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The Risk Factor Profile in Egyptian Patients with Acute Coronary Syndrome: An Observational Study

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Abstract: Little is known about risk factors and treatment modalities in Egyptian patients with acute coronary syndrome (ACS). This cross-sectional study was conducted on 200 adult subjects presenting with ACS including ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), or unstable angina to evaluate the pattern of risk factors profile among Egyptian patients with ACS. All patients were subjected to history taking, clinical examination, 12-lead ECG, and plasma troponin I to confirm myocardial necrosis and to identify STEMI, NSTEMI, and unstable angina. The percent of current smokers was significantly higher than non-smokers (63.5% versus 36.5%, p=0.001). History of hypertension was significantly more frequent among the studied patients (57.5% versus 42.5%, p=0.034), and the same was observed for diabetes mellitus (60.5% versus 39.5%, p=0.003). The number of patients having dyslipidemia was significantly higher than those having no dyslipidemia (57% versus 43%, p=0.048). Regarding the body mass index (BMI), high percentages of the studied patients were overweight or obese (40.5% and 37.5%, respectively), with significant differences (p=0.000). The mean LDL was significantly higher in females than males (125.67±34.3 versus 114.68±25.6, p=0.043). Further, the mean BMI was significantly greater in females than males 32.44±5.5 versus 30.38±3.9, p=0.018). *Conclusions:* The findings of the present study indicated the pattern of modifiable risk factors for ACS Egyptian patients. These included smoking, obesity, hypertension, diabetes mellitus, and dyslipidemia. Lifestyle interventions and awareness of the public are highly recommended for preventing ACS, with especial consideration for women.

Keywords: Acute Coronary Syndrome, Dyslipidemia, Egypt, Obesity, Risk Factor, Smoking

1. Introduction

Acute coronary syndrome (ACS) is a critical cardiovascular problem that is associated with high rates of mortality and morbidity and represents a major health and financial burden. Extensive research work has been employed to identify factors that may increase the risk of coronary heart disease (CHD [1-3].

The major and independent risk factors for CHD include smoking, hypertension, diabetes mellitus, dyslipidemia, and advancing age. The quantitative relationship between these risk factors and CHD risk has been clarified, and the major risk factors are additive in predictive power [4, 5].

Several risk factors are non-modifiable including age, male sex, and race, while tobacco smoking, diabetes mellitus, high blood cholesterol, hypertension, obesity, and sedentary lifestyle are modifiable cardiovascular risk factors [6-8].

For optimum patient care observational studies may be significantly supportive as they provide details of epidemiology and risk factors as well as variations in patients' outcomes among different regions of the world and within the country itself [9, 10].

Egypt has the largest population in the Middle East and a high incidence of cardiovascular deaths; however, we know little about cardiovascular disease (CVD) risk factors in Egyptian patients with ACS [11].

Therefore, the current study was conducted to evaluate these risk factors profile pattern among Egyptian patients with ACS.

2. Methods

Ethical considerations:

This study was approved by the Ethics Committee of the National Heart Institute, Cairo, Egypt and was conducted in accordance with the principles of the Declaration of Helsinki. We obtained informed written consents from the study participants, and we were responsible for maintaining the confidentiality of the data.

Study design, setting, and date:

This cross-sectional study was conducted on 200 subjects. They were recruited from the National Heart Institute, Cairo, Egypt during May 2017 throughout April 2018.

Eligibility criteria:

We examined consecutive patients presenting with ACS. Patients were enrolled in the study if they were ≥ 18 years-old and diagnosed as having ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), or unstable angina.

Patients with dilated cardiomyopathy, valvular heart disease, pre-existing cerebrovascular or hepatocellular diseases, and severe renal insufficiency were excluded.

Procedure:

All patients were subjected to history taking, clinical examination, 12-lead ECG, and plasma troponin I to confirm myocardial necrosis and to identify STEMI, NSTEMI, and unstable angina. Patients were managed according to the standard protocols of diagnosis and treatment, and drug prescriptions and management strategies were determined by the attending cardiologist.

The presence of acute myocardial infarction (STEMI or NSTEMI) was considered in any patient having at least two of the following features: (1) ECG changes (with or without ST-segment elevations); (2) clinical manifestations of acute myocardial infarction; and (3) troponin I > 0.4 ng/ml.

For each patient we recorded the following information: sociodemographic, CVD risk factors, medical history of co-morbidities and/or drug use, the presenting symptoms, laboratory and ECG findings, and management (diagnostic and therapeutic) details. In addition, the body weight and height were measured to the nearest 0.5 kg and 0.5 cm, respectively. Weight was determined using a standard scale with the subjects barefoot and wearing light clothes. Height was measured using a wall-mounted stadiometer. The body mass index (BMI) was calculated as weight (kg)/height squared (m^2). Waist circumference was measured with a non-stretchable measuring tape at the level of the superior iliac spine.

The following definitions were considered: [12,13,14].

1) Dyslipidemia: Intake of lipid lowering therapy, serum LDL-cholesterol > 70 mg/dl, serum triglycerides ≥ 150 mg/dl, serum HDL-cholesterol < 40 mg/dl, or total cholesterol > 200 mg/dl.
2) Hypertension: History of hypertension or systolic/diastolic blood pressure ≥ 140/90 mmHg.
3) Diabetes (type 1 or 2): History of diabetes or fasting plasma glucose > 126 mg/dl.
4) Overweight, obesity, or morbid obesity: BMI of 25–29.9, 30–34.9, or ≥ 35 kg/m^2, respectively.
5) Central obesity: waist-to-height ratio of ≥ 0.5.

Statistical analysis

Data were analyzed using IBM© SPSS© Statistics version 23 (IBM© Corp., Armonk, NY, USA). Categorical variables were presented as numbers and percentages and the proportions of different categories for each variable were compared using the non-parametric chi-squared test. Numerical data were expressed as means and standard deviations, and differences between groups were examined using the student t-test. A two-sided p-value < 0.05 was considered statistically significant.

3. Results

This study included 200 adult patients who presented with ACS. Males significantly outnumbered females (75.5% versus 24.5%, p = 0.001). Nineteen patients (45%) gave positive family history of CHD, with a significant difference (p = 0.045). The percent of current smokers (63.5%) was significantly higher than non-smokers (36.5%), p = 0.001. History of hypertension was significantly more frequent among the studied patients (57.5% versus 42.5%, p = 0.034), and the same was observed for diabetes mellitus (60.5% versus 39.5%, p = 0.003). The number of patients having dyslipidemia was significantly higher than those having no dyslipidemia (57% versus 43%, p = 0.048). The frequency of high total cholesterol was significantly greater (97%, p = 0.001), while the high serum triglycerides was detected in only 6%. There was a significantly high percent of high LDL (71%, p = 0.000). The frequency of low HDL was 3.3% in males, while it was 83.7% in females, with significant differences (p < 0.05). High percent of patients (77%) suffered high non-HDL. Regarding the BMI, high percentages of the studied patients were overweight or obese (40.5% and 37.5%, respectively), with significant differences (p = 0.000) as demonstrated in Table 1.

Comparison between males and females regarding their lipid profile and anthropometric measurements is shown in Table 2. The mean LDL was significantly higher in females than males (125.67±34.3 versus 114.68±25.6, p = 0.043). Further, the mean BMI was significantly greater in females than males 32.44±5.5 and 30.38±3.9, p = 0.018).

Table 1. *Frequency distribution of the risk factors of acute coronary syndrome patients.*

	Acute coronary syndrome (n=200)		X^2 test	P value
	No	%		
Gender				
Male	151	75.5	52.2	0.001*
Female	49	24.5		
Family history of coronary artery disease				
Yes	90	45	2.0	0.045*
No	110	55		
Smoking				
Non-smokers	73	36.5	14.58	0.001*
Current smokers	127	63.5		
Hypertension				
No	85	42.5	4.5	0.034*
Yes	115	57.5		
Diabetes				
Yes	121	60.5	8.82	0.003*
No	79	39.5		
Dyslipidaemia				
Yes	114	57	3.92	0.048*
No	86	43		
Triglycerides				
Normal	188	94	154.8	0.0001*
High	12	6		
Total cholesterol				
Normal	6	3	176.7	0.001*
High	164	97		
Low-density lipoprotein				
Normal	58	29	35.28	0.000*
High	142	71		
High-density lipoprotein				
Male (N=151)				
Normal	146	96.7	131.6	0.000*
Low	5	3.3		
Female (N=49)				
Normal	8	16.3	22.2	0.000*
Low	41	83.7		
Non-high-density lipoprotein				
Normal	46	23	58.3	<0.05*
High	154	77		
Body mass index				
Normal	7	3.5		
Overweight	81	40.5	72.08	0.000
Obesity	75	37.5		
Morbid obesity	37	18.5		

Table 2. *Comparison between males and females regarding their lipid profile and anthropometric measurements.*

	Males (Mean±SD)	Females (Mean±SD)	T Test	P value
Lipid profile				
Total cholesterol, mg/dl	191.83±24.4	196.71±25.2	1.20	0.229
High-density lipoprotein, mg/dl	44.93±4.15	45.61±4.2	1.04	0.300
Low-density lipoprotein, mg/dl	114.68±25.6	125.67±34.3	2.06	0.043*
Triglycerides, mg/dl	125.50±28.06	134.28±42.0	1.36	0.176
Anthropometric measurements				
Body mass index, kg/m^2	30.38±3.9	32.44±5.5	2.42	0.018*
Weight, kg	87.8146±15.27	85.7755±18.75	0.766	0.444
Height, cm	152.9781±51.01	153.4061±41.82	0.053	0.958
Waist circumference, cm	107.2245±12.79	107.0417±17.47	0.067	0.947
Hip circumference, cm	101.1788±24.11	104.8980±17.83	0.994	0.321
Waist/hip ratio	0.93±11.21	0.92±12.01	1.77	0.070

4. Discussion

Acute coronary syndrome is a growing global health concern in different African and Middle East countries including Egypt. The majority of cardiovascular deaths occurs in low- and middle-income countries. This requires tailored multiple risk factor intervention programs to reduce the evolving and increasing burden of CVD. To ensure the implementation and success of such intervention measures,

the epidemiological data on the profile of cardiovascular risk factors specific for the country should be updated [15,16]. Therefore, this study aimed to clarify the pattern of risk factors for ACS among Egyptian patients.

The current study showed a number of modifiable risk factors for the ACS Egyptian patients. These included smoking, obesity, hypertension, diabetes mellitus, and dyslipidemia. Furthermore, there were significant gender differences in the prevalence of obesity and dyslipidemia.

In the present study, a significantly high percent of the ACS patients (63.5%) reported current smoking. The prevalence of current smoking among our patients is much higher than reported by Egyptian ACS patients in a previous study (48%) [11]. Furthermore, this figure outnumbered that reported in the Global Registry of Acute Coronary Events from 25 countries where 47% were current or ex-smokers [17]. The association between smoking and CVD was confirmed in various studies. An earlier study showed high prevalence of smoking among ACS patients especially the younger ones and it detected odds ratio of 7.03 for smoking with a significant increased risk of ACS [18]. A more recent study from Sri Lanka revealed a prevalence of smoking among 55.8% of STEMI, 39.8% of unstable angina and 35.5% of NSTEMI patients, with a significant association between smoking and STEMI ($p = 0.017$) [7]. Smoking is one of the modifiable risk factors for ACS [19]. So, the implementation of awareness campaigns utilizing all the available media should take more considerations from the health care authorities.

Obesity is a major universal health challenge, and it has reached at an alarming level in all Eastern Mediterranean countries [20]. Egypt has the third highest prevalence of obesity in the Middle East and North Africa region [21]. Obesity is a key risk factor for CVD. It has a negative impact on several risk factors associated with coronary artery disease including hypertension, insulin resistance, diabetes, dyslipidemia. These pathological metabolic consequences are triggered by ectopic fat deposition in the skeletal muscles, liver, heart, and pancreas [22].

In the present study, high percentages of the ACS patients were either overweight or obese (40.5% and 37.5%, respectively). Further, females showed a significantly greater mean BMI than males (32.44±5.5 versus 30.38±3.9, respectively; $p = 0.018$) indicating more risk for obesity related metabolic derangements. A recent epidemiologic study concluded that the risk of CVD increases with obesity with coexisting metabolic disorders than metabolically healthy obesity [23]. Obesity is one of the traditional modifiable risk factors for the CVD, and evidence indicates that weight loss result in important risk reduction [24].

The present study showed a significant high prevalence of hypertension and diabetes mellitus among the ACS patients (57.5% and 60.5%, respectively). Hypertension and type 2 diabetes are closely had common comorbidities that carry a greater risk for cardiovascular complications. Such complications are primarily related to the microvascular and macrovascular changes resulting from various mechanisms such as oxidative stress, inflammation, immune system activation, and upregulation of the renin-angiotensin-aldosterone system [25].

The findings of the present study revealed 57% prevalence of dyslipidemia, with a striking frequency of high total cholesterol (97%) and high LDL (71%). The frequency of low HDL was 3.3% in males, while it was 83.7% in females. Accordingly, dyslipidemias management is critical to prevent ACS [26]. According to the American Heart Association, untreated total cholesterol less than 200 mg/dl is an important requirement for maintaining perfect cardiovascular health [27]. Studies recognized that LDL cholesterol particles infiltrate the arterial wall triggering cascade of events with ultimate development of atherosclerosis [28]. Therefore, the American and European guidelines considered LDL cholesterol as an important modifiable risk factor [29,30]. Furthermore, low levels of HDL cholesterol are strongly associated with the development of atherosclerotic CVD. Though, the current evidence suggests that HDL serves as a marker for the cardiovascular risk rather than being a target for intervention to control CVDs [26].

The contributions of the different components of the lipid profile differ between genders. The studied females showed a significantly higher mean LDL as well as BMI than males. This agrees with Reda and colleagues [11] who reported a higher median BMI in women than men in the Egyptian ACS patients. As well, women from all countries in the Middle East show higher prevalence of obesity than men [31]. Research indicates that women with ACS are older with a more burden of comorbidities such as hypertension and diabetes mellitus, in comparison with men [32]. Care for female specific risk factors may permit early detection and intervention in apparently healthy women [33].

5. Study Limitations

In this study, data were collected from a small number of subjects enrolled from one healthcare facility, which may not be representative of the Egyptian population. In addition, although the design of this study was suitable for the evaluation of the pattern of risk factors, it did not permit odds ratio calculation for the significant independent risk factors by multivariable regression analysis.

6. Conclusions

The findings of the present study indicated the pattern of modifiable risk factors for ACS Egyptian patients. These included smoking, obesity, hypertension, diabetes mellitus, and dyslipidemia. More effort is needed to control the established ACS risk factors among the Egyptian population. Furthermore, lifestyle interventions and awareness of the public are highly recommended for preventing ACS, with especial consideration for women.

Ethical Compliance

Potential Conflicts of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from each individual participant involved in this study.

Statement of Human Rights

This study was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments.

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