

Gender differences in epidemiology and risk factors of acute coronary syndrome in Algerian patients of the Oran city: descriptive cross-sectional study

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SOUHRN

Kontext a cíle: Cílem této studie bylo určit vliv charakteristik pacienta z hlediska jejich klinického stavu, životosprávy a chování na závažnost onemocnění podle pohlaví.

Metody: Provedli jsme průřezovou deskriptivní studii.

Výsledky: Počáteční vzorek zahrnoval 1 219 pacientů přijatých pro akutní koronární syndrom (AKS) na kardiologické oddělení fakultní nemocnice v alžírském Oranu. Podle EKG vyšetření prodělalo 34 % pacientů infarkt myokardu s elevací úseku ST (STEMI) a 66 % infarkt myokardu bez elevací úseku ST (NSTEMI). Průměrný věk 413 pacientů se STEMI byl $60,87 \pm 12,20$ roku; tato skupina zahrnovala 324 mužů průměrného věku $59,92 \pm 11,78$ roku a 89 žen průměrného věku $64,36 \pm 13,13$ roku (tzn. mužů bylo ve skupině se STEMI 3,6× více). Z pacientů se STEMI jich 34,8 % mělo hypertenzi; tato diagnóza byla statisticky významně častější u žen než u mužů (65,6 %, vs. 26,5 %; $p < 0,05$). Diabetes byl přítomen u 31,7 % celého vzorku; přítom byl častější u žen než u mužů (50,6 % vs. 26,5 %; $p < 0,05$). Ze 413 pacientů se STEMI jich 63,9 % mělo dyslipidemií; tato diagnóza byla stanovena statisticky významně častěji u mužů než u žen (76,5 % vs. 13,5 %; $p < 0,05$); kuřáků mezi muži bylo 64,5 %. Z 324 pacientů se STEMI byly ve 46,5 % zjištěny tři rizikové faktory, zatímco z 89 pacientek se STEMI byly ve 34,8 % přítomny čtyři rizikové faktory.

Závěr: Naše výsledky prokázaly vyšší prevalenci AKS v hodnoceném vzorku. U pacientů se STEMI bylo nalezeno několik rizikových faktorů kardiovaskulárních onemocnění. Byly pozorovány i rozdíly mezi pohlavími v projevech AKS a výskytu rizikových faktorů.

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ABSTRACT

Background and aims: The aim of this study is to determine the role of clinical, lifestyle, and behavioral characteristics on the severity of the disease according to the gender.

Methods: We conducted a cross-sectional descriptive study.

Results: An initial sample of 1219 patients was admitted for ACS in the cardiology service of Oran-University-Hospital-Center. The electrocardiographic results revealed that 34% of the patients had ST-segment elevation myocardial infarction (STEMI) while 66% had non-ST-segment elevation myocardial infarction (NSTEMI). In STEMI patients, the mean age was 60.87 ± 12.20 years. STEMI patients sample included 413 patients with 324 men with a mean age of 59.92 ± 11.78 years and 89 women with a mean age of 64.36 ± 13.13 years. A male predominance observed with a sex-ratio of 3.6. Among STEMI patients, 34.8% of patients had hypertension where it was significantly higher in women than in men (65.6% vs 26.5% respectively, $p < 0.05$). Diabetes was observed in 31.7% of the whole sample where it was also more common in women compared to men (50.6% vs 26.5%, respectively, $p < 0.05$). Out of the 413 STEMI patients 63.9% had dyslipidemia which was significantly higher in men compared to women (76.5% vs 13.5% respectively, $p < 0.05$), 64.5% of men were current smokers. Out of the 324 STEMI men patients, 46.5% had three risk factors while in the 89 STEMI women patients, 34.8% had four risk factors.

Conclusion: Our results demonstrated a higher prevalence of ACS among the studied sample. STEMI patients presented with several cardiovascular risk factors. Sex differences in the ACS presentation and risk factors was also noticed.

Keywords:

Acute coronary syndrome

Algerian population

Descriptive study

ST elevation myocardial infarction

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Background

Cardiovascular diseases represent a major global health problem, causing one third of the deaths worldwide.¹ Ischemic heart disease is the most common form of cardiovascular diseases. Despite major advances in the management of ischemic heart disease (IHD), it remains the most important cause of premature death in the world.¹ According to the World Health Organization (WHO), IHD accounted for >9 million deaths² and one million deaths were attributable to cardiovascular disease (CVD) in sub-Saharan Africa alone.³ As well as in Algeria that is facing an epidemiological transition, characterized by the regression of communicable diseases and the increase in non-communicable diseases where coronary heart disease was responsible for 29.46% of the total deaths.⁴ Ischemic heart disease also known as coronary artery disease (CAD) and atherosclerotic cardiovascular disease (ACD) manifests clinically as myocardial infarction and ischemic cardiomyopathy. IHD comprises stable angina and acute coronary syndrome (ACS) which includes unstable angina (UA) and evolving myocardial infarction (MI) which is usually divided into ST-segment elevation myocardial infarction (STEMI) or new onset left bundlebranch block (LBBB), and ACS without ST-segment elevation (NSTEMI).⁵

Many risk factors have been associated with the onset of ACS where 70% of at-risk individuals have multiple risk factors and only 2–7% of the general population have no risk factors.⁴ Advanced age, gender, and a family history of ischemic heart disease have been identified as non-modifiable risk factors whereas dyslipidemia, obesity, diabetes mellitus (DM), hypertension (HT), smoking, and a sedentary lifestyle were characterized as modifiable risk factors. All these risk factors have been perfectly outlined by the Framingham Heart Study,⁶ which will contribute to a better understanding and management of this pathology.⁶

Many worldwide observational studies have been published on the epidemiology, risk factors and the outcome of ACS, providing then valuable information that can't be obtained by clinical trials, however, few studies have investigated on the prevalence of ACS and its risk factors in the African continent even less in the Algerian population. Thus, the objective of this study is to determine the epidemiology and risk factors of acute coronary syndrome in Algerian patients of the Oran city.

Methods

Population of the study

We conducted a cross sectional descriptive study over a period of one year from January 1st, 2021 to December 31st, 2021. The study covered all the files of patients hospitalized for ACS at the Cardiology service of the University Hospital Center of Oran, the oldest and grand hospital of the city. During this period, 1219 patients were admitted for ACS in the service of Cardiology. We included all patients of both sexes and of all ages, hospitalized for acute coronary syndrome (ACS) in the study. We excluded all incomplete records or patients who presented with traumatic or non-ischemic chest pain from this study. Data is collected using pre-established forms. All patients had undergone an electrocardiogram (ECG), a cardiac ul-

trasound and a biological assessment (blood count, creatinine, glycemia, troponin, cholesterol, triglyceride, prothrombin level, activated partial thromboplastin time).

Diagnosis of ACS

The diagnosis of ACS was done according to the American College of Cardiology / American Heart Association (ACC/AHA) definitions.^{7–9} We classified ACS patients according to the electrocardiographic results as having ST-segment elevations in the case of the presence of clinical symptoms of myocardial infarction lasting ≥ 30 min with ECG changes of either ST elevation of at least 0.1 mV in two contiguous precordial leads or two limb leads, or the presence of a new LBBB. While patients with non-ST segment elevations were diagnosed as having elevated troponin I levels as an indicator of myocardial necrosis besides some features of unstable angina as angina usually lasts for ≥ 20 min, onset within one month or angina occurs within a crescendo pattern, in addition to ST segment depression ≥ 0.5 mm or T inversion ≥ 0.3 mV in any two leads. Moreover, troponin I levels and the MB fraction of total creatinine phosphokinase (CPK) were measured in order to confirm myocardial cell death. We excluded all incomplete records or patients who presented with traumatic or non-ischemic chest pain from this study.

Risk factors assessment

We used a standardized questionnaire to record data as socio-demographic characteristics. Risk factors of each patient were identified. The identification of dyslipidemia was based on whether patient uses lipid lowering drugs or biochemically indicated by total cholesterol >240 mg/dl, triglycerides >150 mg/dl, low density lipoproteins (LDL) >130 mg/dl and high-density lipoproteins (HDL) <50 mg/dl, <40 mg/dl for females and males, respectively. Diabetes mellitus was defined as either the patient is under medication or presenting clinical symptoms and having plasma glucose concentration ≥ 200 mg/dl (11.1 mmol/l) or fasting blood sugar ≥ 126 mg/dl (7.0 mmol/l). Hypertension was also defined as having systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg and/or being on antihypertensive treatment. Moreover, other risk factors like smoking and hormonal status for women were assessed.

Statistical analysis

The socio-epidemiological, clinical parameters were recorded and analyzed using SPSS software (Statistical Package for the Social Sciences, Chicago, IL) Version 26. The parameters analyzed were age, sex, medical history, cardiovascular risk factors. Continuous variables are expressed as mean \pm standard deviation (SD). Categorical data are summarized using counts and percentages. Baseline characteristics were compared separately between men and women using X-squared and independent samples t tests as appropriate. The significance threshold was $p < 0.05\%$.

Results

The patient flow chart is shown in Figure 1. During the period of study, 1219 patients were admitted for ACS

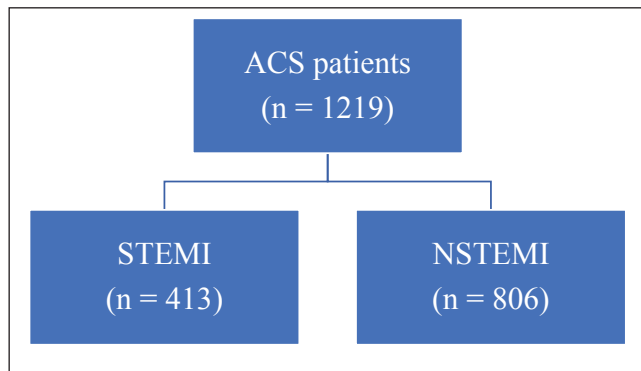


Fig. 1 – Study flowchart. ACS – acute coronary syndrome; NSTEMI – non-ST-segment elevation myocardial infarction; STEMI – ST-segment elevation myocardial infarction.

Table 1 – Age-sex distribution of the patients

Age (years)	Men N = 324 N (%)	Women N = 89 N (%)
<40	10 (3.1%)	3 (3.4%)
40–49	51 (15.7%)	7 (7.9%)
50–59	100 (30.9%)	25 (28.1%)
60–69	99 (30.6%)	21 (23.6%)
70–79	38 (11.7%)	18 (20.2%)
>80	26 (8%)	15 (16.9%)

in the cardiology service of University-Hospital-Center, the main hospital of the city and in the West region of Algeria. According to the electrocardiographic results, 34% of the patients had ST-segment elevation (STEMI) while 66% had NSTEMI. However, in the present study, we were interested only in the patients with ST-segment elevation (STEMI). We noticed that patients with STEMI were more commonly men with a sex-ratio of 3.6. The mean age of the studied sample was 60.87 ± 12.20 . This included 324 men with a mean age of 59.92 ± 11.78 and 89 women with a mean age of 64.36 ± 13.13 . Table 1 illustrates the age-sex distribution of the patients. We noticed that the most represented age-categories in this sample of males were age groups between 50–59 years followed by 60–69 years while we noticed a higher incidence of ACS in women before 65 years (Table 1).

Table 2 illustrates various baseline clinical characteristics of the patients. In the studied sample of STEMI patients, we noticed that 34.8% of patients had hypertension where it was significantly higher in women than in men (65.6% vs 26.5%, respectively, $p < 0.05$).

Additionally, diabetes was observed in 31.7% of the whole sample where it was also more common in women compared to men (50.6% vs 26.5%, respectively, $p < 0.05$). Out of the 413 patients 63.9% had dyslipidemia which was significantly higher in men compared to women (76.5% vs 13.5% respectively, $p < 0.05$). Among the 413 sample, 64.5% of men were current smokers while no smoking status was noticed in women. In this study, we have also

Table 2 – Comparison of the baseline characteristics and risk factors in men and women

Variable	All N = 413	Men N = 324	Women N = 89	P-value
Age, m, (years) \pm SD	60.87 ± 12.20	59.92 ± 11.78	64.36 ± 13.13	0.002*
Sex (m/f)	324/89	324 (78.5%)	89 (21.5%)	0.000*
Cardiovascular risk factors n (%)				
Hypertension	144 (34.8%)	86 (26.5%)	58 (65.2%)	0.000*
Diabetes mellitus	131 (31.7%)	86 (26.5%)	45 (50.6%)	0.000*
Dyslipidemia	264 (63.9%)	248 (76.5%)	12 (13.5%)	0.000*
Current smoker	209 (50.6%)	209 (64.5%)		

Values are expressed as the mean \pm SD or n (%).

* $p < 0.05$

Table 3 – Number of risk factors among men and women

Age (years)	Men N = 324 N (%)	Women N = 89 N (%)
Absence of RF	4 (1.2%)	1 (1.1%)
One RF	34 (10.5%)	7 (7.9%)
Two RF	70 (21.6%)	10 (11.2%)
Three RF	151 (46.6%)	23 (25.8%)
Four RF	58 (17.9%)	31 (34.8%)
>4 RF	7 (2.21%)	17 (19.1%)

RF – risk factor.

checked the hormonal status of female group where almost 70 female patients were in menopause (78.5%).

Table 3 illustrates the number of risk factors among men and women. Out of the 324 male patients, 46.5% had three risk factors while in the 89 female patients, 34.8% had four risk factors.

Discussion

Coronary artery disease is becoming more frequent due to the increasing trends of diabetes, smoking, sedentary lifestyle besides other risk factors. This brief report aimed to determine the epidemiology and risk factors of acute coronary syndrome in Algerian patients of the Oran city. This study was conducted in the most important Univer-

sity-Hospital of the west of Algeria. During the period of the study, which has been carried out from the 1st January 2021 until 31th December 2021, we noticed a high prevalence of ACS compared to the other cardiovascular diseases where 1219 patients with ACS were admitted in the service of cardiology during this period. Among this sample, the prevalence of patients with NSTEMI was higher than those with STEMI (66% vs 34%). These findings are in accordance with the results of the ACCESS group investigators where 11,731 patients were involved reporting 46% ACS in developing countries to be STEMI and 54% to be NSTEMI/UA.¹⁰ The same high proportion of NSTEMI patients was also reported in Western ACS populations like the Global Registry of Acute Coronary Events (GRACE) where 66% of the ACS population was diagnosed as NSTEMI/UA.¹¹ However, other studies showed higher proportion of STEMI patients compared to NSTEMI ones. Indeed, it has been reported in Arabian populations especially in Yemeni patients, where 1761 ACS patients were enrolled, that 69.8% ACS patients were diagnosed as NSTEMI and 30.2% as STEMI.¹² In the present study, we were only interested in the analysis of the characteristics of patients with STEMI. The mean age of this category in our study was relatively similar to that found in the Maghreb ACCESS study¹³ and it is a decade younger than the presentation age in developed countries.¹⁴ Furthermore we noticed a male predominance in STEMI patients compared to women patients (78.5% vs 21.5%). Many worldwide studies have reported the same findings.^{12,13,15,16} We also noticed that the mean age for STEMI in women is significantly higher than in men ($p < 0.05$) which was also confirmed with age categories.

In fact, it was demonstrated that the onset of cardiovascular disease in women occurs later than in men¹⁷ which is due to the role of estrogens that regulate lipids, inflammatory markers, the coagulant system, promoting a direct vasodilator effect via the α and β receptors in the vessel walls then. Moreover, in our study, we observed a higher proportion of classical risk factors of cardiovascular disease such as dyslipidemia where it was diagnosed in 64% of the STEMI patients and it was significantly different between men and women (76.5% vs 13.5%; $p < 0.05$). Additionally, the percentage of current smokers was very high in men where almost 50.6% male STEMI patients are smokers. However, we didn't find a smoking woman in our sample. The absence of smoking status in this sample of women may protect them at least from one risk factor of CVD. Indeed, it was reported that women had a 25% increased risk for CAD conferred by cigarette smoking compared with men.¹⁸ This high rate was also reported in many studies in STEMI male patients such as the Maghreb ACCESS study (51%),¹³ CREATE study¹⁹ (40%) and in Yemeni ACS patients (53%)¹² besides the 37% in the Gulf RACE study.²⁰ However, the rate of tobacco smokers was lower than in our study (28% in the GRACE study). These discrepancies are explained by insufficient public awareness of the negative impact of smoking on cardiovascular disease besides the social and economic level of this category of patients.

The present report showed also a higher rate of STEMI patients with diabetes mellitus (DM) and hypertension (HTN), involving 31.7% of patients with DM and 34.8% of

patients with HTN. We have noticed that there is a significant difference between STEMI male patients with HTN compared to STEMI women with HTN (65.5% vs 26.5%; $p < 0.05$). It is well known that hypertension (HTN) is an important cardiovascular risk factor leading to atherogenesis and to the development of vulnerable plaques which instability or rupture results in thrombosis and vessel occlusions. This sex difference is explained by the hormonal status of this female sample where almost 70% are in menopause. In fact, premenopausal women are protected with endogenous estrogens which maintain vasodilation and contribute to blood pressure control. It was reported that women develop hypertension about a decade after men, becoming more prevalent in elderly women than elderly men.²¹ Moreover, the rate of DM in female STEMI patients was significantly higher compared to male STEMI patients with DM (50.6% vs 26.5%, $p < 0.05$). Many studies have suggested the sex differences in presentation of ACS.

In fact, several studies suggest that diabetes is a stronger risk factor of CHD for women than men²² which is confirmed by our findings. Nevertheless, some studies showed that ACS-related mortality was similar between men and women in a Chinese cohort of patients with T2DM.²³

In addition, Cabrerizo-Garcia et al.²⁴ reported that ACS-related mortality could be worse in women than in men due to their unfavorable baseline characteristics rather than due to sex difference.

In our study, we have also reported the number of CVD risk factors among male and female. We have found that almost two thirds of the population have more than three risk factors. The accumulation of multiple CVD risk factors in the same individual is considered as a serious issue. These findings are confirmed in many studies. Indeed, The INTERHEART study has described many risk factors (including eight risk factors: dyslipidemia, smoking, hypertension, DM, abdominal obesity, psychosocial factors, lack of consumption of fruits, vegetables and of regular physical activity) and showed their association with myocardial infarction ($p < 0.0001$).¹⁶ Similarly, Yang et al.²⁵ reported in their study, where they enrolled a Chinese sample of 46 239 adults, that patients with 1, 2, 3 or ≥ 4 risk factors had an odds ratio of 2.36, 4.24, 4.88, and 7.22 for CVD, respectively.

Conclusion

This important descriptive study has described the main characteristics of ACS in male and female patients who were admitted at the service of cardiology of the most important University-Hospital of the West of Algeria in the Oran city. We noticed a high prevalence of ACS during the period of the study. The enrolled patients were characterized by the presence of several cardiovascular risk factors like smoking and dyslipidemia. Our results demonstrate the need to settle cardiovascular prevention strategies. Further large-scale studies are required to evaluate the role of the studied clinical characteristics on the severity and prognosis of the ACS patients. To improve clinical strategies for prevention and treatment, it will be

interesting to analyze the role of dietary, physical activity, psychological factors management, smoking abstinence besides the evaluation of the genetic predisposition to ACS.

Conflict of interest

None declared.

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