Original Article

Gender differences in patient-reported outcomes and cardiac symptoms in patients with acute coronary syndrome in Riyadh, Saudi Arabia

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ABSTRACT

الغاية: قياس الفروق بين الجنسين في النتائج التي أبلغ عنها المريض، وأعراض القلب لدى المرضى الذين يعانون من متلازمة الشريان التاجي الحاد في مستشفى الملك خالد الجامعي في الرياض، السعودية

المنهجية: أجريت دراسة ملاحظة مقطعية شملت 240 مريضًا بمتلازمة الشريان التاجي الحاد تبلغ أعمارهم 18 عامًا أو أكثر. جُمعت البيانات باستخدام استبيانات موثقة، منها: مقاييس النتائج التي أبلغ عنها المريض، مقياس روز لعسر التنفس، استطلاع صحة المريض، واستطلاع سياتل للذبحة الصدرية. عُمل تحليل الانحدار الخطي متعدد المتغيرات للتعرف على العوامل المرتبطة بجودة الحياة.

النتائج: شارك في الدراسة حوالي 60% ذكورًا، و 40% إناثًا. أدلت الإناث بنتائج أقل بشكل بارز بما يتعلق بنتائج الصحة البدنية الشاملة (11.62 [±2.49] مقابل 13.68 [±2.68]، p=0.00) وأعراض عسر تنفس زائدة (2.61 [±1.41] مقابل 1.55 [±1.51]، p=0.00)، ونتائج القيود الجسدية من استطلاع سياتل للذبحة الصدرية (43.2 [±31.8] مقابل 55.19 [±33.96]، P=0.02) أظهر تحليل الانحدار الخطي متعدد المتغيرات ارتباط الجنس الأنثوي بانخفاض في درجات الصحة البدنية (-0.33 [-2.42، -1.00])، وزيادة في أعراض عسر التنفس (0.30 [0.55، 1.37])، وزيادة في درجات الاكتئاب (0.14 [0.004، 0.87])، وانخفاض في النشاط البدني المتعلق باستطلاع سياتل للذبحة الصدرية (-0.19 [-2.60، -23.68])، ونتائج ملخص استطلاع سياتل للذبحة الصدرية (-0.14 [-.04، -11.34]). بالمثل، ارتبط التقدم بالعمر، وانخفاض الدخل بنتائج أسوأ لجودة الحياة.

الاستنتاج: ارتبط الجنس الأنثوي، كبر السن، وانخفاض الدخل بنتائج أسوأ لمقياس النتائج التي أبلغ عنها المريض لدى مرضى متلازمة الشريان التاجي الحاد. يجب على مقدمي الرعاية الصحية أخذ هذه الفروقات بعين الاعتبار لتطوير استراتيجيات الرعاية، وجودة الحياة لدى هذا المجتمع.

Objectives: To measure the gender differences in patient-reported outcomes and cardiac symptoms in patients with acute coronary syndrome (ACS) at King Khalid University Hospital in Riyadh, Saudi Arabia.

Methods: A cross-sectional study was conducted on 240 randomly selected ACS patients aged ≥18 years. Data were collected using validated questionnaires, including Patient-reported outcomes measures, the Rose Dyspnea Scale, Patient Health Questionnaire, and Seattle Angina Questionnaire. Multiple linear regression analysis was conducted to identify factors associated with quality of life (QoL).

Results: The study included 60% males and 40% females. Females reported significantly lower global physical health scores (11.62 [±2.49] versus (vs) 13.68 [±2.68], *p*=0.00), higher dyspnea symptoms (2.61 [±1.41] vs 1.55 [±1.51], *p*=0.00), and more physical limitation (43.2 [±31.8] vs 55.19 [±33.96], *p*=0.02). Multiple linear regression analysis showed female gender was associated with a decline in physical health (-0.33 [-2.42, -1.00]), increased dyspnea symptoms (0.30 [0.55, 1.37]), higher depression scores (0.14 [0.004, 0.87]), a decline in SAQ physical activity [-0.19 (-23.68, -2.60)] and summary scores [-0.14 (-11.34, -.04)]. Older age and lower income were also significantly associated with poorer QoL outcomes.

Conclusion: Female gender, advanced age, and lower income were associated with worse patient-reported outcomes in ACS patients. Healthcare providers should consider these disparities to improve management strategies and QoL in this population.

Keywords: acute coronary syndrome, gender differences, patient-reported outcomes, quality of life, Saudi Arabia

Saudi Med J 2025; Vol. 46 (4): 388-397
doi: 10.15537/smj.2025.46.20240735

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Received 26th August 20254. Accepted 28th February 2025.

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Acute coronary syndrome (ACS) is a substantial contributor to global morbidity and mortality, profoundly affecting patient outcomes.[1] In Saudi Arabia, ACS impacts approximately 5.5% of the population, with a hospital mortality rate of 5% and an average age of onset at 57 years.[2] Despite advance in treatment, ACS continues to pose a major health burden, especially in terms of patient-reported outcomes and quality of life (QoL)

The risk factors for ACS are well-established and can be classified into modifiable and non-modifiable elements. Modifiable risk factors encompass obesity, dyslipidemia, hypertension, diabetes mellitus, physical inactivity, stress, and unhealthy diet; among the non-modifiable factors, patient age and gender play the most crucial roles in determining outcomes.[3] However, studies exploring gender differences in ACS outcomes, particularly within specific populations, remain limited.

Previous study has shown that men with ACS tend to report higher QoL compared to women, who often face additional challenges such as lower socioeconomic status, physical limitations, and a higher prevalence of depressive symptoms. Depression, in particular, affects approximately 20% of ACS patients and is strongly linked to poorer QoL, with women disproportionately affected.[4-7] Studies have further suggested that younger women (underage 55) with ACS may have worse clinical outcomes and higher fatality rates than their male counterparts, due to a greater burden of comorbidities like hypertension, diabetes, and obesity.[5]

In Saudi Arabia, a growing interest in understanding how sociodemographic factors, such as gender, influence patient-reported outcomes in ACS. A 12-month cross-sectional study carried out in Riyadh, Saudi Arabia, involving 356 ACS patients, found that most non-ST-elevation myocardial infarction (NSTEMI) (51.69%) patients experienced Grade 1 dyspnea (33.4%) and NYHA stage 2 (29.8%), while STEMI patients had a higher mortality risk. Health-related quality of life (HRQOL) assessments showed significant declines in emotional (23.0%, p=0.001), physical (24.4%, p=0.003), and social (27.2%, p=0.002) well-being. Although the findings are valuable, the study did not include regression analysis, which could have provided deeper insights into potential influencing factors.[8] Furthermore, a cross-sectional study in Jeddah involving 367 patients with coronary artery disease discovered a significant correlation among age, gender, marital status, educational level, employment, and QoL outcomes.[9] In addition, depression is prevalent among ACS patients, affecting approximately 20% of them, and correlates with diminished quality of life.[10-12] A small-scale cross-sectional study from Al-Qassim revealed that those patients with an education level below secondary school were 3 times more likely to experience poor physical health. In contrast to male patients, female patients were nearly 3 times more likely to experience poor mental health.[13]

Nonetheless, there remains limited exploration of the gender differences and the sociodemographic disparities in physical and mental health outcomes and cardiac symptoms among patients with ACS in Saudi Arabia. Hence, this study measured the gender differences in patient-reported outcomes and cardiac symptoms in patients presenting with acute coronary syndrome at King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia.

Methods. This study adopted an online cross-sectional design to measure gender differences in the patient-reported outcomes and cardiac symptoms in patients who presented with ACS at King Fahad Cardiac Center (KFCC) at KKUH. King Khalid University Hospital is a multidisciplinary hospital with specialist subunits that offer primary, secondary, and tertiary-level care. It delivers comprehensive healthcare to its patients from diagnosis to recovery, with patient treatment referrals nationwide.

Assuming a prevalence of 10-15% for poor quality of life in patients diagnosed with ACS, and keeping the confidence level at 95% and significance level at 0.05, we required 140 patients with ACS. In order to explore the association between gender and patient related outcomes, assuming a type-1 error of 0.05, type -II error of 0.20 (power of 0.80) and 20% difference in the patient related health outcomes, we need to interview 240 patients. In addition, keeping the non-response at 50%, we needed 360 patients in our study.

Data collection began in September 2022. Any patients aged 18 years or older who had completed at least eight weeks (since the day of admission) were included, and those who refused to participate were excluded. A complete list of 400 patients with ACS admitted from August 2020 to September 2022 was acquired from the administrative department of KFCC. With response rate of 60%, 240 patients out of 400 completed the interview questionnaire and were included in the final analysis. Data were obtained through a team of 6

Disclosure. Authors have no conflict of interests, and the work was not supported or funded by any drug company.

Arabic-speaking medical students. They were trained to conduct phone-based interviews with the patient. After introducing themselves, the data collector explained the study's objectives and confirmed the patient's identity and diagnosis. After obtaining consent to participate and answering all the patient's concerns, an online survey questionnaire was sent via cell phone messaging services (SMS/WhatsApp). Patients were informed that in case of any query they are free to contact the interviewer for explanation. Patients who did not reply to phone calls were called again, and if there was no reply after 3 contacts, the patient was marked as a non-participant. Confidentiality and privacy were maintained by keeping the identity as anonymous throughout the data entry, analysis, and writing of the manuscript.

The questionnaire was comprised of 5 sections: sociodemographic information, Patient System (PROMIS®) items, Patient Health questionnaire-2 (PHQ-2), Rose Dyspnea Scale (RDS), and Seattle Angina Questionnaire-7 (SAQ-7). In addition, the following information was also collected: enrollment in a health care program (HCP), smoking status, and adherence to medications. These questionnaires were translated forward and backward to Arabic and judged by cardiology consultants for face and content validity. The questionnaire was pretested (pilot study) on a separate group of cardiac patients to identify any ambiguity or overlaps.

Sociodemographic. A self-developed questionnaire based on sociodemographic information was administered. This questionnaire included information about the patient's age, gender, social status, education level, occupation, area of residency, income, enrollment in any HCP, smoking status,percentage of medication adherence and enrolled with health education program.

Patient-reported outcome measurements information system. Initially developed by Cella et al[14] and validated by Gruber-Baldini et al,[15] PROMIS® consists of 2 parts. The first part expresses the degree of quality of life, with questions about the patient's general perception of their health, quality of life, general physical health (GPH), and general mental health (GMH). The second part explores fulfillment and pleasure with social activities and relationships. The questionnaire is scored from 0 to 20, with zero denoting the worst possible physical and mental condition and 20 representing an unremarkable health status. The Cronbach'salpha value for the PROMIS was 0.81.

Rose dyspnea scale. The RDS was developed by Rose et al,[16] and is composed of 4 questions regarding the level of dyspnea observed; accordingly, these questions are directed to which act causes shortness of breath. One point is assigned to each activity associated with dyspnea; the score ranges from 0 to 4, with a score of 0 indicating no dyspnea, whereas a score of 4 designates significant dyspnea.[16] The Cronbach's alpha value for the RDS was 0.86.

Patient health questionnaire-2. The PHQ-2 is scored from 0 to 6 and has been validated by Kroenke et al[17] as a screening tool for depression by assessing how often feelings of depressed mood and anhedonia have occurred in the past 2 weeks, with responses ranging from 0 "not at all" to 3 "nearly every day". As the PHQ-2 depression severity increases from 0 to 6, a PHQ-2 score of ≥3 demonstrates a sensitivity of 83% and a specificity of 92% for diagnosing major depression, making it the optimal cutoff point for screening purposes.[17] The Cronbach's alpha value for the PHQ-2 was 0.86.

Seattle angina questionnaire-7. Developed and validated by Spertus et al,[18] the SAQ-7 is a 4-domain instrument (7 questions total) that quantifies the angina symptoms experienced in the past 4 weeks by asking the patient when the symptoms were first observed (varying from mild activity to strenuous activity) and its effect on the patient's quality of life.[18] The first domain (SAQ-7 PL) asks about physical limitations on specific activities. The second domain (SAQ-7 AF) assesses angina frequency and stability. The third domain (SAQ-7 QL) is a QoL score asking about life gratification and lifelong satisfaction with the patient's condition. Finally, a summary score averages the prior 3 domains. SAQ scores range from 0 to 100, with higher scores suggesting fewer angina attacks, improved activity tolerance, and better quality of life. To facilitate clinical analyses, the SAQ-7 PL score, the SAQ-7 QL score, and the summary score were categorized into ranges of 0-24 (poor to decent), 25-49 (decent to moderate), 50-74 (moderate to good) and 75-100 (good to excellent). SAQ-7 AF scores of 0-30, 31 60, 61-99, and 100 reflected angina attacks that occurred daily, weekly, monthly,or no angina.[19] The Cronbach's alpha value for the SAQ-7 was 0.80.

Statistical analysis. Data were analyzed using SPSS Statistical software for Windows version 26.0 (IBM Corp., Armonk, N.Y., USA). Descriptive statistics (frequencies, percentages, means, and standard deviations [SD]) were used to describe the categorical and quantitative variables. An independent Student's T-test was used to compare the mean scores for patient-related outcomes and cardiac symptoms between males and females. Initially, simple linear regression analysis was conducted to identify the meaningful factors associated with outcomes with unadjusted beta value and 95% confidence interval (CI), or those factors making

more than a 10% change in the dependent variable, which were retained in the final model. Multiple linear regression analysis was conducted separately between the sociodemographic variables and each outcome, namely, the GPH, GMH, PHQ-2, RDS, and SAQ-7 scores (including 4 domains), to identify the significant factors associated with dependent variables. Standardized beta coefficients and 95% CI are presented in a tabular format. A *p*-value of <0.05 was considered statistically significant.

Results. Of the 360 patients, 240 completed the questionnaire and were included in the final analysis. Table 1 depicts the comparison between males and females for the sociodemographic characteristics of the patients with ACS. Most of the sample data were males (60.8%) and were city dwellers (89.2%). The mean age of the sample was 61.88 (±11.92) years, ranging from 26 to 91 years. The female patients were older in age, widowed, and less educated as compared to male patients (p<0.05). Smoking was almost negligible among female patients (93.6% never smokers), where as nearly 50% (n=74) of male patients reported smoking on a weekly/monthly basis. No significant difference was observed between male and female patients concerning medicine compliance (66.4 % vs. 74%, p=1.87). Similarly, no significant difference was observed between males and females in response to whether enrolled in a healthcare program (10.3% males said yes vs. 8.5% females, p=0.651).

Table 2 compares mean scores between males and females regarding the patient-reported outcomes and cardiac symptoms. Significant differences were observed between males and females. Questions on general physical health found higher scores for males showing better physical health as compared to females [13.68 (±2.68) vs. 11.62 (±2.49), p=0.00]. Regarding the dyspnea symptoms, females manifested higher dyspnea symptoms compared to males (1.55 [±1.51] vs. 2.61 [±1.41], p=0.00). The GMH (14.16 [±2.89] vs. 13.45 [±3.08], p=0.068) and PHQ-2 scales (1.68 [±1.49] vs. 2.03 [±1.66], p=0.094) , measuring the mental health component found scores to be better for males compared to females, however, it was not statistically significantly different. The SAQ-Physical limitation category found females having lower scores reflecting higher limitations in carrying out daily work compared to the males [55.19 (±33.96) vs. 43.2 (±31.8); p=0.018), respectively. Although, statistically the difference is not significant, but the SAQ scale found better scores for males as compared to females regarding the remaining 3 domains, SAQ-AF (85.07 (±20.59) vs. 81.81 (±21.55),

Table 1 - Comparison of sociodemographic factors between male and female patients with acute coronary syndrome in Riyadh, Saudi Arabia (N=240).

Variables	Total N=240 (%)	Males n=146 (60.8%)	Females n=94 (39.2%)	*P*-value
Age in years				
Mean (±Standard diviation)	61.88±11.92	59.48±11.54	65.63±11.60	
<61	112 (46.7)	81 (55.5)	31 (33)	0.001
>61	128 (53.3)	65 (44.5)	63 (67)	
Marital status				
Married	174	132 (90.4)	42 (44.7)	
Single & divorced	21	11 (7.5)	10 (10.6)	0.000
Widow	45	3 (2.1)	42 (44.7)	
Educational level				
Elementary	88	32 (21.9)	56 (59.6)	
Middle school	32	18 (12.3)	14 (14.9)	0.000
High school	60	43 (20.5)	17 (18.1)	
College and above	60	53 (36.3)	7 (7.4)	
Occupation				
Worker	69	63 (43.2)	6 (6.4)	
Household	62	7 (4.8)	55 (58.5)	0.000
Retired	81	67 (45.9)	14 (14.9)	
Unemployed	28	9 (6.2)	19 (20.2)	
Family monthly income (Saudi Riyals)				
<10K	126	61 (41.8)	65 (69.1)	
10k-20k	89	65 (44.5)	24 (25.5)	0.000
>20K	25	20 (13.7)	5 (5.3)	

p=0.241), SAQ-QoL (67.64 (±25.49) vs. 61.17 (25.69), *p*=0.057) and SAQ-summary scores (70.47 (±19.95) vs. 65.40 (±21.26), *p*=0.062).

Table 3 presents the simple linear regression analysis for the association between *p* the patient-reported outcome scores and the cardiac symptom scores with sociodemographic variables. Among the patient-reported outcomes, GPH, GMH, dyspnea scores, and SAQ-AF and SAQ-7 were significantly associated with different sociodemographic variables such as female gender, increasing age, marital status (widow and divorcee in comparison to married), increasing educational level from elementary to high level, occupation (housewives and retired category and unemployed category vs. working) and increasing income from <10K to >20K (in Saudi Riyals).

Table 4 displays separate multiple linear regression model with adjusted correlation coefficient (beta) and 95% confidence interval for the relationship between sociodemographic variables for each of the dependent (outcome) variables, that is patient-reported outcomes (both GPH and GMH), RDS, PHQ-2 and the SAQ along with subscales. After adjusting for other sociodemographic factors, female gender remained the factor most frequently associated with various outcome measures. Related to the PROMIS®, change from male to

Table 2 - Comparison of patient related outcome scores and Angina symptom scores between male and female patients with Acute Coronary Syndrome in Riyadh, Saudi Arabia.

Quality of life scales	Male Mean (±SD)	Female Mean (±SD)	Mean difference (95% CI)	*P*-value
GPH	13.68 (±2.68)	11.62 (±2.49)	2.06 (1.38, 2.74)	0.000
GMH	14.16 (±2.89)	13.45 (±3.08)	0.72 (-.05, 1.48)	0.068
Rose dyspnea scale	1.55 (±1.51)	2.61 (±1.41)	-1.05 (-1.43, -0.67)	0.000
PHQ-2	1.68 (±1.49)	2.03 (±1.66)	-.35 (-.75, .06)	0.094
SAQ7- PL	55.19 (±33.96)	43.22 (±31.83)	11.97 (2.05. 21.88)	0.018
SAQ7- AF	85.07(±20.59)	81.81 (±21.55)	3.26 (-2.20, 8.72)	0.241
SAQ7- QoL	67.64 (±25.49)	61.17 (25.69)	6.47 (-.19, 13.12)	0.057
SAQ7 – Summary	70.47 (±19.95)	65.40 (±21.26)	5.07 (-.26, 10.40)	0.062

GPH: Global physical health, GMH: Global Mental Health, PHQ-2: Patient health questionnaire, SAQ7-PL: Seattle angina questionnaire physical limitation, SAQ7-AF: Seattle angina questionnaire angina frequency, SAQ7-QoL: Seattle angina questionnaire quality of life

Table 3 - Simple linear regression analysis showing association between sociodemographic factors and the patient related outcomes and Angina symptoms in patients with Acute Coronary syndrome in Riyadh, Saudi Arabia.

Variables	Beta coefficients with (95% CI)							
	GPH	GMH	Dyspnea scale	PHQ-2	SAQ7- PL	SAQ7- AF	SAQ7- QoL	SAQ7 – Summary
Gender Female vs Male	-.36 (-2.74, -1.38)	-.12 (-1.5, .05)	.33 (.67, 1.43)	.11 (-.06, .75)	-.17 (-21.88, -2.06)	-.08 (-8.72,2.20)	-.12 (-13.13, .19)	-.12 (-10.41, .26)
Age	-.20 (-.08, -.02)	-.05 (.05, .02)	.13 (.00, .03)	-.08 (-.03, .01)	-.17 (-.72, .10)	.06 (-.11, .34)	.11 (-.03, .52)	.10 (-.05, .39)
Social status Divorcee vs married	-.04 (-1.69, 0.82)	-.10 (-2.41, .26)	.02 (-.56, 0.84)	.21 (0.45, 1.83)	-.001 (-16.96, 16.83)	-.01 (-9.97, 8.96)	-.05 (-16.39, 6.77)	-0.12 (-10.53, 8.03)
Widow vs married	-.18 (-2.16, -0.38)	-.05 (-1.37,0.57)	0.27 (0.59, 1.57)	-.05 (-.70, 0.32)	-.09 (-20.92, 4.41)	-.13 (-13.65, -0.6)	-.05 (-11.93, 4.84)	-.08 (-11.13, 2.26)
Education	.31 (.42, .98)	.16 (.09, .71)	-.36 (-.62, -.32)	-.08 (-.27, .06)	.14 (-.14,7.82)	.13 (.09, 4.46)	.12 (-.10, 5.26)	.12 (-.16, 4.14)
Occupation Retired vs Working Housewife	-.03 (-.87, .58)	-.02 (-.92, -.63)	.04 (.29, 0.52)	-.17 (-.93, -.13)	-.06 (-14.07, 5.43)	-.02 (-6.35, 4.54)	.08 (-2.28,11.02)	-.001 (-5.39, 5.29)
Unemployed vs working	-.18 (-2.64, -.46)	-.003 (-1.21,1.15)	.16 (0.15, 1.38)	.18 (.28, 1.50)	-.06 (-23.38, 10.36)	-.09 (-14.60, 1.98)	-.11 (-19.16,1.13)	-.07 (-12.76,3.53)
Income	.22 (.54, 1.93)	.17 (.26, 1.76)	-.16 (-.88, -.10)	-.02 (-.46, .34)	-.05 (-12.68, 6.47)	.14 (.51, 11.11)	.18 (2.79, 15.69)	.09 (-1.71, 8.76)

1. Social status comprised of 3 levels: Married; Separated or divorced; Widow or widower. 2. Education comprised of 2 levels: High school and above; Elementary and High school. 3. Occupation comprised of 3 levels: Working; Household & retired; Unemployed, CI: confindecne interval, vs: versus, GPH: Global physical health, GMH: Global Mental Health, PHQ-2: Patient health questionnaire, SAQ7-PL: Seattle angina questionnaire physical limitation, SAQ7-AF: Seattle angina questionnaire angina frequency, SAQ7-QoL: Seattle angina questionnaire quality of life

Table 4 - Multiple linear regression analysis showing association between sociodemographic factors and the patient related outcomes and Angina symptoms in patients with Acute Coronary syndrome in Riyadh, Saudi Arabia.

Variables	Standardized beta coefficients (95% CI)							
	GPH[1]	GMH[2]	Dyspnea scale[3]	PHQ-2[4]	SAQ7- PL[5]	SAQ7- AF[6]	SAQ7- QoL[7]	SAQ7 – Summary[8]
Gender	-.33 (-2.42, -1.00)	-.08 (-1.30, .33)	.30 (.55, 1.37)	.14 (.004, .87)	-.19 (-23.68, -2.60)	.03 (-5.45, 8.09)	-.12 (-13.23, .72)	-.14 (-11.34, -.04)
Age	-.11 (-.06, .003)	-.05 (-.05, .02)	.05 (-.01, .02)	-.13 (-.03,.002)	-.06 (-.62, .25)	.19 (.07, .59)	.17 (.07, .65)	.16 (.05, .52)
Monthly Family Income	.13 (.02, 1.40)	.16 (.18, 1.75)	-.07 (-.62, .17)	.008 (-.39, .44)	-.16 (-17.77, 2.21)	.06 (-.36, 8.54)	.18 (1.87, 15.30)	.06 (-3.12, 7.76)

Adjusted Rsquare for GPH[1] GMH[2] RDS[3] PHQ[4] SAQ-PL[6] SAQ-AF[6] SAQ-QoL[7] SAQ-summary scores[8] were 15%, 3%, 16%, 5%, 5.5%, 4%, 6% and 5% respectively. GPH: Global physical health, GMH: Global Mental Health, PHQ-2: Patient health questionnaire, SAQ7-PL: Seattle angina questionnaire physical limitation, SAQ7-AF: Seattle angina questionnaire angina frequency, SAQ7-QoL: Seattle angina questionnaire quality of life, CI: confidence interval

female gender was associated with a significant decrease in GPH scores (-0.33 [-2.42, -1.00]), a significant increase in dyspnea symptoms (0.30 [0.55, 1.3]), an increase in depression scores (0.14 [0.004, 0.87]). In contrast, a unit increase in monthly family income was associated with a significant elevation in GPH scores (0.13 [0.02, 1.40]) and GMH scores (0.16 [0.18, 1.75]). The adjusted R square explaining the variance for the predictor variables for the GPH was 15%, whereas, for GMH and PHQ-2, the variance explained was only 3% and 5%. Variables such as gender, age, occupation and education were able to explain 16% variance related to dyspnea scores.

Related to SAQ, female gender in comparison to male,indicated a significant association with a decline in SAQ7-PL (-0.19 [-23.68, -2.60]) and the SAQ7 summary scores (-0.14 [-11.34, -0.04]), respectively. In addition to gender, advanced age remained significantly associated with angina scores, with an increase in age exhibiting a significant surge in SAQ-AF (0.19 [0.07, 0.59]), SAQ7- QoL [0.17 (0.07, 0.65)] and SAQ7 summary scores (0.16 [0.05, 0.52]). Also, a unit increase in monthly family income displayed a significant relationship with an increase in SAQ7-QoL scores (0.18 [1.87, 15.30]). Adjusted R square value for the variance explained for SAQ-PL,SAQ-AF,SAQ-QoL,SAQ-summary scores were 5.5%, 4%, 6% and 5% respectively.

No significant associations were observed between occupation and any of the patient-reported outcomes and cardiac symptoms, including GPH (-0.004 [-0.34, 0.36]), GMH (0.10 [-0.11, 0.69]), dyspnea scale (-0.01 [-0.22, 0.18]), PHQ-2 (0.03 [-0.16, 0.26]), SAQ7-PL (-0.05 [-6.93, 3.28]), SAQ7-AF (-0.12 [-5.25, 0.35]), SAQ7-QoL (-0.01 [-3.64, 3.15]), and SAQ7 summary (0.07 [-4.18, 1.32]). All associations were adjusted for adherence to medicine and whether enrolled in a health education program. However, none of the model found any significant association with these two variables.

Discussion. Patient outcomes, such as physical health, mental health, and severity of symptoms, are heavily impacted by sociodemographic factors. Gender emerged as a significant factor influencing patient outcomes, with distinct disparities observed between males and females. Across various metrics, including GPH, males consistently reported higher scores, indicating better health quality than females. This disparity persisted even after controlling for potential confounding variables, as evidenced by the significant associations observed in the linear regression analyses. Gender disparities have been noted in several studies performed in our region, where males are more prone to have ACS, yet females exhibited poorer results regarding physical and mental and social health.[8-10,20] Saquib et al[12] demonstrated a notable, yet statistically insignificant, difference concerning gender, as females had a higher percentage of depression after myocardial infarction (MI) as compared to men. This lack of effect may be due to the small number of females to male patients in the study (65 to 199, respectively), however, the findings in itself are of significance. Factors such as physical inactivity, unhealthy diet, and high cardiac risk profile were prominent risk factors mentioned by previous studies.[12,13]

Lacey and Walters[21] also observed that women had less improvement in terms of physical functioning than men,and our findings regarding the gender differences in terms of physical health and physical limitations were concordant, thus emphasizing the importance of physical activity among participants with ACS, especially females. Generally, physical activity is low

amongst Saudi women, and if in addition, they are diagnosed with cardiac disease, this inactivity reaches to maximum as women tend to confine themselves to their home and routine.[21] Although several initiatives, such as female specific fitness centers, transportation access, sports opportunities have been implemented to improve women's physical activity, they have been unsuccessful, especially among middle-aged women. A previous community-based study from Riyadh identified that a sedentary lifestyle was associated with increased cardiovascular risk scores, thus emphasizing the importance of physical activity.[22]

Mehilli et al[23] emphasized that casual attitudes towards females can lead to delays in their medical treatment and a misinterpretation or undermining of their ACS symptoms. Furthermore, the delivery of evidence-based medical interventions in older females was incredibly less in comparison to males due to the vague presentation of ACS in older females.[23] Although women are gradually performing a more active role in society and fields of employment, the norms and attitudes portrayed by the Saudi culture are predominantly male-dominated. As such, priority is not granted to females regarding their healthcare and overall well-being.[24,25]

The mental health domain established females as low scoring as compared to males, thus highlighting the importance of mental health when treating female cardiac patients. Among the 4 items under GMH, 2 questions, one related to QoL and the second regarding satisfaction with relationships, were answered differently by the genders, with a higher percentage of women mentioning poor QoL and lack of satisfaction. This outcome may be reflected in the lack of social support services, especially for women, as they have multiple societal responsibilities.[12] Brezinka et al[11] stated that women (employed and with a family/children)suffer from an increased psychological burden and unsatisfactory adjustment after an MI and have an increased risk of mortality. Also, poor medication adherence or discontinuing rehabilitation programs was higher in females as compared to males due to poor advocacy by physicians for rehabilitation, lack of means of transport, or underprivileged insurance.[11] Although in our sample, adherence to medicine was not statistically different between males and females, however we observed similar trend with men adhering to medicines regularly in comparison to women.

Old age is a risk factor for atherosclerotic disease due to age-related physiological changes, frailty, and functional cognitive decline.[26] Age in our study was a significant predictor for poor quality of life after diagnosis with ACS, in contrast to what Imam et al[27] described in their research. This discrepancy can be attributed to the small number of participants and their data spread (the age variable had an SD of 10.5 years in their study), which may have led to less accurate analysis. Furthermore, Sangoof et al[9] conducted a study at King Abdulaziz Hospital in Jeddah with 367 patients and determined a significant association between age and quality of life. Hawkes et al[28] discovered a significant correlation between age and physical limitations among older patients, consistent with our findings. Specificaly, as age increases, there is a corresponding decline in physical health scores. However, compared to physical health, older patients displayed better mental health than their younger counterparts, which was consistent with our findings in SAQ-QoL scores.[29] The observed trend might result from older individuals' acceptance of their physical limitations and their reduced dependence on employment, as most are retired, in contrast to the younger demographic.[21] Older individuals often experience worse dyspnea symptoms after an ACS episode due to several interrelated factors. Age-related alterations in cardiovascular physiology are essential in this context.[26] Older adults commonly manifest reduced left ventricular (LV) compliance and heightened myocardial stiffness, which can amplify the elevation in LV end-diastolic pressure during ischemic events.[29] Moreover, the American Heart Association reported that older patients often present with atypical symptoms, such as dyspnea, as opposed to the classic chest pain observed in younger counterparts. This atypical presentation has the potential to impede timely diagnosis and treatment, consequently exacerbating outcomes.[30]

Patient improvement in SAQ-AF, GPH, GMH, and RDS scores was observed concomitantly with higher education levels due to a heightened perception of their condition, frequent follow-up, and healthy behaviors; these results are in alignment with symptoms reported as worsened in Korean patients with a low education level.[31] Notably, management and development of patient educational levels would help improve their symptoms aside from enhancing other aspects such as lipid profile, blood glucose, recurrent admission, and overall quality of life.[31]

Although occupation was not significant in our regression model, Warraich et al[32] linked employment status to differences in QoL scores, with unemployed patients facing financial hardships and exhibiting poorer medication adherence than their employed counterparts. If we consider income as a proxy indicator for occupation, than low income had a negative

association with QoL. Pocock et al[33] emphasized that higher angina grades had a higher risk of the patient becoming unemployed. In contrast, patients with grade 2 to 4 angina had an increased risk of unemployment by 3-fold at 2 years in comparison to patients without angina. Regarding employment status, of 218 patients who had cardiac issues and were employed, 77% remained employed after 2 years of intervention. On the other hand, of the 265 patients who did not work because of cardiac reasons, 45% returned to work 2 years after intervention, and the remainder were not able to work due to their coronary disease.[33]

Income disparities significantly impacted health outcomes post-myocardial infarction, with low-income individuals experiencing higher mortality rates and poorer health outcomes. Additionally, access to essential care procedures like catheterization is often limited among those patients with lower incomes.[34] Considering a patient's income status challenges physicians in customizing care plans to achieve desired outcomes.[35] Individuals with low incomes are more prone to experiencing multiple risk factors, such as diabetes, heart failure, high blood pressure, and acute coronary syndrome, as compared to those patients with higher incomes.[36] Despite the government's efforts to provide nationwide access to healthcare, there are limited numbers of cardiac occupational therapy centers nationwide and even fewer cardiac centers available in rural areas.

Although significant on univariate analysis only, single participants (divorced/single) had more pronounced physical limitations and dyspnea symptoms in comparison to married participants. This could be attributed to a lack of social support and inadequate coping skills, which may impact the overall recovery process following an MI and consequently result in exaggerated severity of dyspnea among single or divorced participants.[37] Kim et al[38] addressed that a lack of social support was a predictor for depression and poor cardiac outcomes, which raises the need for a careful intervention plan in these patients. Furthermore, having social support was beneficial in coping with unfavorable outcomes among individuals diagnosed with acute coronary syndrome, particularly during significant life challenges.[39]

Our study strengths included using simple random sampling to select patients, thus reducing initial selection bias and ensured a diverse sample from various demographic backgrounds. Complete QoL was measured comprehensively using validated measures (PROMIS®, RDS, PHQ, and SAQ-7) enhancing the reliability of our findings. In addition, KKUH is a tertiary care hospital, and patients from all over the Saudi Kingdom have access to it. The model for the general physical health and the dyspnea symptoms generated an acceptable r-square value, however, the remaining of the models showed r-square value around 5-6%, which may be considered low, however, expert opinion suggests that for topics associated with social sciences low r-square value is expected and acceptable.[40] Hence, we believe our results are robust and can be generalized to other patients within the Kingdom. However, we also encountered certain limitations. First, we had a high non-response rate of approximately one-third, which may have introduced selection bias. The authors did not officially publish the validation of PROMIS® and SAQ-7 Arabic versions. Additionally, we did not measure important variables such as BMI, physical activity level, or psychosocial factors and support, hence not including them may have affected our results. Finally, the data were collected online; therefore, information and recall bias may have influenced the patient responses.

In conclusion, alongside age and monthly income, gender emerged as the most significantly associated factor with patient-reported outcomes and cardiac symptoms. Female patients reported lower QoL outcomes, ample physical limitations, and additional occurrences of dyspnea. Healthcare providers should consider these gender differences when managing patients with ACS to improve health outcomes. Additionally, understanding the sociodemographic status of patients with ACS is crucial for delivering effective healthcare and rehabilitation programs. Future prospective studies should consider differences in gender and other sociodemographic factors.

Acknowledgment. *We like to thank Mr. Bushra Hamid, working in the Women's Health Chair, King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia for his help and support in conducting this study. We acknowledge Cambridge Proofreading & Edintign LLC (info@cambridgeproofreading.com) for the English language editing.*

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