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Coronary Artery Disease among Elderly Egyptian Patients: I. Socio-Demographic, Lifestyle, Psychosocial, Medical, and Biochemical Risk Factors

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Abstract

Background: Coronary Artery Disease (CAD) is a worldwide public health problem. Its prevalence rate is increasing all over the world including Egypt.

Aims: To determine the socio-demographic, lifestyle, medical and psychosocial risk factors of CAD among elderly Egyptian patients, and to determine patients' candidates to cardiac surgery.

Patients and Methods: A case-control, hospital-based study design was chosen to conduct this research. The study was conducted on 120 patients with CAD and an equal number of controls. The patients and controls were subjected to an interview, and clinical and laboratory examinations.

Results: The important significant risk factors for CAD were male gender, widow/widower, high education, profession occupations, high social class, smokers, physically inactive, high fat and salt intake, hypertension, diabetes, metabolic syndrome, chronic kidney disease, obesity, abdominal obesity, family history of CAD, stress especially general stress, depression, anxiety, aggression, absence of social support, and high levels of TG, total cholesterol, LDL-cholesterol, and low HDL-cholesterol levels (OR=4.27, 5.54, 3.06, 3.29, 2.07, 3.56, 2.49, 4.42 & 3.97, 6.44, 5.5, 4.66, 2.88, 4.38, 5.7, 4.03, 3.33 & 4.96, 3.21, 10.47, 5.03, 3.14, 3.68, 4.46, 4.88, and 7.66; respectively).

Conclusion: CAD is an important preventable health problem as many of its risk factors are modifiable. Modifications of lifestyle and psychosocial risk factors of CAD are the most important interventions to reduce morbidity and mortality of CAD.

Recommendations: It is important to pay more attention to increase people's and health care team' awareness about these modifiable risk factors. This could be achieved through health education programs. Also, routine screening of subjects above age of forty for early detection of medical risk factors and psychosocial upset for better prevention and control of CAD is recommended.

Keywords: CAD; Socio-demographic; Lifestyle; Medical; Psychological; Biochemical; Risk factors; Elder; Egypt

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Introduction

Heart Disease (HD) remains a worldwide public health problem. There is remaining no cure for many forms of HD. New clues are emerging that might lead to better treatments in the future [1]. Coronary Artery Disease (CAD), the most important entity of HD; occurs when atherosclerotic plaque builds up within walls of the coronary arteries leading to narrowing and appearance of the clinical manifestations of Acute Coronary Syndrome (ACS) that include angina and Myocardial Infarction (MI) [2]. So, ACS is caused mainly due to deficient blood and oxygen flow to the heart muscle and will be the main cause of death till the year 2020 [3]. CAD has symptoms that require ongoing monitoring and treatment to prevent further complications as MI and Heart Failure (HF) [4].

In developing countries prevalence of CAD is about 11.0%, while age-adjusted prevalence is

about 9.0% [5]. In Egypt, the National Hypertension Project (NHP) found an adjusted overall prevalence of CAD is 8.3% [6]. Different reasons are postulated to this; increasing prevalence in developing countries, high expenses of surgical and other treatment modalities, side effects, and the resultant inability make CAD one of the most important medical and health issues [7].

Cardiovascular Disease (CVD) has become the largest single cause of death worldwide. It is responsible for an estimated 17 million deaths and led to 151 million disability-adjusted life years (DALYs) lost (~30.0% of all deaths and 14.0% of all DALYs lost). Also, 12.2% of global deaths (7.2 million) are caused by CAD [8], so it is a leading cause of morbidity, disability, and mortality worldwide [2]. Further, by 2020, 32.0% of the world population deaths will be caused by CVD and by 2030; it will be responsible for 33.0% of all deaths (24.2 million). At this time, 14.9% and 13.1% of deaths in men and women respectively will be caused by CAD [9].

In Egypt, WHOR showed in 2014 that CAD deaths reached 107,232 (23.14%) of all deaths. Age adjusted death rate is186.36/100,000 population; this ranks Egypt #23 in the world [10]. CAD deaths were 78,897 (21.73%) of all deaths, which make CAD the first killer in Egypt in 2013 [11].

The high prevalence and morbidity associated with CAD is one of the most pressing health problems [12]. Data indicate that the elder population has higher prevalence of CAD risk factors [13]. CAD risk factors are classified into unmodified (e.g., age and genetic factors) and modified (e.g., smoking, obesity, psychosocial, etc). Only half of the variances of CAD are explained by unmodified risk factors [14]. Most of the CAD studies focused on the biological risk factors and lifestyle, but evidence shows psychological/psychosocial factors have important role in etiology, development, continuity and the consequence of this illness [15,16]. Psychological factors are considered as independent risk factors in CAD [14].

CAD has multi-factorial etiology, with many of the risk factors being influenced by lifestyle, so rapid changes in dietary habits coupled with decreased physical activity as a consequence of modernization may partly explain the escalation of CAD [17]. Many risk factors have been implicated in causation of CAD, but not all CAD occur in subjects with multiple risk factors. Elevated levels of Blood Pressure (BP) and cholesterol remain the leading causes of CAD [18]. While, tobacco use, obesity, and physical inactivity remain important contributors [8].

Atherosclerosis is a major risk factors for CAD, the main risk factors for atherosclerosis is gender, age, heredity, smoking, Diabetes Mellitus (DM), high BP, High Triglyceride (TG) levels, Low Density Lipoprotein (LDL) levels, Chronic Kidney Disease (CKD), alcohol abuse, overweight, insufficient exercise, excessive stress, etc [19]. Also, studies have cleared psychosocial and psychiatric factors have a great role in the etiology, development, duration, and outcome of CAD [16]. The great important factors are depression [20,21], anxiety [21-24], and stress [25,26].

Aims of the study

They are to determine the socio-demographic, lifestyle, medical, psychosocial, and biochemical risk factors of CAD among elderly patients in Assiut governorate, Egypt. Also, it is to determine patients' candidates to cardiac surgery.

Patients and Methods

Study design

A case-control, analytic, hospital-based study design was chosen to perform this research.

Administrative design

An approval to conduct this study was obtained before starting the field work.

Study setting and patients

A consecutive patients' group (n=120) who attending the Internal Medicine Outpatient Clinics (OPC) and confirmed to have CAD or admitted in Inpatients Ward or Intensive Care Unit (ICU), Assiut Hospital, Al-Azhar University were the studied group for this research. Also, an equal number (120) of normal healthy adults as controls were enrolled in this study; the controls were the visitors, relatives of non cardiac patients or unrelated visitors of CAD patients. The age range of the CAD patients was 60-76 year. Our Community Health Nurse colleague's gave the participants a session of health education about CAD risk factors especially the importance role of modification of their lifestyle in prevention and control of CAD.

Inclusion criteria

Any patient; male or female, age ≥ 60 years, confirmed to have CAD, attending on the Internal Medicine OPC or admitted in Inpatients Ward or ICU, during the study period were the study group.

Exclusion criteria

Any patient; age < 60 years, unconsciousness, refuse to participate were excluded from the study group.

Ethical consideration

The study protocol was approved by the Council of Community Medicine and Internal Medicine Department. Also, it is approved by the Ethical Committee of Assiut Faculty of Medicine, Al-Azhar University. The purpose and procedures to be performed were explained to the patients and controls, accordingly, an informed consent to participate in the study was taken from both of the patients and controls.

Study tools and methods

The patients and controls were subjected to:

1. A specially designed, comprehensive, interviewing form contains data relevant to topic of the study was used. Positive family history of CAD was defined as presence of a documented CAD patient in a first-degree relative male < 55 year or female ≤ 65 year [27]. Consumption any form of tobacco; the participant was considered smoker [28].

2. Anthropometric measurements were applied to all participants: a) Height (cm), b) Body weight (kg), and accordingly Body Mass Index (BMI) was calculated as weight in kg divided by the square of the height in meters (kg/m^2). BMI was classified into; underweight <18.5, normal 18.5-24.9, overweight 25-29.9, and obese ≥ 30 kg/m^2 [29], and c) Waist Circumferences (WC) (cm). WC made at a midpoint between the top of the iliac crest and the lower margin of the last palpable rib in the mid axillary line [30]. Patient considered has abdominal obesity if WC >102 cm in men and >88 cm in women [27].

3. Clinical examination: BP; hypertension was defined as ≥ 2 BP readings of 140 mmHg systolic, 90 mmHg diastolic or a patient who was already on anti-hypertensive medication. Also, all needed examinations and/or investigations to confirm the diagnosis and to assess patients' medical conditions to determine their candidates to surgery were done; echocardiography and/or coronary angiography. The patients' grading of angina pectoris was according to the New York Heart Association [31] (NYHA) that places patients in one of four categories based on how much they are limited during physical activity.

Middle Sex Hospital Questionnaire was applied on the cases and controls. The questionnaire was divided into subscales covering psychiatric symptoms, which including anxiety and depression. Response to each item is scored 2, 1 or 0. A score of ≥ 9 in any subscale indicates the subject is suffering from psychiatric disorders [32]. Also, major stressful life events questionnaire (Life Events List) [33] was used to assess the number and types of stressful life events experienced during the past year, as well as the degree of stress experienced in each. Meanwhile, Modified Overt Aggression Scale (MOAS) [34] was used to assess some aggressive behaviors; it instructs the individual to rate the patient's aggressive behaviors over the past week. In this study it is administered by our Community Health Nurse colleague's. Its items were scored on a 5-point Likert scale; scores were ranged from 0 to 40, with higher scores indicating more aggression.

4. Laboratory investigations of the patients and controls were done: **a)** Plasma glucose level: DM was defined as a patient who was already on treatment for DM or having one of the following criteria; fasting plasma glucose level ≥ 126 mg/dL, 2-hour plasma glucose level ≥ 200 mg/dL or a patient with classic symptoms of hyperglycemia with a random plasma glucose level ≥ 200 mg/dL [35]. **b)** Fasting lipid profile [serum concentration of total cholesterol, Triglycerides (TGs), Low Density Lipoprotein (LDL)-cholesterol, and High Density Lipoprotein (HDL)-cholesterol] was adopts according to the Adult Treatment Panel III (ATP III) classification levels of total cholesterol, LDL-cholesterol, HDL-cholesterol, and TGs [27]. **c)** Metabolic syndrome (MS): was defined according to the NCEP ATP III criteria by the presence of ≥ 3 of the following criteria; abdominal obesity (WC; men >102 cm and women >88 cm), TGs (≥150 mg/dL), HDL-cholesterol (men <40 mg/dL and women <50 mg/dL), BP (≥130/85 mmHg), and fasting plasma glucose (≥110 mg/dL) [27]. **d)** C-Reactive Protein (CRP).

Statistical analysis

The collected data were revised, organized, tabulated and statistically analyzed using Statistical Package for Social Sciences (SPSS) version 20 for windows. Frequency, percentage, and Odds Ratio (OR) were the statistical methods used in the analysis of data. The significance of OR was the 95% Confidence Interval (CI) or the 95% Exact Confidence Limits (ECL).

Discussion

Many risk factors have been implicated in occurrence of CAD [18]. Prevalence of CAD increases along with increasing prevalence of its risk factors [36]. Reduction occurrence of CAD was tried by primary and secondary prevention strategies; primary prevention as behavioral changes and risk factors modifications [37]. Meanwhile, secondary prevention of CAD is an important objective; it leads to reduce cardiac events especially acute MI [38]. Due to CAD high expenses of treatment and their complications; appropriate approach, prevention, and treatment lead to save economic resources and health costs. So, it seems necessary to concentrate on the modified risk factors that are mostly the psychosocial factors and lifestyle [39]. Awareness to CAD psychological risk factors will result in achieving prevention, control, and stability. These achievements lead to lowering risk factors, treatment expenses, and improving quality of life; eventually minimize illnesses and disabilities [40,41].

In the current study we revealed that age group 65-69 year represented a significant risk factor for CAD (OR=1.85) and about half (50.8%) of CAD cases were in this age group. In Egypt, Bahnasawy et al [42] and Ibrahim et al [43] reported lower figures in CAD patients aged > 60 years; 35.4% and 26.4%, respectively (Table 1). Additionally, they reported mean age of CAD was 55.95 ± 11.04 and 54 years, respectively. Also, Egypt NHP [6] has provided the prevalence of CAD was the highest in subjects aged >50 years, 11.1%. Whereas Raymond et al [44] found 70.3% of CAD Egyptian patients were in the age >35 years. Ram Rohit and Trivedi Atul [28] reported the mean age of cases was 54 ± 10.50 years; 40.0% of cases were in the age group 51-60 years. Also, Kasper et al [19] showed that incidence of CAD was more in the age group of 51-60 years.

We observed male gender represented significant risk factor for CAD (OR=4.27); males represented 78.3% of all cases. Jayachandra et al [45] showed overall risk factors are more in males compared to females; ≥65 years, 69.1%. The Egypt NHP found prevalence of CAD was slightly higher in men (8.9%) compared to women (8.0%) [6]. Our result was close to figures of Ram Rohit and Trivedi Atul [28], Ibrahim et al [43], and Taha [46]; 70.4%, 77.6%, and 83.5 %; respectively, but less than Raymond et al [44]; 93.2%. On the other hand, Hadaegh et al [47] reported that CAD was more among females (59.0%).

We found widow/widower is a significant risk factor for CAD (OR=5.54). This is expected and accepted as they might be at old age, experiencing psychosocial stress, and anxiety and depression that increase the risk of CAD occurrence. Also, we showed that urban residence represented significant risk factor for CAD (OR=1.89). Overall CAD prevalence, in India, has increased from 2.06% in 1970 to 5.0% in 2002 in rural area and 1.04% in early 1960 to 13.02% in 2004 in urban area [48]. Taha [46] found CAD is more among patients from urban areas, 59.5%.

We clarified secondary and high education, professional occupation, enough and saved income, and high social class represented significant socioeconomic risk factors for CAD (OR=3.06, 3.29, 1.95, 2.07; respectively) (Table 2). Schnohr et al [49] elicited Relative Risk (RR) of education ≤ 10 year for CAD in men and women was 1.01, 95% CI: 0.85-1.19 and 1.28, 95% CI: 0.97-1.68; respectively and RR of low or middle income for CAD in men and women was 1.14, 95% CI: 0.98-1.32 and 1.22, 95% CI: 1.0-1.5; respectively. Mohanan et al [50] observed patients with up to secondary school education had the highest prevalence of CAD (40.7%). Similar observation; the patients in the middle socioeconomic classes were more than patients from low and high socioeconomic classes. Xavier et al [51] cleared most patients (52.5%) in their study were from middle socioeconomic class. Also, our results are in agreement with Gupta et al [36]; they found patients in middle, low, and high socioeconomic classes were 61.4%, 30.9%, and 7.7%; respectively.

In the present study we elicited that current tobacco smoking, for duration >20 years, and ≥ 20 cigarettes/day were significant

Table 1: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to demographic risk factors.

Demographic risk factors	Patients (n=120)		Controls (n=120)		OR# (95% CI)
	No.	%	No.	%	
Age (years):					
60-64	24	20.0	52	43.3	0.33 (0.18-0.6)
65-69	61	50.8	43	35.8	1.85 (1.07-3.21)
≥ 70	35	29.2	25	20.8	1.56 (0.83-2.95)
Gender:					
Male	94	78.3	55	45.8	4.27 (2.35-7.82)
Female	26	21.7	65	54.2	0.23 (0.13-0.43)
Marital status:					
Married	46	38.3	93	77.5	0.18 (0.1-0.33)
Widow/Widower	74	61.7	27	22.5	5.54 (3.04-10.16)
Residence:					
Urban	82	68.3	64	53.3	1.89 (1.08-3.31)
Rural	38	31.7	56	46.7	0.53 (0.3-0.93)

#Odds ratio. *Confidence intervals. **Exact confidence limits.

Table (1) clears that age group 65-69 year, male gender, widow/widower, and urban residence represented significant demographic risk factors for CAD (OR=1.85, 95% CI: 1.07-3.21; OR=4.27, 95% CI: 2.35-7.82; OR=5.54, 95% CI: 3.04-10.31; 1.89, 95% CI: 1.08-3.31; respectively).

Table 2: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to socioeconomic risk factors.

Socioeconomic risk factors	Patients (n=120)		Controls (n=120)		OR# (95%CI) OR (95%ECL)*
	No.	%	No.	%	
Educational level:					
Illiterate and read & write	26	21.7	59	49.2	0.29 (0.16-0.52)
Elementary	42	35.0	37	30.8	1.21 (0.68-2.15)
Secondary and university	52	43.3	24	20.0	3.06 (1.66-5.67)
Occupational level:					
House wife	21	17.5	45	37.5	0.35 (0.19-0.67)
Unskilled	41	34.2	47	39.2	0.81 (0.46-1.41)
Semi-skilled and skilled	43	35.8	23	19.2	2.36 (1.26-4.43)
Professional	15	12.5	5	4.2	3.29 (1.08-11.91)*
Income:					
Not enough	31	25.8	48	40.0	0.52 (0.29-0.94)
Enough	47	39.2	46	38.3	1.04 (0.6-1.8)
Enough and saved	42	35.0	26	21.7	1.95 (1.06-3.6)
Social class:					
Low	29	24.2	54	45.0	0.39 (0.22-0.7)
Middle	46	38.3	39	32.5	1.29 (0.73-2.27)
High	45	37.5	27	22.5	2.07 (1.13-3.79)

#Odds ratio. *Confidence intervals. **Exact confidence limits.

Table (2) demonstrates that secondary and more level of education, professional occupation, enough and saved income, and high social class represented significant socioeconomic risk factors for CAD (OR=3.06, 95% CI: 1.66-5.67; OR=3.29, 95% ECL: 1.08-11.91; OR=1.95, 95% CI: 1.06-3.6; OR=2.07, 95% CI: 1.13-3.79; respectively).

Table 3: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to lifestyle risk factors.

Lifestyle risk factors	Patients (n=120)		Controls (n=120)		OR# (95% CI) OR (95% ECL)*
	No.	%	No.	%	
Tobacco smoking:					
Current smoker	61	50.8	27	22.5	3.56 (1.97-6.48)
Passive smoker	33	27.5	29	24.1	1.19 (0.64-2.21)
Ex-smoker	8	6.7	14	11.7	0.54 (0.2-1.45)
Never smoke	18	15.0	50	41.7	0.25 (0.13-0.48)
Duration of tobacco smoking (years):	**(n=102)**		**(n=70)**		
< 10	9	8.8	22	31.4	0.21 (0.08-0.53)
10-20	47	46.1	30	42.9	1.14 (0.59-2.2)
> 20	46	45.1	18	25.7	2.37 (1.16-4.87)
Number of cigarettes smoked/day:	**(n=102)**		**(n=70)**		
< 20	22	21.6	28	40.0	0.41 (0.24-0.85)
≥ 20	80	78.4	42	60.0	2.42 (1.18-5.02)
Alcohol use: Yes	6	5.0	2	1.7	3.11 (0.54-31.94)*
Previous physical inactivity: Yes	57	47.5	32	26.7	2.49 (1.4-4.43)
Dietary habits:					
Low fruits and vegetables intake: Yes	58	48.3	37	30.8	2.1 (1.2-3.68)
High fats intake: Yes	74	61.7	32	26.7	4.42 (2.47-7.95)
High salt intake: Yes	67	55.8	29	24.2	3.97 (2.21-7.17)

#Odds ratio. *Confidence intervals. **Exact confidence limits.

Table (3) elicits that significant lifestyle risk factors for CAD are current tobacco smoker's, duration >20 year of smoking, smoking ≥20 cigarette/day, physically inactive, low fruits and vegetables intake, high fat intake, high salty food intake, and chronic work stress (OR=3.56, 95% CI: 1.97-6.48; OR=2.37, 95% CI: 1.16-4.87; OR=2.42, 95% CI: 1.18-5.02; OR=2.49, 95% CI: 1.4-4.43; OR=2.1, 95% CI: 1.2-3.68; OR=4.42, 95% CI: 2.47-7.95; OR=3.97, 95% CI: 2.21-7.17, OR=4.14, 95% ECL: 1.26-17.6; respectively).

lifestyle risk factors for CAD (OR=3.56, 2.37, 2.42; respectively) (Table 3). Cigarette smoking constitutes the single most important, independent and effective risk factor of atherosclerosis in many previous studies [19]. Jayachandra et al [45] found smoking is the most common among elder patients. Tobacco use in any form is a major etiology behind the occurrence of CAD. Smokers, especially

Table 4: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to medical risk factors.

Medical risk factors	Patients (n=120)		Controls (n=120)		OR# (95% CI) OR (95% ECL)*
	No.	%	No.	%	
Hypertension: Yes	83	69.2	31	25.8	6.44 (3.54-11.8)
Diabetes mellitus (DM): Yes	61	50.8	19	15.8	5.5 (2.88-10.58)
Metabolic syndrome (MS): Yes	63	52.5	23	19.2	4.66 (2.52-8.68)
Chronic kidney disease (CKD): Yes	27	22.5	11	9.2	2.88 (1.28-6.56)
Overweight/obesity: Yes:	93	77.5	38	31.7	7.43 (4.02-13.81)
Overweight	49	40.8	24	20.0	2.76 (1.49-5.13)
Obese	44	36.7	14	11.7	4.38 (2.15-9.07)
Abdominal obesity: Yes	72	60.0	25	20.8	5.7 (3.1-10.55)
Positive family history of CAD: Yes	21	17.5	6	5.0	4.03 (1.49-12.63)*

#Odds ratio. *Confidence intervals. **Exact confidence limits.

Table (4) shows that significant medical history risk factors for CAD are hypertension, DM, MS, CKD, overweight and obesity, abdominal obesity, and positive family history of CAD (OR=6.44, 95% CI: 3.54-11.8; OR=5.5, 95% CI: 2.88-10.58; OR=4.66, 95% CI: 2.52-8.68; OR=2.88, 95% CI: 1.28-6.56; OR=7.43, 95% CI: 4.02-13.81; OR=5.7, 95% CI: 3.1-10.55; OR=4.03, 95% ECL: 1.49-12.63; respectively). Further, obese are at increased risk for CAD than overweight (OR=4.38, 95% CI: 2.15-9.07 and OR=2.76, 95% CI: 1.49-5.13; respectively). Meanwhile, positive family history of CAD is a significant risk factor for CAD (OR=4.14, 95% ECL: 1.26-17.6).

the current, were significantly more among the cases compared to controls. Also, strong relations were found between frequency and duration of smoking and CAD [28]. The risk of smokers to develop CAD is at least 2-4 times of that among non-smokers. Environmental tobacco smoke, which is also called passive smoke, is known to cause HD **[52]**. Schnohr et al [49] noticed RR of smoking for CAD in men and women was 1.41, 95% CI: 1.24-1.6 and 1.42, 95% CI: 1.23-1.64, respectively. Yathish et al [52] observed smokers were at risk of having CAD (OR=2.81), while the relative risk (RR) was 1.71. Also, Ram Rohit and Trivedi Atul [**28**] showed smoking is significant risk factor for CAD; smoking for <10 years and ≥10 years increase the risk from 2.01 to 5.12. Also, smoking up to 10 biddies and >10 per day significantly increases risk from 2.96 to 4.82. Further, we elicited that prevalence of current tobacco smokers was 50.8%. This result is similar with Gupta et al [36] and Taha [46]; they reported prevalence of 50.4% and 50.5%, respectively. While, our result is lower than Hadaegh et al [47] and Raymond et al [44]; they reported prevalence of 73.9% and 88.0%, respectively. Also, there was significant statistical difference between smokers and non smokers as regards prevalence of CAD [46].

We reported physical inactivity is significant risk factor for CAD (OR=2.49). Mohan and Deepa [17] clarified decreased physical activity might explain the escalation of CAD. Lopez et al [8] cleared physical inactivity is an important contributors of CAD. Schnohr et al [49] noted RR of physical inactivity for CAD in men and women is 1.28, 95% CI: 1.13-1.47 and 1.36, 95% CI: 1.17-1.59, respectively.

Further, we noticed low intake of fruits/vegetables, and high intake of fat and salty food were significant risk factors for CAD (OR=2.1, 4.42, and 3.97; respectively). Mohan and Deepa [17] observed changes in dietary habits could partly explain the escalation of CAD. DiClemente et al [53] showed promotes counseling on health behavior in clinical practice by advocating full insurance coverage for counseling for smoking and nicotine dependence, alcohol use, healthy diet, and physical activity among adults is important.

In the current study we showed hypertension is significant risk factor for CAD (OR=6.44). Schnohr et al [49] observed RR of hypertension for CAD occurrence in men was 1.46, 95% CI: 1.3-1.64 and in women was 2.02, 95% CI: 1.75-2.33. Also, in our study, 60.8% of our CAD patients were hypertensive. This result was close to Ibrahim et al [43] and Taha [46] figures of hypertension prevalence in CAD Egyptian patients; 56.7% and 56.0%, respectively. While our prevalence of hypertension was higher than that reported by Xavier et al [51], Hadaegh et al [47], Gupta et al [36], Raymond et al [44], and Jayachandra et al [45]; 38.0%, 40.4 %, 28.4%, and 37.7%; respectively. On the other hand, Bahnasawy et al [41] reported higher prevalence of hypertension, 83.2%.

In the present study we elicited DM is significant risk factor for CAD (OR=5.5). Schnohr et al [49] cleared RR of DM for CAD in men and women was 1.96, 95% CI: 1.35-2.12 and 2.74, 95% CI: 1.99-3.78, respectively. Also, 50.8% of our CAD patients had DM. Our result was similar to Bahnasawy et al [42] figure; 57.5% prevalence of DM in CAD patients. On the other hand, our figure was higher than that of Raymond et al [44], Foroughi et al [54], Xavier et al [48], Gupta et al [36], Ibrahim et al [43], Fouad et al [55], Taha [46], and Jayachandra et al [45]; 22.3%, 27.5%, 30.4%, 30.3%, 34.4%, 42.0%, 46.0%, and 21.0%; respectively. Meanwhile, we cleared MS is significant risk factor (OR=4.66). We reported 52.5% of our CAD patients had MS. This result was higher than 44.6% and 18.4% that reported by Fouad et al. [55] and Gupta et al [36], respectively. While it was similar to Taha's [46] figure, 53.0%.

In this study, we showed overweight/obesity and abdominal obesity are significant medical risk factors for CAD (OR=7.43 and 5.7, respectively) (Table 4). Further, obese patients are at increased risk than overweight (OR=4.38 and 2.76, respectively). Schnohr et al [49] clarified RR of obesity for CAD in men and women was 1.2, 95% CI: 1.07-1.36 and 1.19, 95% CI: 1.04-1.37, respectively. According to population-based surveys; there are about 1.3 billion overweight adults in the world. In addition, 23.0% of the CAD burden is attributable to overweight and obesity [(43)]. We found prevalence of obesity was 36.7%, which was similar to that reported by Taha [46] (38.5%) and Raymond et al [44] (39.2%). While, Ibrahim et al [43] found 25.8% of CAD Egyptian patients were obese. Whereas, Bahnasawy et al [42] found 96.5% of CAD of their patients were obese or overweight.

We cleared CKD is significant risk factor for CAD (OR=2.88, 22.5%). This is expected and accepted as CKD could leads to hypertension that is risk factor for occurrence of CAD. Our figure is higher than Jayachandra's et al [45] figure, 11.0%.

We noted positive family history of CAD is significant risk factor (OR=4.03, 17.5%). Our result is higher than figures of Taha [46] (11.0%), Gupta et al [36] (13.1%), and Sekhri et al. [56] (4.6%) for positive family history among CAD patients. On the other hand, our

Table 5: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to psychosocial risk factors.

Lifestyle risk factors	Patients (n=120)		Controls (n=120)		OR# (95% CI) OR (95% ECL)*
	No.	%	No.	%	
Stress: Yes	59	49.2	27	22.5	3.33 (1.84-6.06)
Type of stress:					
Stress at home	74	61.7	47	39.2	2.5 (1.44-4.35)
Stress at work	96	80.0	73	60.8	2.58 (1.39-4.79)
Financial stress: Moderate/severe	89	74.2	49	40.8	4.16 (2.32-7.48)
Stressful life events	75	62.5	43	35.8	2.98 (1.71-5.23)
General stress	76	63.3	31	25.8	4.96 (2.76-8.97)
Depression: Yes:	77	64.2	43	35.8	3.21 (1.83-5.63)
Anxiety: Yes	76	63.3	17	14.2	10.47 (5.32-20.79)
Aggression: Yes	83	69.2	37	30.8	5.03 (2.81-9.05)
Social support: No	17	14.2	6	5.0	3.14 (1.12-10.05)*

#Odds ratio. *Confidence intervals. **Exact confidence limits.

Table (5) illustrates that significant psychosocial risk factors for CAD are presence of stress especially general stress, depression, anxiety, aggression, and absence of social support (OR=3.33, 95% CI: 1.84-6.06; OR=4.96, 95% CI: 2.76-8.69; OR=3.21, 95% CI: 1.83-5.63; OR=10.47, 95% CI: 5.32-20.79; OR=5.03, 95% CI: 2.81-9.05; OR=3.14, 95% ECL: 1.12-10.05; respectively).

Table 6: Distribution of the studied patients with Coronary Artery Disease (CAD) and control group according to biochemical risk factors.

Lipid profile risk factors	Patients (n=120)		Controls (n=120)		OR# (95% CI)
	No.	%	No.	%	
Triglyceride (TG):					
Borderline high	36	30.0	13	10.8	3.53 (1.68-7.52)
High	25	20.8	8	6.7	3.68 (1.5-9.35)
Total cholesterol:					
Borderline high	32	26.7	11	9.2	3.6 (1.63-8.1)
High	29	24.2	7	5.8	4.46 (1.84-11.18)
HDL-cholesterol:					
Low	67	55.8	17	14.2	7.66 (3.93-15.1)
LDL-cholesterol:					
Borderline high	43	35.8	14	11.7	4.23 (2.07-8.76)
High	34	28.3	9	7.5	4.88 (2.1-11.6)

#Odds ratio. *Confidence intervals.

Table (6) demonstrates the most significant biochemical risk factors for CAD are high TG levels (OR=3.68, 95% CI: 1.5-9.35), high total cholesterol levels (OR=4.46, 95% CI: 1.84-11.18), low HDL-cholesterol level (OR=7.66, 95% CI: 3.93-15.1), and high LDL-cholesterol levels (OR=4.88, 95% CI: 2.1-11.6).

figure is lower than figures of Raymond et al [44] (33.8%), Foroughi et al [54] (38.0%), and Bahnasawy et al [42] (46.9%) for positive family history of their CAD patients.

Evidence suggests psychological and social factors are independent risk factors, they have important role in physical chronic diseases, particularly CAD [16,23,57]. So, psychological risk factors of CAD; etiology, prognosis, and mortality are important challenge in understanding and combating CAD [58]. Many of the psychosocial factors are not recognized clinically. Possible causes are; 1- Psychosocial factors are risks rather than inevitable causes, differ widely in importance, and will not be apparent in every case; 2- Psychological characteristics as aggression might be elicited under specific provocation; and 3- There is no try to search for psychosocial explanations only for patients who don't have other familiar, clear risk factors as hypertension, DM, or smoking. Also, many clinicians work based on implicit models that place biological and psychosocial causes as alternatives [39]. However, psychosocial factors may be associated with other risk factors [59]. Psychological factors as protective or risk factors have an important role in CAD; the most important of which are depression, anxiety, stress, occupational status, and social support [20,21,24,25,26,39,60].

We showed aggression is significant risk factor for CAD (OR=5.03) (Table 5). Khayyam-Nekouei et al [39] cleared aggression could be emerged only under special situation. So, it is unlikely to be expressed during an ordinary clinical practice. Also, we showed that stress is significant risk factor for CAD (OR=3.33). The relation between CVDs including CAD and stress is not a simple probable, but tentative proof suggests a relation between the heart and mind [61]. It is has been concluded variables that are mostly viewed as components of stress include: depression and anxiety, social isolation and lack of social support, acute and chronic life events, and psychosocial work characteristics [39,62,63].

We elicited work stress is significant risk factor for CAD (OR=2.58). This result is in consistent with Chandola et al [64]; they stated chronic stress at work is associated with CAD (RR=1.68, 95% CI: 1.17-2.42). Further, they concluded it's an important determinant of CAD and it's mediated through indirect effects on health behaviors and direct effects on neuro-endocrine stress pathways. Also, we reported stressful life events is significant risk factor for CAD (OR=2.98). Research has cleared the importance of stress caused by acute and chronic life events in CAD incidence. Acute life event stressors can trigger CAD events, but it is very difficult to study and quantify the magnitude of these effects [39]. Although the deleterious physiological effects of acute stressors as CAD triggers are well documented, the role of chronic stressors in CAD onset and prognosis remains unclear [65]. Also, we observed stress at home e.g. marital is significant risk factors for CAD (OR=2.5). Balog et al [66] showed marital stress might results in CAD.

We showed absence of social support is significant risk factor for CAD (OR=3.14). Among the major protective factors for CAD is social support [39]. Many studies have shown after MI rate of depression depends upon the amount of social support. One of the

important stress variables is social support that is more important than other variables [63]. Not only the lack of social support is associated with the occurrence of CAD, but also it's an independent risk factor for mortality [67].

We noticed depression is significant risk factors for CAD (OR=3.21). Strong support of the depression's role in increasing morbidity and mortality of CAD viewed depression is an independent predictor [40]. Depression is an important disorder, which leads to an increase in cardiovascular events including CAD, hospital re-admission, and CAD mortality [68]. Depressed people are 64.0% more at risk of suffering from CAD than non-depressed people [40]. Further, it is common among CAD patients; its prevalence is 20.0% higher in HF patients compared with healthy subjects [15]. Depression is also a negative predictor for improvement of CAD [39]. Depression symptoms, accompanied with stress in marital relation among women with and without CAD, were found more among women with marital stress and results in the intensification of CAD [66]. Also, it's risk factor for morbidity and mortality in CAD patients, especially after ACS [20,21]. Finally, depression is shown to be a risk factor in the etiology of CAD [40,67-69]. The challenge on prospective association between depression and CAD is the possibility that depression and subsequent CAD are caused by subclinical manifestation of CVD [40]. The most important underlying pathophysiological mechanism of CAD, atherosclerosis, develops during the decade before early appearance of clinical symptoms. So, atherosclerosis may facilitate depressive symptoms even before clinical CAD symptoms [40,60].

We found anxiety is significant risk factor for CAD (OR=10.47). Although evidence suggests anxiety has an adverse impact on prognosis in CAD patients independent of depression, the role of anxiety as an etiological risk factor is less obvious [23,40,70]. Also, anxiety is an independent risk factor for CAD, but the link between anxiety and CAD is to somewhat less than the relation between depression and CAD. However, this connection is stronger than the association between anger and CAD occurrence [23]. Roest et al [23] cleared symptoms of anxiety in CAD patients is associated with physical factors as palpitation in absence of physical activities, anger, face redness, abnormal heart beat, and muscle tension, which increases risk of CAD. Nabi et al [22] viewed somatic symptoms of anxiety were associated with an increased risk of CAD.

Finally, most studies discussed anxiety and depression as an important disorder that results in increase of CVD episodes, re-admittance to hospital, and death in CAD patients [37]. Janszky et al [20] studied the effects of anxiety and depression on risk factors of CAD; they reported they are associated with low physical activity and high rate of smoking. Also, depression is associated with increased use of alcohol. At the same time, anxiety has connection with hypertension. Further, anxiety independently predicted subsequent CAD events of morbidity and mortality.

In the current study we demonstrated that significant biochemical risk factors for CAD are high TG level (OR=3.68), high total cholesterol level (OR=4.46), low HDL-cholesterol level (OR=7.66), and high LDL-cholesterol level (OR=4.88) (Table 6). Elevated levels of serum total cholesterol, TG and/or LDL-cholesterol and/or low level of HDL-cholesterol are called dyslipidaemia, which is a major risk factor for CAD [71]. Jayachandra et al [45] observed regarding elderly patients, dyslipidemia (9.0%) was the most common risk factor for CAD. Also, **Sekhri** et al [56]; revealed prevalence of dyslipidemia was significantly high, 45.6% of the individuals had high total cholesterol/

Table 7: Distribution of the studied patients with Coronary Artery Disease (CAD) according to their clinical characteristics that determine their candidates to surgery.

Variables	Number (n=120)	Percent
Previous MI: Yes	78	65.0
History of previous Cardiac surgery: Yes	6	5.0
Diagnosis:		
UA	37	30.8
MI	83	69.2
New York Heart Association grading of angina:		
Grade 1	5	4.2
Grade 2	29	24.2
Grade 3	76	63.3
Grade 4	10	8.3
Peripheral vascular disease: Yes	27	22.5
Heart Failure: Yes	19	15.8
Lt Ventricular Ejection Fraction (Lt Vent Function):		
≥60.0% (normal)	9	7.5
≥45.0%-59.0% (mild impairment)	26	21.7
≥35.0%-44.0% (moderate impairment)	47	39.2
<35.0% (severe impairment)	38	31.7
Stenosis >50.0% in Lt main CA (n=120)**:** Yes	18	15.0
No. of stenosed vessels (n=102)**:**		
1	2	2.0
2	16	15.7
≥3	84	82.3
CAD patients candidates to CABG	58	48.3

Table (7) clarifies that history of previous MI and cardiac operations are 65.0% and 5.0%, respectively. There are 30.8% and 69.2% of the patients have UA and MI, respectively. Most of the patients (63.3%) have grade 3 according to NYHA grading. Also, 22.5% and 15.8% of them have history of peripheral vascular disease and HF, respectively. Further, most of the patients; 39.2% and 31.7%, respectively have moderate and severe impairment (left ventricular function). Also, 15.0% of the patients have stenosis >50.0% in main left coronary artery. Further, 82.3% of the patients have ≥3 stenosed vessels. Collectively, 48.3.3% of the patients are candidates for CABG surgery.

high density lipoprotein ratio. Totally, 78.6% of individuals had two or more risk factors for CAD. Schnohr et al [49] cleared RR of TG for CAD in men and women was 1.06, 95% CI: 0.95-1.19 and 1.33, 95% CI: 1.14-1.55, res pectively and of high total cholesterol level was 1.22, 95% CI: 1.09-1.36 and 1.23, 95% CI: 1.06-1.43, respectively. Ibrahim et al [43] concluded dyslipidemia is common among Egyptians with CAD; low HDL-cholesterol was present in 49.2% of CAD patients, high LDL-cholesterol in 30.2%, and high TG in 45.0% of them; these figures are to somewhat similar to our figures. Whereas, Raymond et al [44] cleared dyslipidemia was found in 37.2% of their CAD Egyptian patients. Achari and Thakur [72] reported serum levels of cholesterol, LDL-cholesterol, and total cholesterol to HDL ratio were higher among CAD patients compared to controls. Also, there was a lack of association of serum TGs levels with CAD. Further, Burman et al [73] found LDL-cholesterol levels and total cholesterol/HDL-cholesterol ratio were higher in CAD patients compared to controls but there was no significant difference in S.TG levels. On the other hand, Achari and Thakur [71] observed prevalence of elevated LDL-cholesterol levels is only 38.8% among CAD patients. This suggests either the cut-off used for elevated LDL-cholesterol is not appropriate among all races or >60.0% of CAD is not explained by elevated LDL-cholesterol levels **[17]**. Further, we reported 50.8% of our patients had borderline high/high TG level, which similar to 45.0% that observed by Ibrahim et al [43] and Taha [46]. Also, in our study, high total cholesterol was found among 50.9% of our patients, which is similar to figures of Taha [46] (47.5%) and Ibrahim et al [43] (58.7%). Meanwhile, it is less than Bahnasawy's et al [42] figure, 78.8%. Low HDL-cholesterol was present among 55.8% of our patients, which is

higher than figures' of Taha [46] (10.5%) and Bahnasawy et al [42] (21.2%). Also, high LDL-cholesterol was present in 64.1% of our patients. This result is higher than figures showed by Bahnasawy et al [42] (41.6%) and Ibrahim et al [43] (30.2%) (Table 6).

In the current study, Table 7 we reported history of previous MI and cardiac operations are 65.0% and 5.0%, respectively. Also, 30.8% and 69.2% have UA and MI, respectively. Most of the patients 63.3% have grade 3, respectively according to NYHA [31] grading. Further, 22.5% and 15.8% of them have history of peripheral vascular disease and HF, respectively. Meanwhile, 39.2% and 31.7% of the patients have moderate and severe impairment of left ventricular function, respectively. Also, 15.8% of the patients have stenosis >50.0% in main left coronary artery. Further, 82.3% of the patients have ≥3 stenosed vessels. Lastly, 48.3.3% of the patients are candidates for CABG surgery. Collectively, these data indicate that most of our patients have many CAD risk factors; these results are agreed with Waly et al [74]. Also, many of them were candidates for surgical intervention many years ago. However, many of the patients refused or postponed operation because of personal, cultural, socioeconomic, and other reasons (unpublished data). Further, many of these patients have severe CAD.

Conclusions

CAD is an important preventable public health problem; many of its risk factors are modifiable. Modification of lifestyle and psychosocial risk factors of CAD is the most important interventions to reduce morbidity and mortality of CAD in the community. The most important significant demographic risk factors were male gender and widow/widower; socioeconomic risk factor was profession occupations; lifestyle risk factors were current smoker, high fat and salt intake; medical risk factors were hypertension, DM, MS, obesity, abdominal obesity, and +ve family history; psychosocial risk factors were general stress, depression, anxiety, aggression, absence of social support; and biochemical risk factors were high levels of TG, total cholesterol, LDL-cholesterol, and low HDL-cholesterol level.

Recommendations

Considering the increase in CAD risk factors, it is important to pay more attention to increase people's and health care team members' awareness about the modifiable risk factors that can have an effective role in preventing and better treatment of CAD, and promoting patients health. This could be achieved through health education programs targeting the modifiable risk factors; smoking, obesity, sedentary lifestyle, bad dietary habits and soul and mind peace, and to trained patients regarding these lifestyle changes. Also, routine screening of subjects above age of forty for early detection of medical and psychosocial upset for prevention and better control of CAD is recommended. Further, establishing a national program to target this problem is a priority. More studies on bigger samples of all ages, in addition to community based surveys to better understanding of the real epidemiology of CAD in Egypt are needed. Also, prospective studies are needed to clear the effects of modifying lifestyle in reducing the risk and prevalence of CAD.

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