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ORIGINAL ARTICLE

Epidemiological Variation of Acute Myocardial Infarction Relevant to In-Hospital Outcomes-Tertiary Center Experience-Saudi Arabia

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Abstract

Background: **Epidemiological related differences in patients presenting with ST-elevation myocardial infarction (STEMI) have not yet been fully characterized in the Middle East countries. The aim of this study was to assess gender, ethnic and racial variation in clinical profiles, presentation and treatment strategies with relation to the in-hospital outcomes.**

Method: **This is a retrospective, single center study reviewing the epidemiological details of STEMI patients who were admitted to our center during the period between October 2015 and August 2019.**

Result: **Out of 3079 patients presented with STEMI, 498 (16%) were women, 2170 (70%) were from Middle Eastern Countries and only 1200 (39%) were non- Arabic speakers. Women were older in age compared to men (60.04 ± 11.2 vs 55.35 ± 11.8; P < 0.001). They showed significantly higher rates of cardiovascular risk factors (P < 0.001 for diabetes mellitus (DM), hypertension (HTN) and obesity) and lower prevalence of smoking and old history of previous revascularization (P < 0.001 and 0.007, respectively). Middle Eastern Countries- STEMI patients were elderly, showed higher prevalence of DM, HTN, smoking and obesity compared to South Asian patients (p = 0.001, 0.057, <0.001, <0.001 respectively). Arabic speaking - STEMI patients showed more prevalence of DM, smoking and obesity compared to non-Arabic speaking patients (p < 0.001). Regarding STEMI localization, post myocardial infarction complications and in-hospital length of stay, there were no detected significant gender, ethnic or racial variation. Women showed higher rates of all in-hospital mortality compared to men (5% vs 3%; p = 0.027) however, no ethnic/racial mortality difference was recorded among STEMI patients. Being elderly, presence of multivessel coronary artery disease and left ventricular systolic dysfunction (LVEF < 30%) are the three independent predictors of mortality among our patients (p = 0.013, 0.048 and <0.0001 respectively).**

Conclusion: **Our study demonstrates that there are gender, ethnic/racial-related differences in the demographics and clustered cardiovascular risk factors. However, there were no significant detected variation between both genders and different ethnic groups regarding post MI complications, management provided, and hospital outcomes except for increased the mortality rates among women. Old age, presence of multi-vessel disease and severe left ventricular systolic dysfunction have the greatest effect on in-hospital mortality among STEMI patients.**

Keywords: Epidemiology, STEM, Clinical profile, In-hospital outcome

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1. Introduction

The United States have often documented that there were variation in demographic characteristics, clinical presentation, treatment strategies selection and outcomes among different genders and ethnics [1–5].

Another study conducted in the United States reported that no disparities were observed in the quality of care or outcomes related to gender, race/ethnicity, or medical insurance characteristics between Hispanics and non-Hispanic Whites admitted with Acute Myocardial Infarction (AMI) to a facility with a large Hispanic representation of patients and providers [6].

Limited data and information about epidemiological related variation in STEMI patients and its effect on the hospital-outcomes are available in the Middle Eastern countries and results are still unknown. In general, the health care interaction between socioeconomic factors and the cultural characteristics of patients, providers and widespread implementation of the current guidelines of care all have universally recognized importance [7,8].

The objective of the current study is to provide insights for epidemiological pattern of ST-elevation myocardial infarction based on gender, ethnic and language effect on in-hospital outcome, analyzing the experience of a tertiary care center within a unique location in the holy city of Makkah, having a large sample of patients with different background.

2. Methods

2.1. Study Population

This is a retrospective single-center study of the prospective collected data that is used for reviewing the clinical details of all STEMI patients (3079 patients) presented directly or referred to our institution (King Abdullah Medical City), a tertiary hospital in the holy city of Makkah with 24/7 acute interventional facilities between October 2015 and August 2019.

Data were collected from cath lab records and their case notes including electronic records, echocardiographic and coronary angiographic reports include all of the following:

2.1.1. Demographic Data

Included age, gender, country of origin and ethnicity.

Abbreviations

AF	Atrial Fibrillation
BMI	Body Mass Index
CABG	Coronary Artery Bypass Grafting
CAG	Coronary Angiogram
COPD	Chronic Obstructive Pulmonary Disease
CVA	Cerbro-Vascular Accidents
DLP	Dyslipidemia
DBT	Door to Balloon Time
DM	Diabetes Mellitus
HB	Hemoglobin
HBA1C	Glycosylated hemoglobin
HTN	Hypertension
IHD	Ischemic Heart Disease
IRA	Infarcted Related Artery
LAD	Left Anterior Descending Artery
LCX	Left Circumflex Artery
LM	Left Main
LOS	Length Of Stay
LVD	Left Ventricular Dysfunction
LVEF	Left Ventricular Ejection Fraction
LVT	Left Ventricular Thrombus
MV	Mechanical Ventilation
MVD	Multi- Vessel Disease
PCI	Percutaneous Coronary Intervention
PPCI	Primary Percutaneous Coronary Intervention
PVD	Peripheral Vascular Disease
RCA	Right Coronary Artery
STEMI	ST-Elevation Myocardial Infarction

2.1.2. Clinical Data

Included history of smoking, HTN (hypertension), hypercholesterolemia, DM (diabetes), obesity, history of PVD (Peripheral Vascular Disease), COPD (Chronic Obstructive Pulmonary Disease)& coronary heart disease (history of ACS (Acute Coronary Syndrome), previous PCI (Percutaneous Coronary Intervention) or CABG (Coronary Artery Bypass Grafting)), territory of STEMI (ST-Elevation Myocardial Infarction) and history of thrombolytic therapy or tirofibanuse.

2.1.3. Electrocardiographic Data

The heart rhythm sinus or not and STEMI localization (anterior versus non-anterior).

2.1.4. Laboratory Data

Included serum creatinine, troponin, glucose, HBA1c (Glycosylated haemoglobin) and haemoglobin levels.

2.1.5. Echocardiographic Data

All patients underwent a baseline trans-thoracic Doppler-echocardiography for full assessment including, LVEF (Left Ventricular Ejection Fraction) and LVT (Left Ventricular Thrombus).

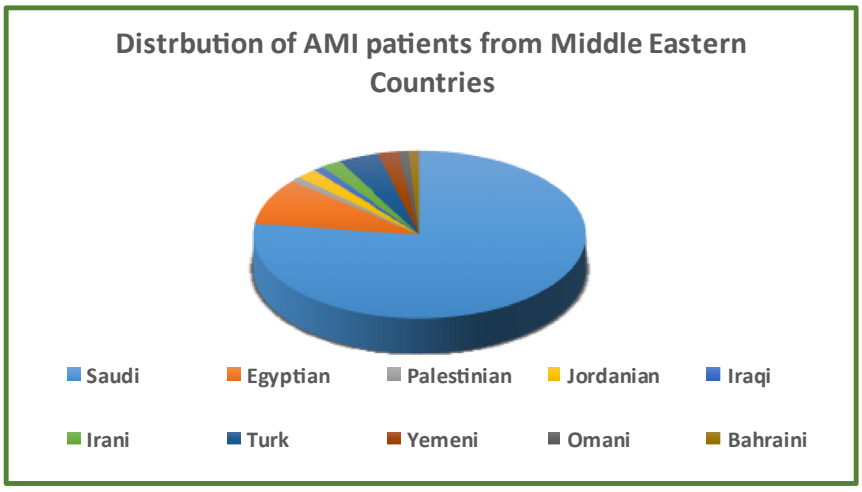

Fig. 1. Distribution of AMI- Middle Eastern patients.

2.1.6. Angiographic Data

Included access site, IRA (infarct related artery), localization of significant coronary lesions (stenosis>70%), number of significantly diseased coronary arteries, number of stented coronary vessels and if any thrombus aspiration was done during the procedure.

2.1.7. Hospital Outcome Data

Included all hospital death, cardiogenic shock, pulmonary oedema, history of cardiac arrest, mechanical ventilation, sever left ventricular dysfunction post myocardial infarction, major bleeding and in-hospital length of stay.

Ethnicity of the patients was used as criteria to differentiate between two groups of our population who reside in different countries:

- Middle Eastern who reside in Middle Eastern countries (Saudi Arabia, Egypt, Palestine, Jordan, Iraq.etc).
- South Asian who are of diverse population, and reside in India, Pakistan, Indonesia, Afghanistan.etc.

Language variation independent of ethnicity was also tested in our current study to discriminate between two groups of patients (Arabic speakers who speak Arabic as official language with various dialects and non- Arabic speakers who speak different non- Arabic languages).

Non- Saudi population including Arabic and non-Arabic speakers were muslims and mostly visited Saudi Arabia for doing Hajj and Umra.

2.2. Statistical Analysis

Statistical analysis was performed by the use of the SPSS software package (SPSS Inc.; Chicago, IL), version 21.0. Continuous data were expressed as mean ± SD and compared using the Student t test. Categorical data were given as a percentage and

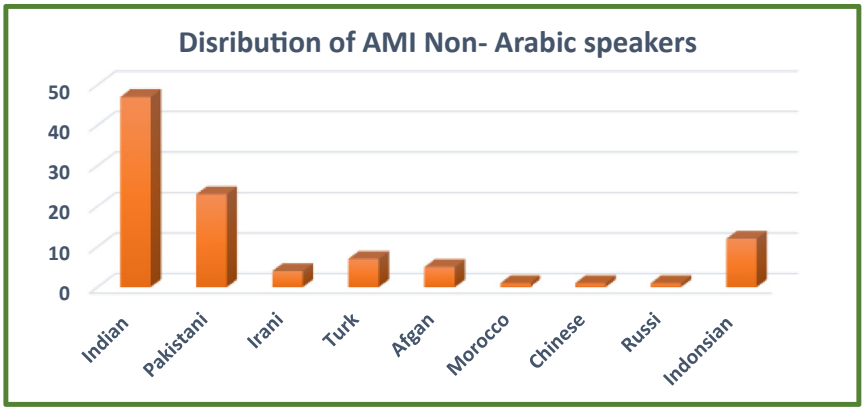

Fig. 2. Distribution of AMI- Non- Arabic speaker patients.

Table 1. Comparing baseline demographic, clinical, angiographic data and hospital outcomes of both genders.

Variable	Male N = 2581 (84%)	Female N = 498 (16%)	P value
I-Demographics and clinical data			
Age (years) Mean ± SD	55.35 ± 11.8	60.04 ± 11.2	<0.001
BMI (kg/m^2) Mean ± SD	27.86 ± 5.1	28.56 ± 5.6	<0.001
HBA1-C (mmol/mol) Mean ± SD	7.54 ± 2.5	8.26 ± 4.2	<0.001
HB (g/dL) Mean ± SD	14.14 ± 1.9	12.21 ± 1.9	<0.001
Glucose (mg/dL) Mean ± SD	171.82 ± 76.2	191.17 ± 88.2	0.01
Troponin 1st (ng/mL) Mean ± SD	68.1 ± 181	69 ± 179	NS
Troponin peak (ng/mL) Mean ± SD	76.3 ± 136	120 ± 564	NS
Serum Creatinine (mg/dL) Mean ± SD	1.19 ± 1.1	1.13 ± 1.4	NS
Pilgrims n,%	800 (31%)	224 (45%)	<0.001
DM n,%	1342 (52%)	318 (64%)	<0.001
HTN n,%	1316 (51%)	328 (66%)	<0.001
Smoking n,%	980 (38%)	25 (5%)	<0.001
DLP n,%	361 (14%)	77 (15%)	NS
Obesity (BMI >30 kg/m^2) n,%	696 (27%)	179 (36%)	<0.001
Valve problem n,%	77 (3%)	19 (4%)	NS
AF n,%	20 (0.8%)	19 (4%)	0.002
COPD n,%	25 (1%)	14 (3%)	NS
CVA n,%	77 (3%)	9 (2%)	NS
PVD n,%	25 (1%)	0	NS
H/O IHD n,%	516 (20%)	99 (20%)	NS
OLD PCI/CABG n,%	206 (8%)	19 (4%)	0.007
STEMI			
Anterior n,%	1445 (56%)	263 (53%)	NS
Inferior n,%	1032 (40%)	219 (44%)	
Other n,%	104 (4%)	16 (3%)	
Baseline LVEF% Mean ± SD	40.78 ± 10.7	41.40 ± 10.6	NS
LVT n,%	232 (9%)	44 (9%)	NS
Reperfusion strategies			
Thrombolytic therapy n,%	490 (19%)	79 (16%)	NS
Non reperfusion (late presentation) n,%	468 (18%)	94 (19%)	NS
Emergency PCI (rescue PCI) n, %	101 (4%)	32 (6%)	NS
PPCI n,%	1522 (59%)	293 (59%)	NS
II- Angiographic data			
Access site Radial n,%	2038 (79%)	338 (68%)	<0.001
LM disease n,%	77 (3%)	14 (3%)	NS
MVD n,%	412 (16%)	79 (16%)	NS
DBT <90 min for PPCI n,%	1187 (1522) (78%)	212 (293) (72%)	NS
IRA			
LAD n,%	1419 (55%)	268 (54%)	NS
LCX n,%	154 (6%)	29 (6%)	
RCA n,%	851 (33%)	159 (32%)	
PCI to LAD n,%	1006 (39%)	124 (25%)	NS
Tirofiban n,%	645 (25%)	109 (22%)	NS
Thrombus aspiration n,%	335 (13%)	59 (12%)	NS
III-Hospital outcome			
Hospital death n,%	69 (3%)	23 (5%)	0.027
LOS (days) Mean ± SD	5.64 ± 8.1	5.69 ± 7.1	NS
Cardiac arrest n,%	154 (6%)	24 (5%)	NS
MV n,%	129 (5%)	29 (6%)	NS
LVEF <30% n,%	567 (22%)	114 (23%)	NS
Cardiogenic shock n,%	129 (5%)	14 (3%)	NS
Pulmonary edema n,%	77 (3%)	24 (5%)	0.08
Re admission n,%	232 (9%)	39 (8%)	NS
Repeated CAG n,%	129 (5%)	9 (2%)	NS
Major bleeding (HB drop> 3 gm) n,%	129 (5%)	19 (4%)	NS

AF: Atrial Fibrillation; BMI: Body Mass Index; CABG: Coronary Artery Bypass Grafting; COPD: Chronic Obstructive Pulmonary Disease; CVA: Cerbro-Vascular Accidents; DBT: Door to Balloon Time; DLP: Dyslipidemia; DM: Diabetes Mellitus; HB: Hemoglobin; HBA1C: Glycosylated hemoglobin; IHD: Ischemic Heart Disease; IRA: Infarcted Related Artery; LAD: Left Anterior Descending Artery; LCX: Left Circumflex Artery; LVEF: Left Ventricular Ejection Fraction; LM: Left Main; LOS; Length of Stay; LVD: Left Ventricular Dysfunction; LVT: Left Ventricular Thrombus; MV; Mechanical Ventilation; MVD: Multi- Vessel Disease; PCI: Percutaneous Coronary Intervention; PPCI; Primary Percutaneous Coronary Intervention; PVD: Peripheral Vascular Disease; RCA: Right Coronary Artery.

Table 2. Binary regression analysis for prediction of mortality.

Variable	B	S.E.	EXP (B)	P value
Age (years)	0.046	0.019	1.047	0.013
MVD	0.899	0.455	0.407	0.048
LVD (LVEF<30%)	1.719	0.435	0.179	<0.0001

LVEF: Left Ventricular Ejection Fraction; LVD: Left Ventricular Dysfunction; MVD: Multi-Vessel Disease.

compared with a Chi-square test. A P value < 0.05 was considered statistically significant. Regression analysis was also used for prediction of the mortality.

Our study is designed to be part of the standard for patient care, to investigate and improve quality of STEMI management & outcomes among diverse population, and has received approval of the ethics

Table 3. Comparing baseline demographic, clinical, angiographic data and hospital outcomes of both ethnic groups.

Variable	South Asian N = 909 (30%)	Middle Eastern N = 2170 (70%)	P value
I-Demographics and clinical data			
Age (years) Mean ± SD	55.03 ± 11.1	56.57 ± 12.0	0.001
Male gender n,%	777 (85%)	1804 (83%)	NS
BMI (kg/m^2) Mean ± SD	26.66 ± 4.4	28.31 ± 5.40	<0.001
HBA1-C (mmol/mol) Mean ± SD	7.71 ± 2.4	7.64 ± 3.1	NS
HB (g/dL) Mean ± SD	13.84 ± 1.9	13.83 ± 2.04	NS
Glucose (mg/dL) Mean ± SD	180.98 ± 81.5	172.48 ± 77.4	NS
Troponin 1st (ng/mL) Mean ± SD	65.20 ± 171.1	68.22 ± 178.2	NS
Troponin peak (ng/mL) Mean ± SD	86.21 ± 126.2	118.12 ± 464.1	NS
Serum Creatinine (mg/dL) Mean ± SD	1.25 ± 1.3	1.26 ± 1.7	NS
Pilgrims n,%	503 (55%)	521 (24%)	<0.001
DM n,%	445 (49%)	1215 (56%)	0.001
HTN n,%	463 (51%)	1181 (54%)	0.057
Smoking n,%	225 (25%)	780 (36%)	<0.001
DLP n,%	128 (14%)	310 (14%)	NS
Obesity (BMI >30) n,%	169 (19%)	706 (33%)	<0.001
CVA n,%	13 (1%)	73 (3%)	<0.001
IHD n,%	143 (16%)	472 (22%)	<0.001
OLD PCI/CABG n,%	41 (4%)	184 (8%)	0.001
Anterior STEMI n,%	501 (55%)	1207 (56%)	NS
Baseline LVEF% Mean ± SD	41.57 ± 10.9	41.16 ± 10.6	NS
LVT n,%	91 (10%)	185 (9%)	NS
Reperfusion strategies			
Thrombolytic therapy n,%	143 (16%)	426 (20%)	0.019
Non reperfusion (late presentation) n,%	172 (19%)	390 (18%)	NS
Emergency PCI (rescue) n,%	59 (6%)	74 (3%)	NS
PPCI n,%	535 (59%)	1280 (59%)	NS
II- Angiographic data			
Access site			
Radial n,%	683 (75%)	1693 (78%)	NS
LM disease n,%	32 (4%)	59 (3%)	NS
MVD n,%	159 (17%)	332 (15%)	NS
DBT <90 min of PPCI n,%	418 (535) (78%)	954 (1280) (75%)	NS
Tirofiban n,%	235 (26%)	519 (24%)	NS
Thrombus aspiration n,%	118 (13%)	276 (13%)	NS
III-Hospital outcome			
Thrombus aspiration n,%	111 (12%)	283 (13%)	NS
Hospital death n,%	27 (3%)	65 (3%)	NS
LOS (days) Mean ± SD	5.59 ± 7.34	5.68 ± 8.12	NS
Cardiac arrest n,%	59 (6%)	119 (5%)	NS
MV n,%	59 (6%)	99 (4%)	NS
Cardiogenic shock n,%	49 (5%)	94 (4%)	NS
Pulmonary edema n,%	41 (5%)	60 (3%)	0.012
LVD (LVEF<30%) n,%	215 (24%)	466 (21%)	NS
Major bleeding (HB drop> 3 gm) n,%	49 (5%)	99 (4%)	NS

BMI: Body Mass Index; CABG: Coronary Artery Bypass Grafting; CVA: Cerebrovascular Accidents; DBT; Door to Balloon Time; DLP: Dyslipidemia; DM: Diabetes Mellitus; HB: Hemoglobin; HBA1C: Glycosylated hemoglobin; IHD: Ischemic Heart Disease; LM: Left Main; LOS; Length of Stay; LVD: Left Ventricular Dysfunction; LVEF: Left Ventricular Ejection Fraction; LVT: Left Ventricular Thrombus; MVD: Multi-Vessel Disease; MV; Mechanical Ventilation; PCI: Percutaneous Coronary Intervention; PPCI: Primary Percutaneous Coronary Intervention.

Table 4. Baseline demographic, clinical data and hospital outcomes of both Arabic and non-Arabic speakers.

Variables	Non Arabic speakers N = 1200 (39%)	Arabic speakers N = 1879 (61%)	P-value
I-Clinical data			
Age (years) Mean ± SD	55.25 ± 10.8	55.23 ± 10.7	NS
Male gender n,%	984 (82%)	1597 (85%)	0.032
DM n,%	576 (48%)	1084 (58%)	<0.001
Smoking n,%	300 (25%)	705 (38%)	<0.001
HTN n,%	624 (52%)	1020 (54%)	NS
Obesity (BMI >30 kg/m^2) n,%	213 (19%)	644 (34%)	<0.001
CVA n,%	17 (1%)	69 (4%)	0.001
Dyslipidemia n,%	162 (14%)	276 (15%)	NS
IHD n,%	231 (19%)	384 (20%)	NS
OLD PCI/CABG n,%	88 (7%)	137 (7%)	NS
Anterior STEMI n,%	672 (56%)	1036 (55%)	NS
Reperfusion strategies			
Thrombolytic therapy n,%	149 (12%)	420 (22%)	<0.001
Non reperfusion (late presentation) n,%	306 (26%)	256 (14%)	<0.001
Emergency PCI (rescue) n,%	48 (4%)	85 (5%)	NS
PPCI n,%	697 (58%)	1118 (59%)	NS
II- Angiographic data			
Access site			
Radial n,%	911 (76%)	1465 (78%)	NS
LM disease n,%	44 (4%)	47 (3%)	NS
MVD n,%	216 (18%)	275 (15%)	NS
DBT <90 min of PPCI n,%	541 (697) (78%)	831 (1118) (74%)	NS
Tirofiban n,%	303 (25%)	456 (24%)	NS
Thrombus aspiration n,%	143 (12%)	251 (13%)	NS
III-Hospital outcome			
Pulmonary Edema n,%	36 (3%)	65 (3%)	NS
Cardiogenic Shock n,%	56 (5%)	87 (5%)	NS
MV n,%	77 (6%)	81 (4%)	0.002
Cardiac Arrest n,%	56 (5%)	122 (5%)	NS
In-hospital Death n,%	30 (3%)	62 (3%)	NS

BMI: Body Mass Index; CABG: Coronary Artery Bypass Grafting; CVA: Cerebrovascular Accidents; DM: Diabetes Mellitus; HTN: Hypertension; IHD: Ischemic Heart Disease; MV; Mechanical Ventilation; PCI: Percutaneous Coronary Intervention; STEMI: ST-Elevation Myocardial Infarction.

committee/institutional review board of our institution.

3. Results

Three thousands and seventy-nine STEMI patients were admitted to our cardiac center between the period of October 2015 and August 2019. The mean age of all our patients was 56 ± 12 years old, 33% were pilgrims, 16% were women, 70% were from Middle Eastern countries and only 39% were non- Arabic speakers. Between patient's groups, comparisons were performed for the following pair wise:

I. Gender: Men versus women
II. Ethnicity: Middle Eastern versus South Asian (distribution of Middle Eastern STEMI patients was shown in Fig. I)
III. Language: Arabic versus non-Arabic speakers (distribution of non- Arabic speaking STEMI patients was shown in Fig. II)

3.1. I-Baseline and Clinical Measures

3.1.1. I-1.Men Versus Women

Women were significantly elderly and more anemic compared to men (*P value for both < 0.001*). Cardiovascular risk factors showed significantly higher rates among women patients compared to men (P < 0.001 for DM, HTN and obesity). Women also showed lower prevalence of both smoking and old history of coronary revascularization (P < 0.001 and 0.007, respectively). On the other hand, no significant differences were observed between both genders regarding STEMI localization, LVEF, LVT, use of therapeutic agents, prevalence of MVD (Multi Vessel Disease), PPCI utilization rate and distribution of stenosed or stented coronaries Table I.

3.1.2. I-2.Middle Eastern Versus South Asian

Middle Eastern patients were elderly, showed higher prevalence of DM, HTN, smoking and

obesity compared to South Asian patients *($p = 0.001$, 0.057, < 0.001, < 0.001, respectively)*.Pilgrims were more prevalent among STEMI- South Asian patients (P < 0.001). However, no significant differences were observed between both ethnic groups regarding STEMI localization, LVEF, LVT, prevalence of MVD, PPCI utilization rate and distribution of stenosed or stented coronaries. Table III.

3.1.3. I-3.Arabic Versus Non-Arabic Speakers

Arabic speaking- STEMI patients showed more prevalence of DM, smoking and obesity compared to non- Arabic speakers *($p < 0.001$ for all)*. There were no significant differences between two groups regarding age or STEMI localization and complications Table IV.

3.2. II- Hospital Outcomes

3.2.1. II-1.Men Versus Women

Women showed relatively higher recorded rates of pulmonary edema compared to men. All other in-hospital outcome parameters (post myocardial infarction significant left ventricular dysfunction, cardiogenic shock, mechanical ventilation and in-patient length of stay) did not show significant differences between the two gender groups except for the in-hospital mortality rates that was recorded to be higher among women compared to men ($p = 0.027$). Table I.tbl1

Being elderly, presence of MVD and sever left ventricular systolic dysfunction (LVEF<30%) are the three independent predictors of mortality among both genders Table II.

3.2.2. II-2.Middle Eastern Versus South Asian

After adjustment of all predictors, South Asian patients had relatively higher rate of pulmonary edema, otherwise, there are similar other post STEMI complications, such as length of hospital stay and mortality like Middle Eastern patients Table III.tbl3

3.2.3. II-3.Arabic Versus Non-Arabic Speakers

After adjustment of all predictors, Arabic and non- Arabic speaking patients showed similar hospital outcome measures Table IV.

4. Discussion

4.1. What Is Already Known About This Subject and What Does This Study Add?

Data of different clinical characteristics and management strategies of STEMI patients have previously been reported in literature from the Middle East, however, little is known about the epidemiological variation of myocardial infarction population and how it affects the hospital outcomes.

This study provides a detailed description of the little known about the epidemiological variation in those patients and its impact on in-hospital outcome, which was conducted in a facility with a large representation of different background population. All that would help the physicians in identifying those high-risk STEMI patients, providing them more attention and proper hospital care. Community interventions should also be implemented to reduce the risk factors of CAD and myocardial infarction.

4.1.1. Gender Variation

In our study, when comparing the presentation of STEMI in relation to gender, we found that women were elderly, had a significantly higher prevalence of comorbidities (obesity, diabetes mellitus and hypertension) and poor hospital outcomes (higher rates of pulmonary edema, mechanical ventilation and even in-hospital mortality), suggesting a greater severity in the clinical presentation for this group. These findings were similar to different studies from different regions [9–13]. Also a recent study conducted from six Middle Eastern Countries demonstrated that women have almost doubled the number of mortality from STEMI compared with men [14].

On the other hand, door-to-balloon times <90 min were achieved in 72% of women who were treated with PPCI and these were less likely than men achieved. This could be attributed to multiple factors, including atypical symptoms, delay in seeking medical care, under-referral of women to receive acute cardiac care, and refusal of invasive procedures. Hopefuly, this rate of achieving benchmark is slightly higher than recorded by another recent Middle Eastern study [14] and could be explained by establishing organized STEMI programs and networks across the region with significantly improvement in the communication, and transportation of the patients from all peripheral hospitals.

Morover, we noted that being elderly, having MVD in coronary angiography and developing post myocardial infarction sever systolic dysfunction are the three independent predictors of in-hospital mortality which were consistent with other studies [11,15]. However, some registries from middle (upper and lower) and high income countries have found no gender difference in the adjusted rates of in-hospital mortality [16,17].

This raises the question whether the gender factor actually affects the prognosis of STEMI or whether it

is due to confounding factors. In our study, Women were significantly older in age and had higher prevlance of cardiovascular risk factors which all might explain their poor prognosis compared to men. Morover, old age was also detected as one of the three predictors of in-hospital mortality in our study and we thought this is the biggest driver of increased mortality among women. Several factors potentially might explain the high mortality rates associated with old age. Those patients often have atypical symptoms, cognitive impairments, associated co-morbdities and difficulty accessing care. Interestingly in our study, there was no gender-related variation in hospital provided treatment, including rates of revascularization therapy which might affect the outcomes. This finding does not agree with those reported in other studies that women were less likely to undergo invasive coronary angiography and revascularization [16–19]. This could be explained by higher tertiary care service provided by our center with marked improvement in the strategies and treatment protocols for those STEMI populations who are in early need for revascularization with no gender bias.

4.1.2. Ethnic/Racial Variation

The key point in our study is the unique location of our tertiary center in the region of holly city of Makkah (place of Hajj & Umra); hence, different acute myocardial infarction, ethnic and racial population with different background are characteristics that have been seen in our cardiac center.

We found that risk factor profiles is significantly different across ethnicity. Despite variation in risk factors, there was no ethnic difference in the clinical presentation, invasive management, post STEMI complications and in-hospital mortality. In our study, cardiovascular risk factors were highly prevalent among the Middle Eastern population and this is in resonance with reports from other studies [20,21]. Another Middle Eastern registry conducted on 2426 patients who underwent PCI concluded that they were a relatively young age population with high prevalence of DM, cigarette smoking, obesity and most of them had low in-hospital cardiovascular events similar to our findings [22].

On the other hand, South Asian patients had less prevalent cardiovascular risk factors with no difference in the short-term mortality after STEMI, compared with Middle Eastern patients as mentioned in previous studies [23–25].

This ethnic and racial AMI cardiovascular risk factors variation could be explained by different genetic, cultural and environmental factors, which might lead to differences in the degree of atherosclerosis, thrombotic activity and distribution of collateral circulation.

Despite the difference in cardiovascular risk profile, there was similar hospital outcomes in both groups and this reflects the proper health care service and management provided by our center to those variant populations with no ethnic bias. These findings highlight the importance of comparing ethnic groups that have equal-access to healthcare system.

4.1.3. Language Variation

Limited information is available on language related influences in myocardial infarction patients, while multi-factors could affect the prognosis and outcomes in those populations. Lack of knowledge about available health services and how to use them, language barrier problems, health and cultural beliefs, low education levels, anxiety, lack of private health insurance and high medical costs are factors which might affect managements and outcomes in STEMI patients.

In our study, most of the Arab speaking patients from Middle Eastern countries showed higher prevalence of cardiovascular risk factors and receiving more thrombolytic therapy compared to non- Arabic speaking patients. Surprisingly, non-Arabic speakers who had multiple language and culture barriers, showed the same hospital outcomes like Arabic speaking patients and reflects again that a proper similar health care service is provided in our center with no bias in selection of the treatment plan.

These findings also highlight the huge facilities provided by the ministry of health of Saudi Arabia in Makkah region, especially during the hot seasons (Hajj and Umra). Increased work force, raised the number of working cath labs, improved working network and expansion of all available services including the provision of translators of different nationalities by hajj committee might all explain the reason for proper equal management and the same in-hospital outcomes.

Finally, all those findings are considered unique as no other research is based on that topic in our region.

4.2. Limitation

Single center with missing follow up and long-term outcome data as nature of a tertiary center, which refer patients back to their primary and secondary hospitals after doing coronary revascularization. In addition, many of our patients were from different places and countries; they came to Makkah

only for Hajj & Umra and they were going back to their respective places and countries after Hajj & Umra with no follow up by our center. Results of this study are encouraging, it need corroboration in multicenter larger population with further follow-up.

5. Conclusion

In our study, there were gender, racial and ethnic variation in the baseline demographics and clustered cardiovascular risk factors. However, there are no differences in post AMI complications, treatment plan and hospital outcomes except that women-gender showed higher rates of in-hospital mortality. These might be a reflection of the proper and equal service provided by our center with no bias, improved STEMI management protocols and hence, proper outcomes. Old age, presence of multi-vessel disease and sever left ventricular systolic dysfunction have the greatest effect on in-hospital mortality in STEMI patients. More investigations are required for similar data in other tertiary centers to provide multi center results and hence generalize our conclusion.

Declaration

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Author Contribution

Sheeren Khaled: Conception, Design, Supervision, Materials, Data collection and/or processing, Analysis and/or interpretation, Literature review, Writer, Critical review; **Mohammad Almalki:** Design, Supervision, Materials, Data collection and/or processing, Analysis and/or interpretation; **Ghada Shalaby:** Design, Materials, Data collection and/or processing, Analysis and/or interpretation; **Azmat Khadija Niazi:** Design, Materials, Data collection and/or processing; **Sara Ahmed:** Design, Materials, Data collection and/or processing; **Asma Alsilami:** Design, Materials, Data collection and/or processing; **Mohannd Alhazmi:** Design, Materials, Data collection and/or processing; **Zeyad Bukhary:** Design, Materials, Data collection and/or processing; **Najeeb Jaha:** Conception, Design, Supervision, Materials, Critical review.

Declaration of competing interest

The authors declare that there are no known conflicts of interest associated with the publication of the article.

References

[1] Correa-de-Araujo R, McDermott K, Moy E. Gender differences across racial and ethnic groups in the quality of care for diabetes. Wom Health Issues 2006;16:56–65. https://doi.org/10.1016/j.whi.2005.08.003.
[2] Chen J, Rathore SS, Radford MJ, Wang Y, Krumholz HM. Racial differences in the use of cardiac catheterization after acute myocardial infarction. N Engl J Med 2001;344:1443–9. https://doi.org/10.1056/NEJM200105103441906.
[3] Spencer F, Scleparis G, Goldberg RJ, Yarzebski J, Lessard D, Gore JM. Decade-long trends (1986 to 1997) in the medical treatment of patients with acute myocardial infarction: a community-wide perspective. Am Heart J 2001;142:594–603. https://doi.org/10.1067/mhj.2001.117776.
[4] Vaccarino V, Rathore SS, Wenger NK, Frederick PD, Abramson JL, Barron HV, et al. Sex and racial differences in the management of acute myocardial infarction, 1994 through 2002. N Engl J Med 2005;353:671–82. https://doi.org/10.1056/NEJMsa032214.
[5] Cook NL. Disparities in cardiovascular care: does a rising tide lift all boats?. 2010. p. 2253–4. https://doi.org/10.1161/CIRCULATIONAHA.110.956961.
[6] Romero T, Velez P, Glaser D, Romero CX. Do gender and race/ethnicity influence acute myocardial infarction quality of care in a hospital with a large Hispanic patient and provider representation? Cardiol Res Pract 2013;2013. https://doi.org/10.1155/2013/975393.
[7] Marmot M. Social determinants of health inequalities. Lancet 2005;365:1099–104. https://doi.org/10.1016/S0140-6736(05)71146-6.
[8] Mensah GA. Eliminating disparities in cardiovascular health: six strategic imperatives and a framework for action. Circulation 2005;111:1332–6. https://doi.org/10.1161/01.CIR.0000158134.24860.91.
[9] Duraes AR, Bitar YS, Freitas AC, Mp Filho I, Freitas BC, Fernandez AM. Gender differences in ST-elevation myocardial infarction (STEMI) time delays: experience of a public health service in Salvador-Brazil. Am J Cardiovas Dis 2017;7:102. PMC5698564.
[10] Hambraeus K, Tydén P, Lindahl B. Time trends and gender differences in prevention guideline adherence and outcome after myocardial infarction: data from the SWEDEHEART registry. Euro J Prevent Cardiol 2016;23:340–8. https://doi.org/10.1177/2047487315585293.
[11] Benamer H, Tafflet M, Bataille S, Escolano S, Livarek B, Fourchard V, et al. Female gender is an independent predictor of in-hospital mortality after STEMI in the era of primary PCI: insights from the greater Paris area PCI registry. EuroIntervention 2011;6:1073–9. https://doi.org/10.4244/EIJV6I9A187.
[12] Gevaert SA, De Bacquer D, Evrard P, Convens C, Dubois P, Boland J, et al. Gender, TIMI risk score and in-hospital mortality in STEMI patients undergoing primary PCI: results from the Belgian STEMI registry. EuroIntervention 2014;9:1095–101. https://doi.org/10.4244/EIJV9I9A184.
[13] Zachura M, Wilczek K, Kurzawski J, Gierlotka M, Gąsior M, Sadowski M. Gender-related differences in men and women with ST-segment elevation myocardial infarction and incomplete infarct-related artery flow restoration: a

multicenter national registry. Postepy w Kardiologii Interwencyjnej= Advan Intervent Cardiol 2018;14:356. https://doi.org/10.5114/aic.2018.79865.

[14] Shehab A, AlHabib KF, Bhagavathula AS, Hersi A, Alfaleh H, Alshamiri MQ, et al. Clinical presentation, quality of care, risk factors and outcomes in women with acute ST-elevation myocardial infarction (STEMI): an observational report from six middle Eastern countries. Curr Vasc Pharmacol 2019;17:388–95. https://doi.org/10.2174/1570161116666180315104820.

[15] Cretu DE, Udroiu CA, Stoicescu CI, Tatu-Chitoiu G, Vinereanu D. Predictors of in-hospital mortality of ST-segment elevation myocardial infarction patients undergoing interventional treatment. An analysis of data from the RO-STEMI registry. Maedica 2015;10:295. PMC5394434.

[16] Lu HT, Nordin R, Ahmad WA, Lee CY, Zambahari R, Ismail O, et al. Sex differences in acute coronary syndrome in a multiethnic asian population: results of the Malaysian national cardiovascular disease database—acute coronary syndrome (NCVD-ACS) registry. Glob Heart 2014;9:381–90. https://doi.org/10.1016/j.gheart.2014.06.001.

[17] Valero-Masa MJ, Velásquez-Rodríguez J, Diez-Delhoyo F, Devesa C, Juárez M, Sousa-Casasnovas I, et al. Sex differences in acute myocardial infarction: is it only the age? Int J Cardiol 2017;231:36–41. https://doi.org/10.1136/openhrt-2017-000689.

[18] Worrall-Carter L, McEvedy S, Wilson A, Rahman MA. Gender differences in presentation, coronary intervention, and outcomes of 28,985 acute coronary syndrome patients in Victoria, Australia. Wom Health Issues 2016;26:14–20. https://doi.org/10.1016/j.whi.2015.09.002.

[19] Khan E, Brieger D, Amerena J, Atherton JJ, Chew DP, Farshid A, et al. Differences in management and outcomes for men and women with ST-elevation myocardial infarction. Med J Aust 2018;209:118–23. https://doi.org/10.5694/mja17.01109.

[20] Gehani AA, Al-Hinai AT, Zubaid M, Almahmeed W, Hasani MM, Yusufali AH, et al. Association of risk factors with acute myocardial infarction in Middle Eastern countries: the INTERHEART Middle East study. Euro J Prevent Cardiol 2014;21:400–10. https://doi.org/10.1177/2047487312465525.

[21] Hammoudeh AJ, Alhaddad IA, Khader Y, Tabbalat R, Al-Mousa E, Saleh A, et al. Cardiovascular risk factors in Middle Eastern patients undergoing percutaneous coronary intervention: results from the first Jordanian percutaneous coronary intervention study. J Saudi Heart Assoc 2017;29:195–202. https://doi.org/10.1016/j.jsha.2016.10.002.

[22] Alhaddad IA, Tabbalat R, Khader Y, Al-Mousa E, Izraiq M, Nammas A, et al. Outcomes of middle eastern patients undergoing percutaneous coronary intervention: the primary analysis of the first Jordanian PCI registry. Heart Views: Off J Gulf Heart Assoc 2017;18:3. https://doi.org/10.4103/1995-705X.206206.

[23] Khan NA, Grubisic M, Hemmelgarn B, Humphries K, King KM, Quan H. Outcomes after acute myocardial infarction in South Asian, Chinese, and white patients. Circulation 2010;122:1570–7. https://doi.org/10.1161/CIRCULATIONAHA.109.850297.

[24] Zaman MJ, Philipson P, Chen R, Farag A, Shipley M, Marmot MG, et al. South Asians and coronary disease: is there discordance between effects on incidence and prognosis? Heart 2013;99:729–36. https://doi.org/10.1136/heartjnl-2012-302925.

[25] Caínzos-Achirica M, García-García C, Elosua R, Piulats N, Recasens L, Bruguera-Cortada J. Myocardial infarction in South Asian immigrants in catalonia. Results from the ASIAM study. Rev Española Cardiol 2013;66:405–7. https://doi.org/10.1016/j.rec.2012.10.008.