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Coronary Artery Disease Risk Among Middle-Aged Women, Minia, Egypt: An Epidemiological Study

[1]Eman Mohamed Mahfouz, [2]Ebtesam Esmail Hassan, [3]Nashaat Nabil kamal, [4]Eman Fathi Abd Elrazik

[1,2,3,4] Public Health and Preventive Medicine Department, Faculty of medicine, Minia University

Abstract: **Background: The mortality trends of coronary artery diseases (CAD) among women were increasing and despite the old stipulations that heart disease are men's problems; and women are relatively immune against it; more women than men die as a result of heart disease. (CAD) risk among women is under-recognized and women usually do not perceive CAD as the greatest threat to their health. Misdiagnosis as a result of uniqueness of symptoms, and postmenopausal drop of estrogen level pose women at a higher risk for developing cardiovascular disease. There is paucity of studies on middle-aged women in low- and middle-income countries who are more likely to develop CAD and die from it in comparison to women in industrialized countries. *Aim:* To describe CAD risk profile and predict ten years coronary heart disease risk using global risk score among women in a rural community, Minia, Egypt. Method: Cross sectional community based study carried out in a rural area and included 124 women aged 35-75 years. An interview questionnaire included socio demographic data, history. Medical and lifestyle risk factors. BMI was calculated, blood pressure was measured. Fasting blood glucose and fasting lipid profile were carried out for each participant. Assessment of the ten years risk for developing heart disease using Framingham risk score was undertaken. Results: 124 rural women with mean of 51.69±10.49 year participated in the study. Nearly one -quarter (27.4%) of them were significantly having a high risk for developing coronary heart disease in the next ten years, and 40.3% of them was located in the intermediate risk zone. The most significant risk factors are diabetes (P=0.001), hypertension (P=0.001), smoking (P=0.001), physical inactivity (P=0.03) and dyslipidemia (0.001). Conclusion: Moderate –to- high risk score for coronary heart disease were prevalent among study participants. Obesity, hypertension, diabetes, dyslipidemia, smoking behavior and physical inactivity contribute significantly with a varying degrees to the global cardiac risk score which is found to be an alarm and useful tool for screening and early detection of those at risk in order to follow an intensive risk factor modification strategy. There is a need to increase awareness about modifiable risk factors of CHD among women.**

Keywords: **Women, Cardiac risk profile, scoring, hypertension, diabetes, cholesterol, obesity, BMI.**

1. INTRODUCTION

Coronary artery disease (CAD) continues to be a leading cause of morbidity and mortality among adults in Europe and North America.[1] It was estimated that 17.600.000 Americans has ischemic heart disease (IHD), of whom 10.200.00 have angina pectoris.[2]

Based on data from the Framingham Heart Study, the lifetime risk of developing symptomatic CAD after age of forty is 49% for men and 32% for women.[3] An estimated 17.3 million people died from CVDs in 2008, representing 30% of all global deaths, of these deaths, an estimated 7.3 million were due to CAD and 6.2 million were due to stroke.[4] The World Health Organization (WHO) has estimated that by 2020, the global number of deaths from CAD will rise from 7.6 million in 2005 to 11.1 million.[5]

Although cardiac diseases are thought of by some as a "man's disease," women may nearly equally die each year from it as men.[6] CAD was the cause of death of 292,188 women in 2009, which means almost one in every four female deaths.[7]

Despite of improvements in cardiac diseases trends, the skyrocketing in prevalence of obesity, diabetes and risky lifestyle choices most probably ensures that CVD will not just tapers. Actually, current trends suggests that CVD is increasing among young adults, particularly females.[8a] Having multiple cardiac risk factors is considered serious, because risk factors may work all together and worsen each other's effects. Treatment of cardiovascular risk factors has resulted in a 50 % decrease in deaths from CHD over the past 30 years.[8b]

Many women may be covertly and silently have high risk for CVD for whom primary prevention is needed, so predicting CVD using risk scores to identify those at a higher risk is required to target those who are categorized as moderate-to-high risk by carrying out specific behavioral intervention, lifestyle modifications or using medications. So, application of primary clinical prevention strategies is an important public health priority. One approach is to use global CHD risk to help guide decisions with patients.[9] Global CHD risk calculation can assist physicians in identifying patients at moderate to high risk who can benefit most from preventive pharmacotherapy.[10]

It is also important to study and to identify women behaviors that have an impact on the development of coronary artery disease.

2. METHODS

Study design: Cross- sectional community- based study carried out among asymptomatic females aged equal or more than 35 years old, who are apparently healthy without signs or symptoms suggestive of coronary artery disease, and living in the chosen rural area during the 5 months study period from November 2013 to march 2014. Females with previous confirmed or probable history of atherosclerotic cardiovascular diseases, pregnant, with known neoplasm or younger than 35 years are excluded.

Administrative and ethical consideration: An approval was taken from the ethical committee of the Faculty of Medicine, Minia University, and the local council of Burgaia village to interview the participants. Following the ethical guidelines of epidemiological research, a written informed consent was taken from each participant.

Collection of data: Data were collected by a well-structured questionnaire including socio demographic data: age, educational level, occupation and marital status. Medical data concerning disease: its duration and site and the received therapy.

CAD risk factors including:

A. History of diabetes, hypertension, whether under treatment or not.

B. Family history of premature coronary artery disease.

C. Smoking history:

D. History of physical activity.

BMI and waist circumference was measured. Arterial pressure is measured.[12] Fasting finger prick blood glucose test was determined for each participant in the fasting state on the same day. Those who were not fasting were motivated to report in a fasting state on the next day (fasting was defined as a minimum of 8 hours between the subject's last consumption of any calorie-containing food or drink and the time of the FPG test.[13] Using a fasting lipid profile to ensure the most precise lipid assessment which include total cholesterol, LDL-C, triglycerides, and HDL-C**.** Blood should be collected after a 12-hour .[14]

Then calculating a 10-year risk for coronary heart disease using Framingham point scores (FRS) .[15, 16] Framingham Risk score FRS classification algorithm stratifies women into three groups based on eight measurable criteria: ideal cardiovascular health, at risk and high risk. The ideal cardiovascular risk group applies to women who are at the lowest level of risk.

3. RESULTS

Statistical analysis: Data entry and analysis were all done with I.B.M. compatible computer using software called SPSS for windows version 19. Graphics were done by Excel Microsoft office 2007. Quantitative data were presented by mean and standard deviation, while qualitative data were presented by frequency distribution. Chi square test and Fisher's exact test was used to compare between proportions.

This study included 124 females living in Burgaia village, Minia governorate from November 2013 to March 2014. The age of the subjects ranged between 35-75 years with mean of 51.69±10.49 year.

Table (1): Baseline characteristics of the studied women (total =124).

characteristics		No	%
Age group (years):	35-45	42	33.9
	46-55	38	30.6
	56 – 65	32	25.8
	≥66	12	9.7
Marital status:	Married	81	65.3
	Widow	34	27.4
	Single	1	0.8
	Divorced	8	6.5
Education :	illiterate	64	51.6
	read &write	27	21.8
	secondary	27	21.8
	university& above	6	4.8
Occupation :	House wife	85	68.5
	Working	39	31.5
Smoking :	Active smoking	2	1.6
	Passive smoking	43	34.7
Physical activity		38	30.6
Hypertension		35	28.2
Diabetes		28	22.6
Hypertension treatment		26	21
Family history of pre mature CAD		24	19.4

The table (1) shows that the 33.9% of participants lied in the age group 35-45 year, 65.3% were married, 51.6% were illiterate, and 68.5% were house wife. as regard life style risk factor only (1.6%) were active smokers, while (34.7%) were passive but only one third of them (30.3%) were physically active. according to medical history one third of participants were hypertensive (28.2%), and (22.6%) were diabetics but (19.4%) had positive family history of premature CAD .

Table (2): Description of CVD risk profile among rural women (total =124).

		No	%
BMI	Underweight	2	1.6
	Normal	32	21.8
	Over weight	30	21
	Obese	60	55.6
WC	Normal	42	33.9
	High	82	66.1
FBS	Normal	83	66.9
	Pre -Diabetic	33	24.2

	Diabetic	11	8.9
Blood pressure	Normal	83	33.1
	High	41	69.9
Lipid profile	TC		
	Optimal	80	64.5
	Border line	31	25
	High	13	10.5
	LDL-C		
	Optimal	84	67.7
	Border line	27	21.8
	High	13	10.5
	HDL-C		
	Optimal	25	20.2
	Border line	30	24.2
	Low	69	55.6
	TG		
	Optimal	98	79
	Border line	16	12.9
	High	10	8.1

TC:200–239mg/dl ; borderline ,TC: ≥240mg/dl; high: * TG: 150-199 mg/dl; borderline TG: ≥200–high *LDL-C: 130-159 mg/dl; borderline LDL-C: 160 mg/dl; and* HDL-C:50-60mg/dl ;borderline, low HDL-C: <50 mg/dl in women high risk.

Table 2 clearly demonstrates that slightly more than half of the participated women are obese using BMI (55.6%) or have central obesity (66.1 %) waist circumference (≥88cm) compared to 33.9% had normal waist circumference. Nearly 70% of women are hypertensive, almost 9% categorized as diabetic. Regarding the lipid profile 64.5% of studied females had optimal total cholesterol, nearly one fourth 20.2% had normal HDL while 10.5% had high LDL, and 8.1% had high TG.

Figure (1): Distribution of the studied females according to Framingham's point scores (FRS).

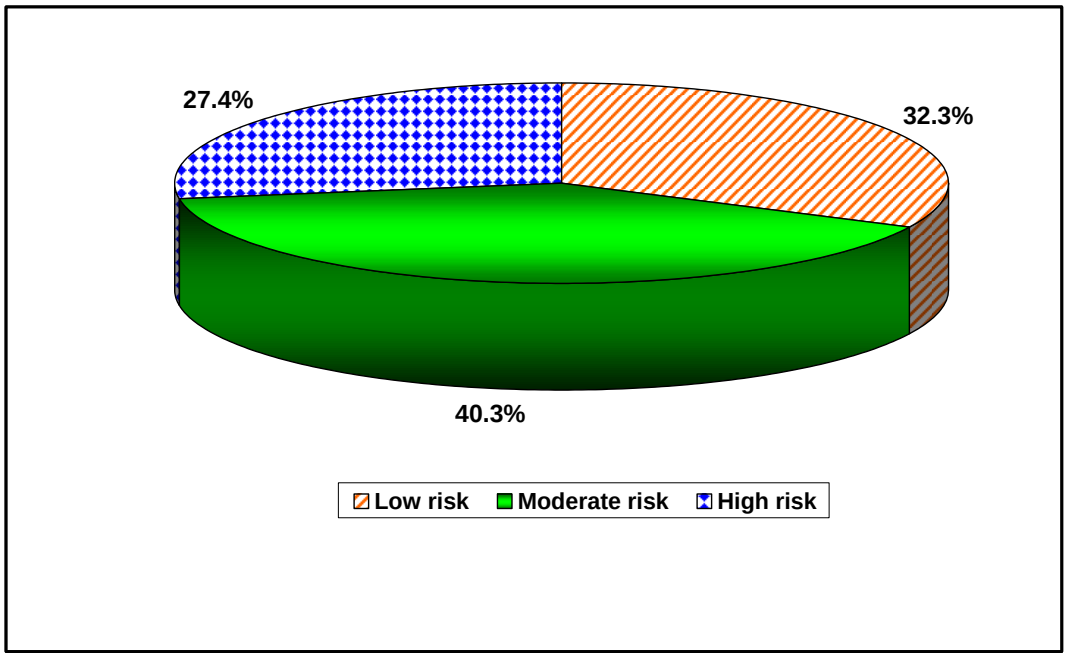

Figure (1) shows that 40.3% of studied females located in the intermediate zone of CAD risk, while as more as one fourth (27.4%) lied in the high risk zone.

Table (3): Relation between FRS and CAD risk factors among women.

	Low risk N =40	Moderate risk N=50	High risk N =34	X2 df (P- value)
Smoking				
Smoker	0(0.0%)	(0.0%)	2(100%)	19.1
Passive smoker	5(12.2%)	19(46.3%)	17(41.5%)	4
Non smoker	35(43.2%)	31(38.3%)	15(18.5%)	(0.004)
Physically activity				
Yes	18(47.4%)	10(26.3%)	10(26.3%)	6.5
No	22(25.5%)	40(46.5%)	24(27.9%)	2(0.03)
Diabetes				
Normal	36(43.4%)	34(41%)	13(15.7%)	41.4
Pre-diabetic	4(13.3%)	16(53.3%)	10(33.3%)	(0.001)
Diabetic	-	-	11(100%)	
Blood pressure				
Normal	36(43.3%)	34(41%)	13(15.7%)	22.2
Hypertensive	4(9.8%)	16(39%)	19(51.2%)	2(0.001)
BMI				
Normal	12(35.5%)	16(47.1%)	6(17.6%)	12.5
Over weight	13(43.3%)	14(46.7%)	3(10%)	4
Obese	15(25%)	20(33.3%)	25(41.7%)	(0.01)
Waist circumference				
Normal	15(35.7%)	22(52.4%)	5(11.9%)	8.1
high ≥88cm	25(30.5%)	28(34.1%)	29(35.4%)	2(0.01)
Total cholesterol				
optimal< 200	36(90%)	35(70%)	9(26.5%)	37.2
borderline 200-239	4(10%)	12(24%)	15(44.1%)	4
high ≥240	0(0)	3(6%)	10(29.4%)	(0.001)
HDL-C				
optimal≥ 60	11(27.5%)	8(16%)	6(17.5%)	13
borderline 59-60	15(37.5%)	12(24%)	3(8.8%)	4
high < 50	14(35%)	30 (60%)	25(73.5%)	(0.01)
LDL-C				
optimal<129	38 (95%)	34(68%)	12(35.3%)	34.8
borderline130-159	2(5%)	13(26%)	12(35.3%)	4
high ≥160	-	3(6%)	10(29.4%)	(0.001)
TG				
optimal<150	34(85%)	43(86%)	21(61.8%)	9.7
borderline 150-199	4(10%)	3(6%)	9(26.5%)	4
high ≥200	2(5%)	4(8%)	4(11.8%)	(0.04)
HDl/cholesterol ratio				
Normal ≤ 5:1	35(87.5%)	37(74%)	16(47.1%)	14.9
High > 5:1	5(12.5%)	13(26%)	18(52.9%)	2 (0.000)

*= Significant.

Table (3) shows that high significant association between FRS and smoking (P=0.001), hypertension (P=0.001), diabetes (P=0.001), physical activity (P=0.03) and obesity (P=0.01),central obesity (P=0.01). There was significant relationship between FRS and total cholesterol (.P=000), LDL-C(P=0.000), HDL-C (P=0.01) , TG (P=0.04) and HDL / cholesterol ratio (P=0.000).

4. DISCUSSION

In this community based study, a total of 124 middle-aged asymptomatic women≥35 years are interviewed, where assessment of cardiac risk was carried out and the results are handed individually to each woman with explanation regarding the level of risk and ways of modification or ameliorating it. Nearly up to three- quarters of females participated in this study either obese or at risk of obesity (overweight). Obesity as evidenced by BMI is prevalent among 55.6% of the study participants, while overweight was found among 21% of them. These figures are slightly higher than what estimated by Ono et al[16]., (2005) in WHO global comparable estimates, and found that prevalence of obesity was 48% in females, and slightly higher than what reported by Ellabany and Abel-Nasser[17], (2006) who found that 48.4% were obese, 24.2% were overweight. This high frequency of obesity can be explained by faulty dietary habits and the pattern of Egyptian diet in general characterized by the high consumption of starchy and fatty foods with prevailing sedentary lifestyle among the study sample.

Nearly two-thirds of asymptomatic females (66.1%) have Central obesity (waist circumference ≥88cm), which is considered to be high figure and may be reflecting the high prevalence of over-weight and obesity among study participants which in turn undermine cardiac health among study participants. Despite this high figure, it is slightly lower than the figure stated by Ibrahim et al[18]., (2011) who found that 70.9% of participants had central obesity.

This study showed that hypertension was found out among 31.5% of asymptomatic women which approximates what reported by Guo et al[19]., (2012) that hypertension was prevalent among 28.5% of women.

Nearly 9% of asymptomatic women found to be diabetic, which approximates what estimated by International diabetes federation, (2013)[20] that 8.3% of adult females had diabetes.

This study shows that 35.5% of studied females had high total serum cholesterol level ≥200 mg/dL, this finding approximate what was observed by Santos et al[21].,(2001) and found that 37.4% of women had hypercholesterolemia.

Low levels of HDL-C (< 50 mg/dl) is one of the cardiovascular risk factors which is found to be highly prevalent (55.6%) among participant females in this stud which is nearly three folds more than what reported by Carroll et al[22] ., (2010) who found that 21.3% of adults aged 20 years and over had low HDL cholesterol.

High level of LDL-C level(≥130 mg/dL) is an important cardiovascular risk which is observed among one-third (32.3%) nearly of the studied females, this was similar to findings reported by Lloyd-Jones et al[23]., (2009) in a report from AHA statistics committee and found that 31.7% have an LDL-C level ≥130 mg/dL,

According to 10-year risk for CAD using FRS, 40.3% of studied asymptomatic women categorized to be at moderate risk, and 27.4% of them belong to the high risk category, whereas, 32.3% located in the low risk zone. These findings approximate what reported by Greenland et al[24]., (2010) who found out that 40% of asymptomatic people located in the intermediate risk zone, and approximately one-quarter of US adults belong to the high-risk category, whereas, low-risk group constitutes 35%.

Smoking is considered to be a major cause of CAD. In this study, it was observed that there was significant relation between smoking in females and FRS. All smoking women lie in high risk category, which approximates Ma et al[25]., (2008) findings regarding mortality due to IHD in Japan and Yildirim etal.,[26] (2007) who found that cigarette smoking is predisposing to an earlier onset of CAD.

It was observed from the study that physically active women are less liable to develop CAD in the next ten years, about half of physically active women (47.4%) lie in low risk category but only 26.3% lie in high risk category. This is explained by Fletcher et al.[27], (1996) who classifies physical inactivity as a major risk factor in a study of the benefits and recommendations for physical activity programs for all Americans.

As shown in this study, obesity as categorized by BMI has a significant relation to CAD risk. Nearly 41.7% of obese females lie in high risk group compared with 25% lie in low risk category. This finding is consistent with what reported by Labounty[28], (2013) in an international multicentre study and found that individuals with increased BMI have greater prevalence, extent, and severity of CAD, and higher BMI is independently associated with increased risk of intermediate-term risk of myocardial infarction.

Abdominal adiposity is thought to increase the risk of CVD, as evidenced in this study, which is also similar to what stated by Yusuf et al[29]., (2005) who studied Obesity and the risk of myocardial infarction and identified abdominal obesity as a predictor of adverse metabolic or cardiovascular outcomes independently of body mass index.

Nearly half (51.4%) of hypertensive women compared to 15.5% of women with normal blood pressure levels located in the high risk zone. This approximate what reported by Wolf-Maier et al[30].,(2012) that hypertension has been well recognized as a major independent risk factor for cardiovascular disease and stroke.

Diabetes is a significant and powerful risk factor for CVD and diabetes per se put women at a higher risk for developing CAD. Diabetes causes severe implications on women's health, so early diagnosis of the disease is essential and critical. All diabetic women in this study lied in high risk zone for developing CAD in the next ten years which is consistent with Preis et al[31]., (2005) who found that patients with diabetes had a twofold to fourfold increased risk for development and dying from CHD compared with non diabetic individuals. The study show significant association between TC, TG, low HDL-C and FRS, this in approximate agreement with Hammoudeh et al[32] ., (2008) who studied Serum lipid profiles with and without CAD in Jordan and found that CAD patients had significantly higher TG and TC and lower HDL-C levels than individuals with no CAD.

5. CONCLUSION AND RECOMMENDATIONS

These results indicated that the risk profile of middle-aged women in rural Upper Egypt, are disadvantaged with multiple cardiovascular risk factors which undoubtedly impacts on their health (obesity, low HDL, central obesity, lack physical activity, diabetes, and hypertension). Almost one-fourth of the study participants have a high risk for developing CAD in next ten years using FRS which is found to be significantly associated with smoking, diabetes, hypertension, obesity, central obesity, as well as physical inactivity. High total cholesterol, LDL-C, and triglyceride were significantly associated with increase FRS. But high HDL-C was found to be protective and associated with decrease risk of CAD. Therefore motivating population to adopt healthy lifestyle by creating healthy public policy in workplaces and facilitating physical activity at work sites, motivating population to quit smoking. Nutrition education programs about role of diet in development and protection from CAD integrated in primary health care and school health programs. So, every woman is demanded to take cardiac risk factors seriously and undertake intensive actions to modify the risk

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