someone in their household has consumed processed food containing salt in the past 24 hours, more than a third had consumed salted dried fish, 21% had consumed salted canned fish, meat and legumes and 24% reported the use of processed foods (Ghana Health Service, 2015).

The burden of high salt intake has been compounded with the current upsurge in the intake of seasonings and bouillons. Findings from 2014 Ghana Demographic Health Survey indicated that 92% and 62% of women in Northern and Greater Accra region, respectively reported using them (Myjoyonline, 2017a). This burden of salt intake may even worsen with time as a result of the nutrition transition where most Ghanaians now prefer to eat imported and locally processed foods and spicy dishes and where there is over patronage of food from vendors (eat-outs) with an average Ghanaian consuming at least a meal from a vendor on a daily basis due to busy schedules at work and lifestyle choices: food from vendors are known to be high in salt and saturated fat (Guthrie *et al.*, 2002).

Fruits and vegetables have a protective function against the development of coronary heart disease and other chronic diseases (Pereira *et al.*, 2004). This protective function is exhibited through the potassium, fiber, vitamins and other phenolic compounds (Van Duyn and Pivonka, 2000). These nutrients are able to fulfil their roles through mechanisms such as reduction of oxidation stress, lowering of blood pressure, lowering lipoprotein profile, increasing insulin sensitivity, and improving homeostasis regulation (Van Duyn and Pivonka, 2000; Appel *et al.*, 1997; Bazzano *et al.*, 2003).

A study in Ghana by FAO found the daily intake of fruits and vegetables to be 1.5 portions and 2.3 portions, respectively which is far lower than the WHO recommended minimum of 5 portions consumption per day with a consumption rate of 30% and 37% among women and men, respectively (Myjoyonline.com, 2017b). Fruits and vegetables intake is a challenge as a result of the seasonal nature of fruits and vegetables. The contributing factors are; poor availability and poor distribution systems at some parts of the country such as the northern sector (Amo-adjei and Kumi-Kyereme, 2015), poor storage and processing facilities, high cost, negative perception and attitude of people towards fruits and vegetables intake, poor knowledge on the health benefits of fruits and vegetable consumption among the populace etc. (Amo-adjei and, Kumi-Kyereme, 2015).

Overweight/Obesity

Obesity especially the abdominal obesity is known to be the cause of elevated cardiometabolic risks. The predominant mechanisms appear to involve the promotion of insulin resistance as a result of excess free fatty acids secreted by an expanded adipose tissue mass, and the development of an inflammatory milieu due to increased secretion of inflammatory cytokines and adipokines from adipose tissue (Bray *et al.*, 2009). Major proinflammatory cytokines secreted by adipocytes include tumour necrosis factor-α, interleukin-6, leptin, resistin, and plasminogen activator inhibitor-1. All these cytokines have been differently associated with hyperinsulinemia, hyperglycemia, insulin resistance, diabetes, and endothelial dysfunction, as well as plaque development, progression, and rupture. Adiponectin, another important adipocyte, has protective cardiometabolic actions; however, adiponectin levels decline with increasing obesity (Bray *et al.*, 2009).

Overweight and obesity is a major culprit of CVDs. It leads to the development of atherosclerosis which causes blood to flow through the arteries under high pressure. A report by WHO indicated that Ghana is leading the prevalence of obesity with 3 million of its populace being overweight and obese (The Point Myjoyonline, 2007).

In 2005, prevalence of obesity was found to be 7.4% and 2.8% among female and males, respectively; it was highest among the married women as compared to the unmarried, employed as compared to the - self-employed or unemployed. Ethnically, prevalence of obesity was 16.4%, 6.6%, and 6.0% among the Ga Adangbe, the Ewe and the Akan, respectively (Biritwum *et al.*, 2005). Regional – wise, Greater Accra had a higher prevalence of overweight/obesity with Upper East and Upper West regions virtually having no records (The Point Myjoyonline, 2007).

According to Benkeser and Biritwum, among the women in the capital city of Ghana, (Accra) found 64.9% women to be overweight/obese, 78.7% had waist circumference greater than 88 cm and 78.9% had high waist: hip ratio (Benkeser and Biritwum, 2012). Among basic school children, Opuni – Frimpong *et al.* found prevalence of overweight/obesity among basic school pupils in Asante Akim to be 22.5% (Opuni – Frimpong *et al.*, 2015); among school children between the ages of 10 -20 years in the Kumasi metropolis, 12.2% and 0.8% were found to be overweight and obese, respectively (Kumah *et al.*, 2015). Pulse news letter indicated that 70% of the urban populace were obese (Pulse Newsletter Ghana News Agency, 2015).

A review of 43 studies across the ten regions of Ghana involving 48,966 sampled populations by Ofori-Asenso *et al.* found out that nearly 43% of the adult Ghanaian population was either overweight or obese with national prevalence of overweight and obesity estimated to be 25.4% and 17.1%, respectively. Regionally, 43.4%, 36.9%, 32.4% and 55.2% of residents in Ashanti, Central, Northern and Greater Accra region, respectively were overweight or obese (Ofori-Asenso *et al.*, 2016).

Dyslipidemia

Dyslipidemia is highly correlated with atherosclerosis. High levels of low-density lipoprotein lead to atherosclerosis whilst high levels of high-density lipoproteins are protective against CVDs (WHF, 2017). In a women health study of Accra, 22.7% had

hypercholesterolemia (Hill *et al.*, 2007). In a cross-sectional study involving 424 new patients for Komfo Anokye Teaching hospital found the prevalence of lipid abnormalities to be 60% for high Total Cholesterol, 32% for high Triglycerides, 17% for low HDL and 61% for high LDL (Micah and Nkum, 2012). In a study involving 207 men in a selected peri-urban community in Greater Accra Region, 8.7% were found to have hypercholesterolemia with total cholesterol > 5.18 mmol/L, 34.8% had dyslipidemia with low-density lipoprotein > 2.29 mmol/L (Vuvor *et al.*, 2016).

Among 180 HIV/AIDS patients recruited at the Fevers Unit of the KBTH, total cholesterol, triglycerides, LDL, TC/HDL, LDL/HDL ratios and atherogenic index of plasma (AIP) were elevated in HIV patients (p < 0.0001) with significant variations between Highly Active Antiretroviral Therapy (HAART) and HAART-naïve groups when compared to the control group while the mean HDL level was significantly low in HIV groups compared to the control group. The odds for developing hypercholesterolemia was 3.54 times more in patients on HAART compared to HAART-naïve patients but HDL was significantly lower in HAART patients compared to HAART-naïve patients (OR = 0.22, p < 0.001) (Tagoe *et al.*, 2016).

Excessive alcohol intake

Excessive alcohol intake leads to an increase in atherosclerosis progression, cardiovascular disease complications and mortality. This can be attributed to the metabolism of ethanol that leads to the formation of acetaldehyde which is oxidized to form acetate leading to the production of reactive oxygen species, pro-inflammatory cytokines and a toxic effect of alcohol in the formation of atherosclerosis plaque (Carnevale and Nocella, 2012).

According to GhanaWeb (2016), the annual per capita alcohol consumption in Ghana is about 1.54 liters of pure alcohol. The most common alcoholic beverages consumed are the locally brewed ones such as "akpeteshei", Alomo, palm wine among others which account for about 88%

consumption among the populace with the remaining 12% from the imported drinks (Sutton and Kpentey, 2014).

In 2008, Ghana was shortlisted among countries that consume high amount of alcohol with the recorded alcohol consumption exceeding the unrecorded (GhanaWeb, 2008). Thirty million liters of alcohol are consumed annually with 86% of the consumers being women in the child bearing age (18 – 35 years) in Greater Accra, Western and Central regions (Kunateh, 2009). Tagoe and Dake (2014), reported an upsurge of alcohol intake among the populace with 32.7% men; 15.4% women and 30.4% men; 13.5% women consuming alcohol in 2008 and 2003, respectively. Among the youth, The Global School-based Student Health Survey (GSHS) indicated that 15.3% students take alcohol with 9% of 4430 adolescents reported to have been drunk with alcohol on at least one occasion in the 12 months preceding the survey (Kabiru *et al.*, 2010). In a study among students in a university in Accra by Oti and Danso-Owusu (2016), 25.81% out of the 403 students were reported to consume alcohol with 33.67% (202) being males and 17.91% (201) females. The average age at first time consumption was 18.67 years. Furthermore, a cross-sectional study among 4916 Ghanaian women revealed that, 17.5% consume alcohol; within the ages of 15 – 19 and 45 – 49 years and the regions of Central, Volta, Upper East and West, Ashanti, Northern and Greater Accra regions were found to be associated with alcohol consumption (Tampaah – Naah AM, Amoah, 2015).

Smoking

Smoking puts one at risk of developing CVDs through damage of the endothelium, increase of fat deposit in the arteries, increase of low – density lipoprotein, decrease high – density lipoprotein, increases clotting and coronary artery spasm (WHF, 2017). Owusu- Dabo et al (2009) found 3.8% (8.9% males; females 0.3%) of 7096 residents in the Ashanti region to be current smokers and 9.7% (males 22.0%, females 1.2%) residents who have ever smoked tobacco (Owusu- Dabo *et al.*, 2009).

According to the World Data Atlas (2017), in 2015, prevalence of smoking among male adults in Ghana was 13.1% with an average annual growth rate of 9.29% i.e. from 9.2% in 2000 to 13.1% in 2015.

Physical inactivity

Physical inactivity leads to overweight/obesity and hence, increase in cholesterol level and visceral fat. This is accompanied by increase innate and adaptive immunological response at the cellular and tissue levels leading to persistent low-grade vascular inflammation which is a key regulatory mechanism in the pathogenesis of atherosclerosis (Libby *et al.*, 2009).

The findings of a cross-sectional study among 444 senior high school students in the Accra metropolis by Nyawornota *et al.* (2013) indicated that 17 %, 49% and 34% were engaged in low, moderate and high physical activity levels, respectively. Ocansey *et al.* (2014) reported that about one-third of the Ghanaian children and youth engage in inadequate physical activity. Also, Ocansey *et al.* (2016) reported a decline in school and community grade from D in 2014 to an F in 2016. Among 296 adolescents between the ages of 13 and 18 years, 44.3% and 55.7% had low and moderately high physical activities level, respectively with more females having low physical activity level. With sedentary behavio Kumah *et al.*, 2015, 54.1% had high sedentary behaviour (Asare and Danquah, 2015). Dake reported changes in the physical activity level among Ghanaians as a result of changes in work and recreational activities. More people now engage in sedentary work and leisure time activities like watching of television and playing games on their phones (Graphic Online, 2015).

Diabetes

Diabetes affects the heart muscle causing systolic and diastolic failure and hyperglycemia causes myocardial infarction after ischemic event. Up to 97% of diabetics are dyslipidemic with abnormal lipoprotein structures (Fagot-Campagna, 2000). Diabetics tend to have more small Low-density lipoprotein (sLDL) than the large

Low-density lipoprotein (large LDL); the sLDL, are more atherogenic since they easily penetrate and form stronger attachments to the arterial wall. Also, the sLDL are more susceptible to oxidation. Oxidized LDL is pro-atherogenic because once the particles become oxidized they acquire new properties that are recognized by the immune system as "foreign." Thus, oxidized LDL produces several abnormal biological responses, such as attracting leukocytes to the intimae of the vessel, improving the ability of the leukocytes to ingest lipids and differentiate into foam cells, and stimulating the proliferation of leukocytes, endothelial cells, and smooth muscle cells (Chan, 1998) all of which are steps in the formation of atherosclerotic plaque.

In addition, patients with diabetes have elevated levels of many clotting factors including fibrinogen, factor VII, factor VIII, factor XI, factor XII, kallikrein, and von Willebrand factor. Conversely, anticoagulant mechanisms are diminished in diabetes. The fibrinolytic system, the primary means of removing clots, is relatively inhibited in diabetes because of abnormal clot structures that are more resistant to degradation, and also because of an increase in Plasminogen activator inhibitor-1 (PAI-)1 (Carr, 2001). Chronic oxidative stress is associated with diabetes as a result of increased metabolism due to excess glucose and fatty acids (Nourooz-Zadeh *et al.*, 1997) as well as mitochondria dysfunction associated with insulin resistance (Petersen *et al.*, 2004).

A community – based study by Amoah *et al.* (2002) in Greater Accra among 4,733 participants with a mean age of 43.7 ± 14.3 found out that diabetes is more prevalent in men compared to females (7.7 vs. 5.5%) [P<0.05] with the highest prevalence (13.6%) occurring in the age range of + 64 years and a crude prevalence of 6.3%. In 2015, the International Diabetes Federation indicated that 450, 000 Ghanaians were diabetics of which 75% are undiagnosed putting the people at risk for complications. It further estimated that the number was likely to reach 820,000 by 2035 (GhanaWeb IDF, 2016). Furthermore, a diabetes screening conducted by Ghana Diabetes Association in Ghana in selected urban centres in Ghana revealed that 4 million Ghanaians were diabetics (Taylor, 2016).

Currently, Ghana has been ranked the 6th Country in Africa with high prevalence of diabetes according to WHO statistics on diabetes between 2016 and 2017 with 154790 being women living with diabetes in Ghana of which 22001 are found in the Eastern region of Ghana (GhanaWeb, 2017). Mortalities associated with diabetes: 8300 and 5000 people died from diabetes in 2013 and 2015, respectively (Graphic online, 2017).

Stress

Stress can lead people to adapt unhealthy habits like smoking and bad eating habits (WHF, 2017). Acute stress triggers reduced blood flow to the heart; irregular heart beat and increases the likelihood of blood clotting and these can initiate the development of CVDs (WHF, 2012). The pathophysiologic link between psychosocial stress and atherosclerosis include inflammation - induced low - density lipoprotein cholesterol oxidation, elevated shear stress and adverse catecholamine that leads to increase endothelial damage (Davis, 1990). Dr Samuel Atindanbila reported the high rate at which stress – related diseases are recorded in the hospitals and called for immediate measure to curb the situation (Ghanaweb, 2017).

Findings of Dwamena and Dzisi (2012) case study among employees of Ghana Ports and Habor Authorities in Takoradi indicated that 75% employees worked under pressure as a result of not having adequate information about their roles (6%), role ambiguity (45%) of which 70% were stressed, contradiction in job expectations (25%) of which 70% are likely to develop job – related stress, 28% claim that they were given more work than their abilities could permit, underutilization of skills leading to low job satisfaction (61%) and non participation in decision making (67%). Among banking staff in Kumasi, workloads, career progression, long working hours, future uncertainties, job – related

technical problems, inadequate salaries, lack of ample time at home, role ambiguity, role conflict, organizational instability, relationship with superiors, subordinates, colleagues and the physical working environment are the stress inducers (Obirih – Opareh and Osei, 2014).

Among nurses in Tema General Hospital, the prevalence rate of stress was 99% with 45%, 30%, 20% and 4% been extremely stressed, severely, moderately and mildly stressed, respectively. Some causal factors include sudden changes at the facilities such as reshuffling of nurses to different wards, departments and shifts systems. Other facility-related factors contributing to stress among nurses were poor interpersonal relationship (mean =3.712, SD=1.052), role at work (mean=3.402, SD=1.067), level of control (mean=3.364, SD=0.984) and change (mean=3.164, SD=0.957) (Dorcoo and Dzodzomenyo, 2016).

Hypertension

Hypertension destroys the cardiac and vascular system with time causing hypertensive heart disease, renal dysfunction and vascular remodelling. Hypertensive heart is made up of abnormalities such as left ventricular hypertrophy, systolic and diastolic dysfunction. With the hypertensive heart, the left ventricle wall thickens as a compensatory response to elevated blood pressure in order to reduce wall stress (Hasebe, 2011). The stressing of the walls of the blood vessels causes it to clog or weaken up leading to atherosclerosis and narrowing of the blood vessel making them more likely to be blocked with blood clots and fat particles breaking off from the lining of the blood vessels walls (WHF, 2017).

In Ghana, hypertension is the number one killer and major cause of admissions with 67% of all deaths in KBTH attributed to it. According to the Ghana Health Service, more people are becoming hypertensive due to unhealthy lifestyle with nearly one of every five adults being hypertensive (Myjoyonline, 2007). A cross-sectional study among four rural communities in the Ga district found 25.4% of 362 populace to be hypertensive

with overweight and obesity being the major risk factors; 5.8 (95% confidence interval 1.4-24.3) and 6.9 (95% confidence interval 1.7-28.2), respectively (Addo *et al.*, 2006). Duah *et al.* (2013) found 27.1% of 539 populace of Adansi south to be hypertensive with majority within the age groups of 40 to 59. In 2014, the prevalence of hypertension among males and females age 18 and above was 29.9% and 27.6%, respectively (Sottie, 2015). WHO recent estimate of prevalence of hypertension in Ghana is 27.3% (FHI, 360).

Conclusion

In conclusion, prevalence of modifiable risk factors of CVDs is high among the Ghanaian populace. This has a direct and indirect negative effect on the economy. Directly, as a lot of money is spent on drug importation and other health-related medications, reduction in the workforce or manpower as a result of absenteeism due to ill health or mortalities etc. Indirectly, the living standards of families whose breadwinners develop CVDs or its risk factors such as diabetes and hypertension are negatively affected financially and emotionally leading to truancy at school, malnutrition, social vices etc. which also adds up to the economic burden of the country. As a way forward to help curb these menace, the following suggestions can be considered: Increase the education and campaign about the healthy lifestyle practices and proper dietary intake at public gatherings, schools, in the media etc., incorporating routine screening for these risk factors into the everyday outpatient department services, increase government or agency funded researches in relation to CVDs and its risk factors as well as other chronic health conditions etc.

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