

Cardiovascular Topics

The pattern of risk-factor profile in Egyptian patients with acute coronary syndrome: phase II of the Egyptian cross-sectional CardioRisk project

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Abstract

Background: Egypt is the most populous country in the Middle East and North Africa and has more than 15% of the cardiovascular deaths in the region, but little is known about the prevalence of traditional risk factors and treatment strategies in acute coronary syndrome (ACS) patients across Egypt.

Methods: From November 2015 to August 2017, data were collected from 1 681 patients with ACS in 30 coronary care

centres, covering 11 governorates across Egypt, spanning the Mediterranean coast, Nile Delta and Upper Egypt, with a focus on risk factors and management strategies.

Results: Women constituted 25% of the patients. Premature ACS was common, with 43% of men aged less than 55 years, and 67% of women under 65 years. Most men had ST-elevation myocardial infarction (STEMI) (49%), while a larger percentage of women had unstable angina and non-ST-elevation myocardial infarction (NSTEMI) (32% each; $p < 0.001$).

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Central obesity was present in 80% of men and 89% of women, with 32% of men and women having atherogenic dyslipidaemia. Current smoking was reported by 62% of men and by 72% of men under 55 years. A larger proportion of women had type 2 diabetes (53 vs 34% of men), hypertension (69 vs 49%), dyslipidaemia, and obesity (71 vs 41%) ($p < 0.001$ for all). There were no gender differences in most diagnostic and therapeutic procedures, but among STEMI patients, 51% of men underwent primary percutaneous coronary intervention compared to 46% of women ($p = 0.064$).

Conclusions: Central obesity and smoking are extremely prevalent in Egypt, contributing to an increased burden of premature ACS, which warrants tailored prevention strategies. The recognised tendency worldwide to treat men more aggressively was less pronounced than expected.

Keywords: Egypt, acute coronary syndrome, risk factors

Submitted 22/6/18, accepted 10/12/18

Cardiovasc J Afr 2019; 30: online publication

www.cvja.co.za

DOI: 10.5830/CVJA-2018-074

Ischaemic heart disease is the leading cause of years of life lost worldwide.¹ Despite advances in treatment, between 1990 and 2016, the global number of deaths from cardiovascular diseases (CVD) for people aged more than 70 years increased by 54%.¹ While the CVD mortality rate has receded in high-income countries between 2000 and 2012, low- and middle-income countries have witnessed an increase.² Attempts at lowering incident CVD require population-based preventative guidelines that address the specific risk factors for each age and gender group. Prevention is even more vital in lower-income countries considering the high treatment cost of CVD, plus infections and malnutrition, using limited health resources. Egypt is a classic example, with overpopulation and a low per capita health expenditure.³

A gender-specific pattern of risk factors has emerged worldwide, with female patients presenting with acute coronary syndrome (ACS) having higher rates of diabetes mellitus, hypertension and obesity, compared to men.⁴ Furthermore, universally there is a tendency for women to receive less-intensive pharmacological and invasive treatment following ACS.⁴ The Middle East and North African (MENA) region is no exception, with the Gulf countries overall reporting less-aggressive treatment strategies in females, accounting for higher complication and mortality rates in women.⁵

Egypt is the most populous of the 20 MENA countries, harbouring about 20% of the total MENA population of about 409 million.⁶ It is unknown whether Egypt follows a similar pattern of ACS risk factors and treatment strategies to that observed in the MENA region and worldwide.

The past decades in Egypt have seen a transition from prevalent undernutrition to obesity.⁷ Over two-thirds of adults and one-third of children are overweight or obese, surpassing the average for Europe.⁸ Three traditional CVD risk factors, namely obesity, diabetes and hypertension, were the leading risk factors for early death and disability in Egypt, as measured by attributable disability-adjusted life years.⁹ One in six individuals

has diabetes.⁸ These factors are expected to be a major contributor to ACS risk in Egypt but have not previously been quantified in ACS patients across Egypt.

The CardioRisk project is a nationwide, cross-sectional study of existing risk factors and management strategies for ACS in Egypt. The present study is the first report of data collected in the CardioRisk project, from November 2015 to August 2017. The primary objective was to describe the risk-factor profile among Egyptian patients with ACS and the different treatment strategies adopted in intensive care units dealing with ACS patients across Egypt. A secondary aim was to explore gender differences with regard to ACS risk factors and treatments, to enable informed design of national treatment guidelines and gender-specific prevention protocols.

Methods

CardioRisk is a multi-centre, observational, cross-sectional study of risk factors and management of patients presenting with ACS to coronary care units in Egypt. A total of 30 units participated from 11 governorates spanning the Mediterranean coast, Nile Delta region and southern Egypt. Participating coronary care units in each area included hospitals of different levels of complexity, in order to capture a network of centres representative of Egyptian reality.

Data were collected on patients presenting with ACS during their hospital stay, with a focus on CVD risk factors, diagnostic and management strategies, as well as in-hospital complications and in-hospital mortality. To minimise selection bias, patient enrolment was done consecutively on all weekdays for some centres, and on pre-determined days in others. Management of patients followed the existing diagnostic and therapeutic strategies currently followed in each centre. No recommendations for management were put forth during the study, and drug prescriptions and management strategies were completely left to the participating cardiologists' decision.

Detailed information was given to each patient prior to enrolment in the study, and data were included only after obtaining signed informed consent. The study was approved by the ethics committee of the Egyptian Association of Vascular Biology and Atherosclerosis (EAVA) [<http://cardio-risk.org/>].

This study is an analysis of data collected during phase I (November 2015 to January 2016) and phase II (February 2016 to August 2017) of the CardioRisk project. A total of 1 681 patients were included.

A 12-lead ECG was performed in all patients by a cardiologist participating in the study. Based on electrocardiogram (ECG) findings, patients were classified as having ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), unstable angina or other electrocardiographic abnormalities. Plasma concentrations of troponins and the MB fraction of total creatinine phosphokinase (CPK) were measured to detect evidence of myocardial cell death.

Acute myocardial infarction (STEMI or NSTEMI) was defined by at least two of the following features: (1) electrocardiographic changes (patients with or without ST-segment elevations), (2) compatible clinical symptoms, and (3) troponin I > 0.4 ng/ml and/or MB fraction of CPK > 8.8 ng/ml. Patients were enrolled in the study if they were 18 years or older and diagnosed with STEMI, NSTEMI or unstable angina.

Data were collected using a web-based system case-report form (available on www.cardio-risk.org), with a pre-determined username and password for each participating investigator. The following information was captured for each enrolled patient: socio-demographics, CVD risk factors, history of co-morbidities and prior drug use, presenting symptoms, laboratory data, ECG findings, diagnostic and therapeutic procedures, in-hospital complications and in-hospital mortality.

Dyslipidaemia was defined as having a history of lipid-lowering therapy or low-density lipoprotein (LDL) cholesterol > 70 mg/dl (> 1.81 mmol/l).¹⁰ Atherogenic dyslipidaemia was defined as having elevated serum triglycerides (≥ 150 mg/dl; 1.7 mmol/l) combined with low high-density lipoprotein (HDL) cholesterol (< 40 mg/dl; < 1.04 mmol/l).¹¹ Isolated atherogenic dyslipidaemia was defined as having atherogenic dyslipidaemia without standard dyslipidaemia. Hypertension was defined as having a history of hypertension or systolic/diastolic blood pressure $\geq 140/90$ mmHg. Diabetes (type 1 or 2) were defined as a history of diabetes or fasting plasma glucose > 126 mg/dl (> 6.99 mmol/l).

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. Body mass index (BMI) was calculated as weight (kg)/height squared (m²). Patients were considered overweight or obese if they had a BMI of 25–29.9 or ≥ 30 kg/m², respectively. Waist circumference was measured with a non-stretchable measuring tape at the level of the umbilicus. Central obesity was defined as a waist-to-height ratio ≥ 0.5 .¹²

Blood samples were collected and analysed in the accredited controlled laboratory units of the participating centres. Routine assays were used for analysis of glycated haemoglobin (HbA_{1c}) and serum glucose and lipid levels.

Statistical analysis

Continuous data are reported as median (5th, 95th percentile); categorical data are reported as percentages. The Mann–Whitney *U*-test was used for comparison of continuous variables, whereas the Pearson χ^2 test was used for categorical variables. All analyses were two-tailed, and *p*-values < 0.05 were considered significant. Analysis was done using PASW statistics for Mac (23.0; SPSS Inc, Chicago, IL, USA). GraphPad Prism for Mac was used for the generation of figures.

Results

The study population comprised 1 681 subjects, of whom 425 (25%) were women (Table 1). The median age was 56 years in men and 61 years in women (*p* < 0.001). Premature ACS was highly prevalent, in 46% of men aged less than 55 years and in 67% of women aged < 65 years. Education status was higher in men, with only 7 and 17% reporting no education and having completed primary school only, respectively, compared to 26 and 25% of women (*p* < 0.001).

A larger proportion of men presented with STEMI (49%), while other presentations (unstable angina and NSTEMI) were more frequent in women (32% each; *p* < 0.001; Table 1). An atypical presentation with absence of chest pain was more frequent in women (7 vs 4% of men; *p* = 0.003), and dyspnoea as a presenting symptom was more prevalent in women (58 vs 48% in men, *p* < 0.001). Approximately one-fifth of subjects had had a prior attack or myocardial infarction.

Median BMI was well into the overweight range in men and was in the obese range in women (Table 2). Women overall had

Table 1. Socio-demographics and clinical characteristics at presentation

Variables	Men (n = 1 256)	Women (n = 425)	p-value
Age, years	56 (37–73)	61 (44–80)	< 0.001
Age group (%)			
< 55 years	46	28	< 0.001
55–64 years	36	39	
≥ 65 years	18	33	
Education (%)			
None	7	26	< 0.001
Primary school	17	25	
Secondary school	30	27	
University/college	48	22	
Married (%)	92	73	< 0.001
Previous AMI (%)	21	17	NS
History of stable angina (%)	26	30	NS
Presenting symptoms (%)			
Chest pain	96	93	0.003
Dyspnoea	48	58	< 0.001
Palpitations	86	84	NS
Cardiac arrest	4	3	NS
Initial diagnosis (%)			
Unstable angina	22	32	< 0.001
NSTEMI	29	32	
STEMI	49	36	
Location, if STEMI (%)			
Anterior	60	55	NS
Lateral	6	4	
Inferior	34	41	

Data are presented as median (5th, 95th percentile), or % within genders for all ACS patients, unless otherwise indicated. AMI, acute myocardial infarction. *p*-values are from Mann–Whitney *U*-test for continuous variables or Pearson χ^2 test for categorical variables. NS, *p* ≥ 0.1 .

Table 2. Anthropometric measures and serum biochemical parameters in the study population

Variables	Total population (n = 1 681)	Men (n = 1 256)	Women (n = 425)	p-value
BMI, kg/m ²	29.8 (23.7–40.3)	29.0 (23.7–38.3)	32.9 (24.0–44.1)	< 0.001
Waist, cm	98 (72–120)	98 (73–118)	98 (72–128)	NS
Waist/height ratio	0.57 (0.43–0.72)	0.56 (0.42–0.68)	0.59 (0.44–0.80)	< 0.001
Serum biochemistry				
Triglycerides, mg/dl	160 (49–320)	155 (49–320)	170 (48–320)	0.02
(mmol/l)	1.81 (0.55–3.62)	1.75 (0.55–3.62)	1.92 (0.54–3.62)	
LDL cholesterol, mg/dl	130 (66–199)	127 (69–198)	136 (65–210)	0.03
(mmol/l)	3.37 (1.71–5.15)	3.29 (1.79–5.13)	3.52 (1.68–5.44)	
HDL cholesterol, mg/dl	40 (22–80)	40 (22–76)	41 (22–97)	0.044
(mmol/l)	1.04 (0.57–2.07)	1.04 (0.57–1.97)	1.06 (0.57–2.51)	
Total cholesterol, mg/dl	198 (131–290)	197 (130–285)	200 (137–297)	0.023
(mmol/l)	5.13 (3.39–7.51)	5.10 (3.37–7.38)	5.18 (3.55–7.69)	
HbA _{1c} , %	6.0 (4.8–10.0)	6.0 (4.8–9.7)	7.0 (4.8–10.5)	< 0.001

Data are presented as median (5th, 95th percentile) and groups are compared with Mann–Whitney *U*-test. NS, *p* ≥ 0.1 . BMI, body mass index; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

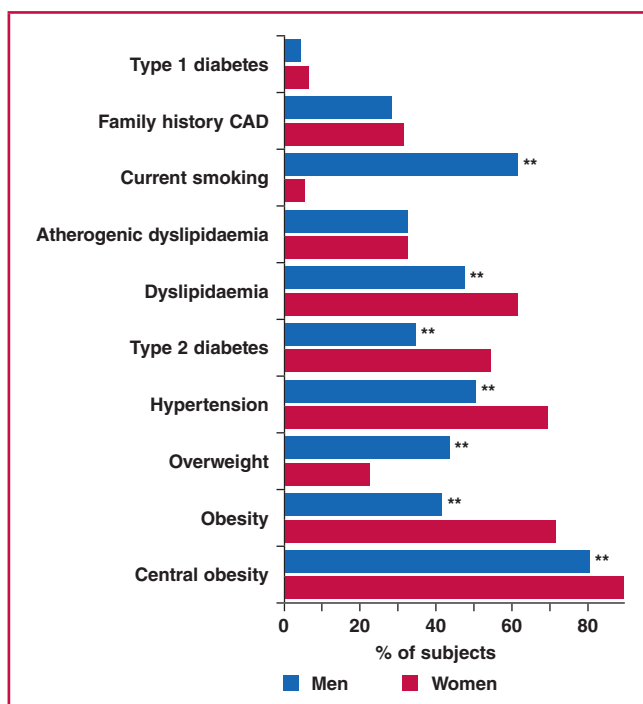


Fig. 1. Gender-specific prevalence of traditional cardiovascular risk factors. Data are presented as percentages of each gender having the specified risk factor. $n = 1\,256$ men and 425 women. Central obesity was defined as waist/height ratio ≥ 0.5 . For other definitions see Methods section. CAD, coronary artery disease. $**p < 0.001$ vs women.

a worse plasma lipid profile compared to men (Table 2). Central obesity (defined as a waist/height ratio ≥ 0.5) was extremely prevalent in both men (80%) and women (89%) (Fig. 1). Men were more frequently current smokers (62 vs 5% of women) and overweight (46 vs 22% of women) ($p < 0.001$ for both). Among men with premature ACS (< 55 years), 72 and 12% reported current smoking and ex-smoking, respectively (Table 3).

Women had a higher frequency of most other traditional risk factors, including type 2 diabetes (53 vs 34% of men),

Table 3. Prevalence of risk factors by age and gender

Variables	Age group					
	< 55 years		55–64 years		≥ 65 years	
	Men (n = 583)	Women (n = 122)	Men (n = 453)	Women (n = 161)	Men (n = 220)	Women (n = 142)
Current smoking, %	72	5	56	6	50	4
Ex-smoking, %	12	1	21	3	21	1
Type 2 diabetes, %	28	45	40	62	39	50
Hypertension, %	40	54	57	70	61	80
Dyslipidaemia, %	42	60	48	64	49	55
Isolated atherogenic dyslipidaemia, %	22	19	19	17	18	18
Overweight, %	46	28	44	16	50	23
Obesity, %	40	69	47	79	30	62
Central obesity, %	76	92	84	91	84	85
Family history CAD, %	29	32	26	30	24	28

Data are presented as % within age and gender groups. Central obesity was defined as waist/height ratio ≥ 0.5 . For other definitions, see Methods section. CAD, coronary artery disease. The three most frequently occurring risk factors within each subgroup are in bold.

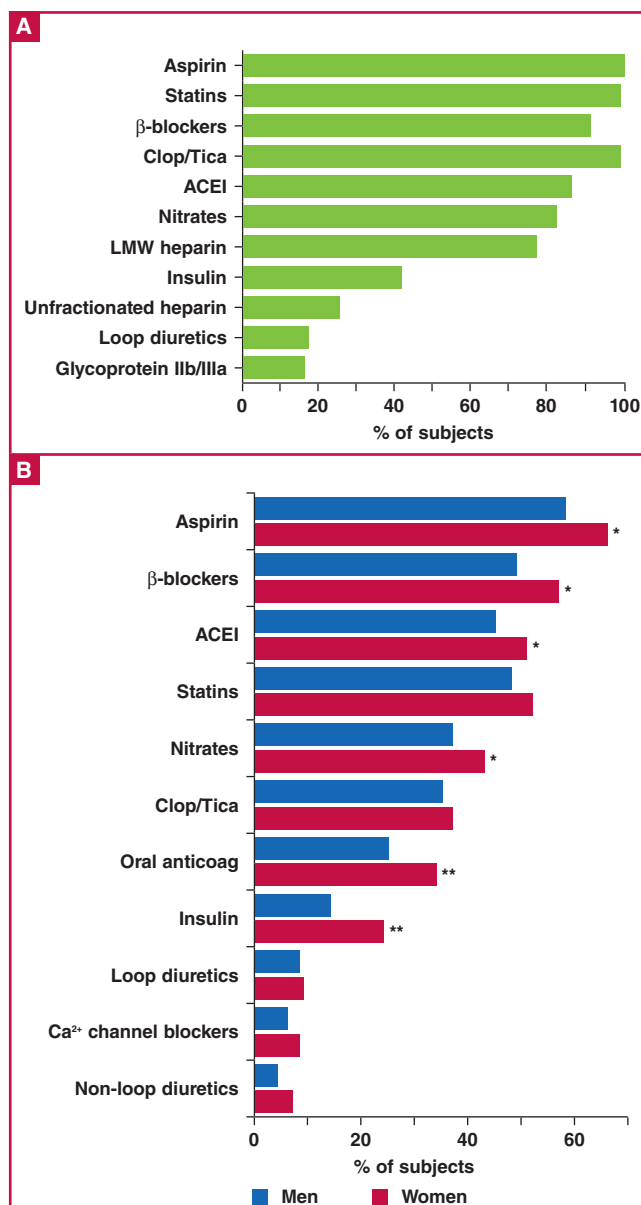


Fig. 2. A. Commonly prescribed in-hospital medications in the total population (men and women combined). No significant gender difference was observed for any of the drugs. B. Gender differences in history of chronic drug use prior to admission. $n = 1\,256$ men and 425 women. $*p < 0.05$; $**p < 0.001$ by Pearson's χ^2 test. ACEI, angiotensin converting enzyme inhibitors; CLOP/TICA, clopidogrel or ticagrelor; LMW, low-molecular-weight.

hypertension (69 vs 49%), dyslipidaemia (60 vs 45%), and obesity (71 vs 41%; $p < 0.001$ for all) (Fig. 1), but atherogenic dyslipidaemia was equally prevalent in men and women (32%). The higher prevalence of diabetes in women was not solely explained by their older age, since it was also observed when the population was stratified by age (Table 3). Women were also more likely to report chronic use of several drugs prior to admission, including aspirin (66 vs 58% in men) ($p < 0.001$), β -blockers, angiotensin converting enzyme inhibitors (ACEI), nitrates and oral anticoagulants (Fig. 2).

Table 4. Non-invasive diagnostic procedures and echocardiography findings in the total population

Procedures	Percentage
Stress ECG	22
Echocardiography	96
Echocardiography findings	
Normal (LVEF > 50%)	48
Mild impairment (LVEF 41–50%)	33
Moderate impairment (LVEF 31–40%)	14
Severe impairment (LVEF < 31%)	5
Radionuclide imaging	4
No significant gender difference was observed for any of the procedures or outcomes ($p \geq 0.36$). LVEF, left ventricular ejection fraction. $n = 1\,256$ men and 425 women.	

The commonly prescribed medications during hospitalisation are shown in Fig. 2, pooled for men and women, since the frequencies were similar for both. More than 90% of patients admitted with ACS received aspirin, clopidogrel/ticagrelor statins, and beta-blockers. Nitrates, low-molecular-weight heparin and ACEI were administered in more than 75% of patients. Unfractionated heparin, fondaparinux, glycoprotein IIb/IIIa inhibitors, oral anticoagulants and calcium channel blockers were given to a smaller proportion of patients on an individual basis according to the protocol of each medical centre.

The frequency of non-invasive diagnostic procedures is shown in Table 4, pooled for men and women, since there was no gender difference for any of the procedures ($p > 0.18$ for all). Among all ACS patients, 96% had an echocardiography performed, revealing a normal left ventricular ejection fraction (LVEF) in nearly half the patients. On the other hand, 22 and 4% of patients, respectively, underwent subsequent stress ECG and radionuclide imaging.

Table 5 shows the difference between males and females in revascularisation-related interventions. Diagnostic coronary angiography was performed in a similar proportion of men and women (62 and 59%, respectively). However, radial access was more likely to be used in men (12 in men vs 6% in women) ($p < 0.001$). There was also a trend for lower rates of percutaneous coronary intervention (PCI) in women compared to men. Among all ACS patients, PCI was attempted in 54% of men vs 43% of women ($p < 0.001$). Patients diagnosed with STEMI were either treated with PCI or thrombolytic therapy, with a small proportion undergoing neither treatment (Table 5).

Primary PCI was conducted in 51% of men compared to 46% of women with STEMI ($p = 0.064$), while 43 and 44% of male and female STEMI patients, respectively, underwent thrombolytic therapy (in the form of streptokinase). Among all ACS patients, 5% were referred for cardiac coronary artery bypass graft (CABG) surgery, again with no gender disparity. Cardiac surgery was performed in a larger proportion of women (1.7%) than men (0.6%; $p = 0.03$).

Overall, men and women had similar rates of most in-hospital complications recorded, including re-infarction (4% of all ACS patients), atrial fibrillation (5%), ventricular tachycardia or fibrillation (5.5%), cerebrovascular stroke (1%), major bleeding (0.5%) and acute renal failure (2.5%) ($p > 0.34$ for all). However, more women experienced second- or third-degree atrioventricular block (3.1 vs 1.5% in men) ($p = 0.042$), and mechanical complications (3.6 vs 1.8% of men) ($p = 0.024$).

Table 5. Thrombolytic therapy and other interventions in men and women

Interventions	Men (n = 1256)	Women (n = 425)	p-value
Coronary angiogram	62	59	NS
Radial access	12	6	0.001
Normal coronaries	2	7	< 0.001
PCI	54	43	0.001
Primary PCI (% of STEMI cases)	51	46	0.064
Thrombolytic therapy	22	17	0.021
Thrombolytic therapy (% of STEMI cases)	43	44	NS
CABG	6	4	NS
Cardiac surgery	0.6	1.7	0.033
Temporary pacemaker	1.3	2.4	NS
Permanent pacemaker	0.4	0.4	NS

Data are presented as % within gender for all acute coronary syndrome patients, unless otherwise indicated. p -values are from Pearson χ^2 test. NS, $p \geq 0.1$. PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft.

Discussion

The eastern Mediterranean region, comprising 22 countries, witnessed 1.3 million CVD deaths in 2015; 16% of these were in Egypt.¹³ This calls for tailored programmes to reduce the burden of risk factors in the country. A *Cochrane Systematic Review* showed that risk-factor interventions may lower blood pressure, BMI and waist circumference in low- and middle-income countries.¹⁴

However, strategies to improve the prevention and management of ACS in Egypt and other low- and middle-income countries are hampered not only by economic considerations but also by the paucity of data emerging from these countries. These countries have experienced an increase in CVD, and most of the CVD burden and mortality occurs there.^{15,16}

To our knowledge, this is the first study to assess the epidemiology of risk factors and treatment strategies for patients with ACS across Egypt. Two traditional risk factors had a strikingly high prevalence: smoking and obesity. Smoking and ex-smoking were reported by 48 and 13% of patients, respectively, exceeding the rate for Gulf countries, where 38% were current smokers.¹⁷ It also exceeded that reported for the 25 countries represented in the GRACE registry, where current and past smokers together accounted for 47% of ACS patients.¹⁸

Of all men presenting with ACS in this study, 46% had premature ACS by global standards (aged < 55 years); of these, 74% were current smokers and 12% ex-smokers. There was a strong gender disparity, where only 5% of women reported current smoking. Devising accessible health-awareness campaigns utilising local TV and social media to alter attitudes of young and middle-aged men towards smoking may substantially reduce the CVD burden in Egypt.

Egypt currently has the third highest prevalence of obesity in the MENA region, after Saudi Arabia and the United Arab Emirates.¹⁹ Even metabolically healthy obesity increases the risk for future CVD events by 49%,²⁰ and associated metabolic abnormalities confer additional risk.²⁰ Median BMI in the present study was 29 kg/m² in men and 33 kg/m² in women. Correspondingly, obesity was more prevalent in women (71%) than men (41%). A similar higher prevalence of obesity in women is uniformly observed in the general population across all countries in the Middle East.²¹

Dyslipidaemia was correspondingly more prevalent in women. However, atherogenic dyslipidaemia, which is linked to central

adiposity²² and independently predicts major cardiovascular events in coronary disease patients,²³ was present in approximately one-third of patients, with no gender difference.

Waist/height ratio, a marker of central adiposity, is superior to BMI in predicting metabolic perturbations and incident CVD and diabetes, with a ratio ≥ 0.5 predicting increased risk.²⁴⁻²⁶ In a survey of more than 2 000 adults in the Egyptian National Hypertension Survey Program, central obesity was present in 50% of subjects. In our study, 80 and 89% of men and women, respectively, had central obesity, defined by a waist/height ratio ≥ 0.5 . This is linked to an increasing burden of diabetes and related morbidity.

Egypt harbours 21% of all diabetes cases in MENA.²⁷ The most recent International Diabetes Federation report estimates diabetes prevalence in Egypt in adults aged 20 to 79 years at 15%, substantially exceeding the global estimate of 9%, as well as the overall estimate for MENA (11%).²⁷ The present study showed that 53% of women and 34% of men with ACS in Egypt had type 2 diabetes. The higher prevalence in women is unlikely to be solely explained by their older age, since the discrepancy persisted even within age sub-groups. A likely contributing factor is the substantially higher frequency of obesity in women. Overall, the present study highlights the extremely high prevalence of central obesity and related morbidity in ACS patients in Egypt.

In line with global rates, STEMI was more common in men, while NSTEMI and unstable angina were more frequent in women. An echocardiograph was conducted in most patients, while coronary angiography was done in only 61% of patients, with no significant gender difference. Radial access for coronary angiography was twice as frequent in men (12%) compared to women (6%). This paradoxically lower tendency to utilise radial access in women despite their recognised higher propensity to bleeding complications following femoral catheterisation,²⁸ reflects a universal trend.²⁹ The trend is likely explained by fear of technical difficulties related to the smaller radial artery calibre in women and its liability to undergo spasm. However, the rate of radial catheterisation in the present study remains low compared to other settings.

In a study of 19 countries in the ACCOAST trial, a radial approach was used in 43% of cases of coronary angiography.³⁰ This study demonstrated marked regional variations, with some countries, notably France and Hungary, using a radial approach for most cases, and others, particularly in Eastern Europe, resorting to radial access in under 1% of patients.³⁰

Over 90% of ACS patients received antiplatelet therapy and statins upon hospitalisation, and more than 80% received ACEIs. Among all ACS patients, PCI was attempted in a larger proportion (54% of men and 43% of women) compared to rates reported for the Gulf countries in 2013 (16 and 11%, respectively).⁵ The rates of PCI in Egypt are also higher than those in the GRACE ($n = 7\ 609$; 33 and 25%) and CANRACE registries ($n = 1\ 336$; 41 and 31%).³¹

The apparently higher rates and lower gender disparity in Egypt are possibly explained by a nine-year difference between the reports (2007–8 for GRACE and CANRACE, vs 2016–7 for the present study). Another factor is the higher proportion of STEMI in the present study compared to GRACE and CANRACE.³¹ In all ACS patients in the present study, thrombolytic therapy was administered to 22% of men and 17% of women. A greater gender disparity and an overall lower rate

of usage was reported in the Gulf RACE study (20% in men vs 7% in women).⁵

Clinical trials have established that once STEMI is diagnosed, men and women derive an equally greater benefit from immediate revascularisation via PCI relative to thrombolysis.^{32,33} However, in many regions of the world, women continue to be treated less aggressively than men.³¹ The present study shows a similar trend, although the difference did not reach statistical significance. Primary PCI was attempted in 51% of men and 46% of women diagnosed with STEMI. However, the rate of thrombolytic therapy in STEMI patients was similar in men and women.

Our data shows that 8% of men and 11% of women with STEMI received neither PCI nor thrombolytic therapy. We speculate that this may be related to delays in presentation and/or diagnosis beyond the guideline-recommended time window for revascularisation, although time elapsing from symptom onset to hospital admission was not recorded.

Financial obstacles are another possible contributor. Egypt government health expenditure per capita is about one-third lower than the average for the MENA region,³⁴ with the majority of the population resorting to out-of-pocket health expenditure.³⁵ A small proportion of patients were scheduled for CABG (5%), a rate comparable, however, to that recorded for Arabian Gulf countries.⁵

Conclusion

This is the first collective report on phases I and II of the CardioRisk project, investigating the risk factors and treatment strategies in ACS patients across Egypt. Central obesity emerged as a near-universal risk factor, together with hypertension and diabetes, in addition to smoking in younger men. There was widespread use of antiplatelet drugs, statins and ACEIs, as well as frequent use of coronary angiography and thrombolytic therapy, with no gender difference within STEMI cases. Primary PCI was performed in a relatively high proportion of STEMI patients, with a modest gender disparity (51% in men and 46% in women). This study may help provide a basis for age- and gender-specific national preventative guidelines and strategies to increase adherence to global management protocols.

We acknowledge the support of the Egyptian Association of Vascular Biology and Atherosclerosis (EAVA). The study was funded by a grant from AstraZenica Egypt. The sponsors of the study had no role in data collection, analysis, interpretation, writing of the report or the decision to submit it for publication.

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