CARDIOLOGIE TUNISIENNE

ARTICLE ORIGINAL

Health-Related Quality of Life in Tunisian Patients with Coronary Artery Disease: A Cross-Sectional Study

Qualité de vie liée à la santé chez les patients tunisiens atteints de maladie coronarienne : étude transversale

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Résumé

Introduction : Les progrès dans la prise en charge de la coronaropathie ont considérablement amélioré la survie, entraînant une augmentation de l'espérance de vie. Toutefois, les patients doivent faire face à des symptômes et à des schémas thérapeutiques complexes au long cours, susceptibles d'altérer leur qualité de vie liée à la santé (QVLS). La QVLS des patients tunisiens atteints de coronaropathie ayant été insuffisamment étudiée, cette étude visait à l'évaluer et à en identifier les facteurs associés.

Méthodes : Nous avons mené une étude observationnelle transversale monocentrique incluant 150 patients consécutifs atteints de coronaropathie suivis en consultation externe de cardiologie. Les participants ont répondu à un entretien structuré basé sur un questionnaire incluant la version tunisienne validée du questionnaire SF-36 (*36-Item Short Form Health Survey*).

Résultats : L'âge moyen était de 62,7 ans ; 70,7 % des patients présentaient une bonne QVLS selon le score total du SF-36 (> 50), tandis que 59,3 % et 52,7 % avaient de bons scores pour les composantes physique et mentale, respectivement. L'analyse univariée a identifié les facteurs suivants comme étant significativement associés à une moins bonne QVLS (tous avec $p < 0,05$) : le sexe féminin, un âge avancé, un niveau d'éducation plus faible, le chômage, la dyslipidémie, le diabète, l'hypertension artérielle, l'insuffisance rénale, l'obésité, le tabagisme, la sédentarité, les hospitalisations répétées, les admissions pour insuffisance cardiaque aiguë ou infarctus du myocarde avec sus-décalage du segment ST (STEMI), l'atteinte coronarienne tritronculaire, les événements cardiaques récents, une fraction d'éjection ventriculaire gauche modérément réduite et une mauvaise observance du traitement médical.

Conclusion : La majorité des patients tunisiens atteints de coronaropathie ont rapporté une bonne QVLS. Cependant, plusieurs facteurs sociodémographiques, cliniques et comportementaux étaient associés à une moins bonne QVLS, nombre d'entre eux étant potentiellement modifiables. Ces résultats soulignent l'importance de la prise en charge des facteurs de risque cardiovasculaire, de l'éducation thérapeutique et d'une prise en charge pluridisciplinaire pour améliorer la QVLS au sein de cette population.

Mots-clés

Qualité de vie liée à la santé – Coronaropathie – Évaluation – Questionnaire

Summary

Background: Advances in the management of coronary artery disease (CAD) have significantly improved survival, resulting in longer life expectancy. However, patients must cope with symptoms and complex long-term treatment regimens that may adversely affect their health-related quality of life (HRQoL). As HRQoL in Tunisian patients with CAD has been insufficiently investigated, this study aimed to assess HRQoL and identify its associated factors.

Methods: We conducted a single-center, observational, cross-sectional study including 150 consecutive patients with CAD attending an outpatient cardiology clinic. Participants completed a structured interview using a questionnaire that included the validated Tunisian version of the 36-Item Short Form Health Survey (SF-36).

Results: The mean age was 62.7 years. Overall, 70.7% of patients had good HRQoL according to the SF-36 total score (>50) , while 59.3% and 52.7% had good physical and mental component scores, respectively. Univariate analysis identified female sex, older age, lower educational level, unemployment, dyslipidemia, diabetes mellitus, hypertension, renal failure, obesity, smoking, physical inactivity, recurrent hospitalizations, admissions for acute heart failure or ST-segment elevation myocardial infarction (STEMI), multivessel coronary artery disease, recent cardiac events, mildly reduced left ventricular ejection fraction, and poor adherence to medical treatment as factors significantly associated with poorer HRQoL (all $p < 0.05$).

Conclusion: Most Tunisian patients with CAD reported good HRQoL. However, several sociodemographic, clinical, and behavioral factors were associated with poorer HRQoL, many of which are potentially modifiable. These findings underscore the importance of cardiovascular risk factor management, therapeutic education, and multidisciplinary care to improve HRQoL in this population.

Keywords

Health-related Quality of life - Coronary artery disease – Assessment- Questionnaire

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INTRODUCTION

With the rise in the incidence of cardiovascular risk factors, Coronary artery disease (CAD) remains a major global health issue (1) despite reductions in morbidity and mortality rates due to advancements in therapeutic approaches. Given the prolonged life expectancy resulting from these advancements, patients have to manage CAD symptoms and complex treatment plans over a long duration, affecting as a result their Health-related Quality of life (HRQOL) (2). From a cardiologist's perspective, the assessment of CAD is predominantly medically oriented: generally focusing on specific signs and symptoms indicating which may significantly underestimate patients' poor HRQoL (3), because it is not just limited to symptoms due to CAD. Thus, evaluating HRQoL is crucial in managing CAD because it can help clinical decision-making (4) since the aim of treatment is not just to extend life, but also to relieve symptoms and maximize the highest achievable level of HRQOL, within the constraints imposed by CAD.

Moreover, research on the effects of CAD has primarily focused on mortality risk, survival rates, and serious complications, as well as symptoms like pain and dyspnea. Whereas, other important aspects encountered by clinicians in their daily practice are understudied, such as the patients' satisfaction with treatment, their mental state (including emotions and self-assessment), their perception of health status and the impact of the disease on their social life and work efficiency. Thus the importance of focusing on patients' HRQoL in order to bridge the gap between research and clinical practice (4).

The aim of our study was to assess the HRQoL in Tunisian patients with coronary artery disease and to specify its associated influencing factors.

METHODS

Study design

This was an observational, descriptive and cross-sectional single-center study that was carried out at the cardiology department of HABIB THAMEUR teaching hospital of Tunis. It included patients over the age of 18 years old, treated for CAD seen in outpatient consultation. We included patients having Complete coronary revascularization (Percutaneous coronary intervention (PCI) or Coronary artery bypass grafting (CABG)) done at least 12 months prior to the interview. We didn't include patients with a history of psychiatric or cognitive disorders that may impair an oral interview.

Patients with incomplete coronary artery revascularization or serious comorbidities (such as a malignant tumor, terminal kidney-failure, sequelae of stroke, amputation, end-stage heart-failure, severe valvular heart disease …) were excluded.

Study protocol

Sample size calculation: An a priori sample size calculation was performed using GPower 3.1 for multiple linear regression (fixed model, R^2 deviation from zero). Assuming a medium effect size ($f^2 = 0.15$), a significance level of 0.05, a statistical power of 85%, and 15 predictors, the required minimum sample size was 150 participants.

Patients seen in outpatient consultation during the study period and meeting the inclusion criteria were consecutively added to the study. The data from each patient was collected, after obtaining a written consent, through an individual fully-structured interview that contained : The patient's Age, Sociodemographic characteristics and Habits, The patient's medical history, Transthoracic echocardiographic findings, Angiographic findings and revascularization protocol.

Therapeutic aspects: Adherence to optimal medical treatment, smoking cessation, and physical activity.

Finally The 36-Item Short Form Health Survey (SF-36) : It is a widely used generic instrument for assessing health-related quality of life (HRQoL) (5). In this study, the version translated into the Tunisian dialect and culturally adapted and validated for the Tunisian population was used (6). The questionnaire comprises 36 items that evaluate eight domains of health status:

Physical Functioning (PF): assesses limitations in performing physical activities. Role Limitations due to Physical Problems (RP): evaluates the extent to which physical health interferes with work or other daily activities. Bodily Pain (BP): measures pain intensity and its impact on normal activities. General Health (GH): assesses individuals' overall perception of their health. Vitality (VT): evaluates energy levels and fatigue. Social Functioning (SF): measures the impact of physical and emotional health on social activities. Role Limitations due to Emotional Problems (RE): assesses limitations in daily activities resulting from emotional difficulties. Mental Health (MH): evaluates psychological well-being, including symptoms of anxiety and depression.

These subscales are regrouped into 2 scales: 1. Physical component scale (PCS) : PF, RP ,BP ,GH 2. Mental component scale (MCS) : VT, SF, RE and MH

The 36-Item Short Form Survey (SF-36) is scored through

a standardized, multi-step algorithm that translates raw patient responses into quantifiable health metrics; Step 1: Item Recoding: The raw answers from the questionnaire are first recoded. This step ensures that a higher score always indicates a better state of health (including reverse-scoring negatively phrased questions so that higher values consistently represent better health outcomes)

Step 2: Transforming to a 0-100 Scale: Once the items are recoded, the scores for the items in each of the 8 domains are averaged together. Then, these raw scale scores are transformed into a 0–100 scale using this formula:

$$\text{Transformed Score} = \left(\frac{\text{Actual Raw Score} - \text{Lowest Possible Raw Score}}{\text{Possible Raw Score Range}}\right) \times 100$$

Scores for each of the eight domains are calculated independently; therefore, no overall SF-36 total score is recommended.

Interpretation of SF-36 Domain Scores

SF-36 domain scores range from 0 to 100, with higher scores indicating better health-related quality of life. No universal cutoff values have been established to define poor or good health-related quality of life using the SF-36. Therefore, domain scores were interpreted as continuous variables, in accordance with the recommendations of the SF-36 developers (5).

According to similar studies, Points greater than 50 indicate a preserved or good QOL (7)

Statistical analysis

All analyses were carried out using SPSS for Windows (version 25.0, SPSS Inc., Chicago, Illinois). We conducted a descriptive study followed by an analytical study. For qualitative variables, we calculated absolute frequencies and percentages. For quantitative variables, we computed means, medians, standard deviations, and determined the extreme values. Concerning Analytic study, Continuous variables were compared using independent samples t test. The correlation between continuous variables was tested using Pearson correlation test. Differences between proportions were evaluated by Pearson Chi-square test or Fisher's exact probability test. In multi-variate analyses, we applied a linear regression analysis to identify which of the following factors remains associated to MCS, PCS and SF-36 after adjusting for confounding variable. A p-value < 0.05 based on two-sided calculation was considered statistically significant.

RESULTS

Of the 183 patients with a history of CAD eligible for this study were seen in outpatient consultation from July to December 2023, 33 patients were excluded, as a result 150 patients eligible for the study were included.

The mean age of study population was 62.7 ± 12.8 years and ranging from 38 to 76 years with a male predominance (sex ratio: 3.6 with 118 men and 32 women.)

The sociodemographic data, comorbid conditions, clinical characteristics, echocardiographic findings, revascularization data and therapeutic aspects of this study are presented in Table 1:

Table 1. Demographic, clinic and para-clinic characteristics

Socio-demographic and economic characteristics	
Age (Y/O)	62.7±12.8
Gender	
• Male (n,%)	118 (79)
• Female (n,%)	32 (21)
Marital status	
• Married (n,%)	117 (78)
• Single (n,%)	33, 22
Level of education	
• Illiterate (n,%)	24, 16
• Instructed (n,%)	126, 84
Living environment	
• Urban (n,%)	117, 78
• Rural (n,%)	33, 22
Occupation	
• Employed (n,%)	75, 50
• Retried/jobless (n,%)	75, 50
Insurance coverage	
• Yes (n,%)	104, 69
• No (n,%)	46, 31
Habits	
• Smoking (n,%)	36, 24
• Physical activity (n,%)	62, 41
Clinical characteristics	
Comorbidities	
• HTA (n,%)	91, 61
• Diabetes (n,%)	93, 62
• Dyslipidemia (n,%)	110, 73
• Obesity (n,%)	70, 47
• Chronic kidney disease (n,%)	68, 45
• Stroke (n,%)	6,4
Number of previous hospitalization	
• 1 time (n,%)	37, 25
• 2-4 times (n,%)	104,69
• ≥ 5 times (n,%)	9,6
Echocardiographic findings	
• Midely reduced LVEF (n,%)	59, 39
• Preserved LVEF (n,%)	91, 61
Angiographic data	
• Coronary status	
One vessel (n,%)	56,37
Two vessels (n,%)	64, 43
Three vessels (n,%)	30,20
• Number of implanted stents	
One (n,%)	56, 37
Two stents (n,%)	59, 39
Three or more stents (n,%)	34, 23
Therapeutic aspects	
• Number of medications	
>5 (n,%)	111, 74
<5 (n,%)	39, 26
• Adherence to optimal treatment	
Optimal (n,%)	110, 73
Not optimal (n,%)	40, 27

THE 36-ITEM SHORT FORM HEALTH SURVEY (SF-36)

We studied our population's participants according to their mental (MCS) (including VT, SF, RE, and MH), physical (PCS) (including PF,RP,BP and GH) and overall (SF36) scores. For the physical component, we observed the highest scores in the dimension Bodily pain (76.3) followed by Physical Functioning (71.1). The scores ranged from 5 to 100.

For the mental component, the items Social functioning and Mental Health demonstrated the highest means (65.4 and 57.4). The scores ranged from 5 to 100.

Table 2 summarizes SF 36 and its components scores.

Table 2. SF-36 Questionnaire scores

	Physical component					Mental component					Overall SF 36
	PF	RP	GH	BP	PCS	SF	VT	RE	MH	MCS	
Means	71,1	42,2	55,9	76,3	61,4	65,4	53,6	37,6	57,4	53,5	64,3
Standard Deviation	24,6	48,4	24,0	20,9	25,5	26,3	20,0	47,5	22,7	24,9	21,7
Minimum	0	0	0	23	14	13	10	0	16	14	20
Maximum	100	100	100	100	100	100	100	100	96	99	97
Percentage of patients having an altered score (%)	20	57.3	35.3	10.7	40.7	22.7	41.3				

PF : Physical Functioning ; RP : Role limitations due to Physical problems; RE : Role limitations due Emotional problems; VT : vitality; MH : Mental health; SF : Social functioning; BP : Bodily Pain; GH : General Health; PCS : Physical Component Score; MCS : Mental Component Score ;

ANALYTIC STUDY

Correlations between patient's age and the other demographic characteristics are reported in the figure 1 and table 3.

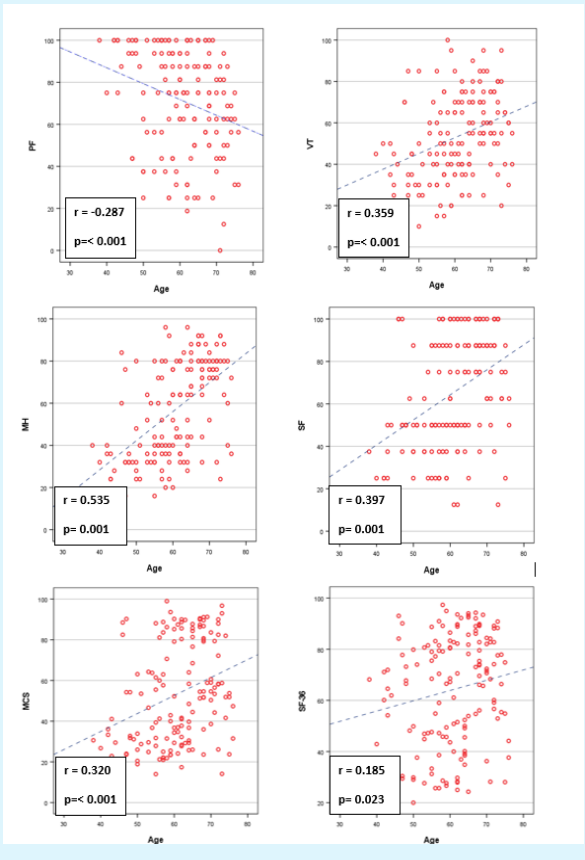

Figure 1. correlations of patient's age with physical functioning, vitality, mental health, social functioning, MCS and SF36

Association between sociodemographic characteristics and SF-36 summary scores:

For the overall SF-36 scores, men had significantly higher scores than women (67±22 vs. 54.2±17.3 , p = 0.001), and retired participants had the highest scores (72.9 ±20.5) compared with employed (62.6±22.4) and jobless participants (57.1±17.6; p = 0.007).

No significant differences were observed according to educational level (62.2 ±23.5 vs. 65.3±20.8 , p = 0.413), social insurance coverage (62.1± 20.1 vs. 65.2±22.4 , p = 0.420), living environment (63.9±20.9 vs. 64.4±22 , p = 0.918), or marital status (63.3± 22.8 vs. 67.5±17.5 , p = 0.262).

Similarly, the Physical Component Summary (PCS) score was significantly higher in men than women (65.1±26 vs. 47.6±17.7, p < 0.001), in instructed than illiterate participants (64.3±24.7 vs. 55.6±26.3, p = 0.049), and differed according to occupation, with retired participants reporting the highest score (66.7±23.9) and jobless participants the lowest (47.7±17.3; p = 0.006). No significant associations were found with social insurance coverage, living environment, or marital status (all p > 0.05).

For the Mental Component Summary (MCS), men had significantly higher scores than women (56.4±25.6 vs. 42.6±18.9 , p = 0.001), and retired participants again had the highest score (65.2±23.8) compared with employed (50.9±25.4) and jobless participants (44.5±19.3 ; p = 0.001). No significant differences were observed according to educational level (55.8±25.3 vs. 52.3±24.8, p = 0.423), social insurance coverage (52.5±24.6 vs. 53.9±25.5, p = 0.742), living environment (55.8 ±24.2 vs. 52.8±25.2, p = 0.553), or marital status (53±25.7 vs. 55.2±22.6, p = 0.654).

Association between Quality of life and history of coronary artery disease:

Table 3 summarizes association between quality of life and patients' history of CAD;

Table 3. Association between Quality of life and history of coronary artery disease

	MCS mean±SD	P	PCS mean±SD	P	SF36 mean±SD	P
Comorbidities						
• Tobacco						
Yes	56.2±25.7	0.031	65.6±24.8	0.001	67.5±26.5	0.005
No	47.3±21.94		51.9±25.2		56.9±23.5	
• Diabetes						
Yes	51.3±24.27	0.168	56.2±24.7	0.001	60.4±24.8	0.004
No	57.1±25.8		69.8±25.2		70.7±25.6	
• Arterial hypertension						
Yes	54.2 ±23,5	0.672	58.0±25.5	0.044	62.5±25.8	0.241
No	52.4±27.2		66.6±24.7		66.8±25.4	
• Dyslipidemia						
Yes	54.5±24.5	0.384	59.4±27.1	0.120	63.3±26.5	0.343
No	50.5±26.13		66.7±23.4		67.1±24.6	
• Obesity						
Yes	38.8±19.5	<0.001	45.7±25.3	<0.001	49.2±25.8	<0.001
No	66.3±22		75.1±24.1		77.5±259	
• Chronic kidney disease						
Yes	53.8±24.72	0.880	55.1±27.2	0.005	60.7±23.4	0.064
No	53.2±25.26		66.6±25.3		67.3±24.7	
• Stroke						
Yes	54.6±29	0.910	54.4±25.6	0.494	59.3±26.3	0.571
No	53.4±24.8		61.7±24.2		64.5±26.2	
Number of previous cardiovascular hospitalizations						
1	47.1±	0.039	66.6±24.3	0.005	66.4±25.5	0.020
2-4	56.8±		61.7±25.6		65.2±24.8	
≥5	41.2±		36.4±25.4		44.9±20.4	
Reason of hospitalization						
• Stemi						
Yes	50.9±	0.376	58.4±24.5	0.318	61.5±24.6	0.265
No	54.8±		62.8±25.6		65.7±22.5	
• Nstemi						
Yes	54.3±	0.623	25.3±27.6	0.681	64.5±23.6	0.876
No	52.3±		60.3±23.5		63.1±24.8	
• Heart failure						
Yes	46.1±	0.041	48.1±22.5	<0.001	53.4±23.5	<0.001
No	55.8±		65.6±23.6		67.7±24.2	
• Chronic coronary syndrome						
Yes	52.6±	0.888	62.1±25.6	0.908	67.4±25.8	0.575
No	53.6±		61.3±25.4		64.0±26.3	
Coronary status						
• Single vessel disease	51.2±	0.262	66.3±23.5	0.019	67.2±28	0.019
• Two-vessels disease	57.3±		62.2±24.5		66.3±24.6	
• Three-vessels disease	49.6±		50.3±23.5		54.4±	
Left ventricular ejection fraction						
• <40%	32.9±	0.021	34.5±27.2	0.001	43.1±26.5	0.001
• 40-50%	56.6±		59.5±23.4		63.7±25.4	
• >50%	54.1±		65.3±25.8		66.9±24.9	
Therapeutic aspects						
• Smoking cessation						
Yes	56.7±	0.727	68.3±22.5	0.099	68.6±23.4	0.424
No	47.4±		52.1±24.7		57.1±23	
• Regular physical activity						
Yes	55.9±	0.324	69.9±24.5	<0.001	69.3±24.1	0.017
No	51.8±		55.6±24.8		60.7±22.4	
• Optimal medical treatment						
Yes	54.4±	0.462	65.1±27.8	0.03	66.8±25	0.016
No	51.0±		51.2±26.5		57.2±24.9	
• Treatment adherence						
Yes	54.6±	0.327	63.9±25.25	0.033	66.3±24.8	0.045
No	49.9±		53.5±24.5		58.0±24.6	

Multivariate analysis

We applied a linear regression analysis to identify which of the factors significantly associated to PCS in univariate analysis, remains associated to PCS after adjusting for the other variable, Results show that only obesity and hospitalization for acute heart failure remain associated to PCS while adjusting to other factors (as shown in table 4).

In the other hand, multivariate analysis show that only age and obesity, remain significantly associated to MCS after adjusting for the other variable. (table 4)

Concerning SF36, multivariate analysis show that only age, obesity and hospitalization for acute heart failure remain significantly associated to SF-36 after adjusting for the other variable.

Predictor	PCS, OR (95% CI)	p-value	MCS, OR (95% CI)	p-value	Total SF-36, OR (95% CI)	p-value
Age	—	—	1.1 (1.05-1.16)	<0.001	1.09 (1.025-1.17)	0.038
Obesity	14.46 (5.14-40.68)	<0.001	17.72 (7.23- 43.41)	<0.001	29.55 (9.6-90.1)	<0.001
Hospitalization for acute heart failure	4.2 (1.13-15.52)	0.031	—	—	24.92 (2.66 - 232)	0.005

Values are regression coefficients (OR) with 95% confidence intervals from multivariable linear regression models for PCS, MCS, and total SF-36. Only predictors retained as statistically significant in the final models are shown.

DISCUSSION

Main results and methodological considerations

Our study showed that only 29.3% of patients had an impaired overall HRQoL (SF-36 total), while 40.7% and 47.3% presented reduced physical (PCS) and mental (MCS) component scores, respectively.

Multivariate analysis identified obesity, hospitalization for acute heart failure, and age as the main independent determinants of HRQoL. Obesity was independently associated with lower SF-36 total (OR = 29.55; 95% CI: 9.6 to –90.1), PCS (OR = 14.46; 95% CI: 5.14 to 40.68), and MCS (OR= 17.72; 95% CI: 7.23 to 43.1) scores.

Hospitalization for acute heart failure was also independently associated with lower SF-36 total (OR= 24.92; 95% CI: 2.66 to 232) and PCS (OR = 4.2; 95% CI: 1.13 to 15.52).

Increasing age was independently associated with higher SF-36 total (OR = 1.09; 95% CI: 1.025 to 1.17) and MCS (OR =1.1; 95% CI: 1.05 to 1.16).

A major strength of this study is the use of the SF-36 questionnaire, one of the most widely validated instruments for assessing HRQoL. Furthermore, the Tunisian Arabic version used in this study has been culturally adapted and validated for the Tunisian population (6).

Nevertheless, several limitations should be acknowledged, including the relatively small sample size (150 patients), the single-center design, and the absence of a control group of individuals without coronary artery disease, which may limit the generalizability of our findings.

Factors associated with the deterioration of Health-related quality of life

Gender and age

Our population showed a male predominance (78.7%), consistent with previous HRQoL studies among patients with coronary artery disease conducted in Europe (8), and Canada (9). However, women had significantly lower MCS, PCS, and total SF-36 scores, in agreement with several studies (8,9–11).

Regidor et al. (12) attributed the poorer HRQoL among women to the cumulative burden of domestic responsibilities, childcare, work-related demands, and occupational inequalities. Furthermore, Norris CM et al. demonstrated that depressive symptoms are more prevalent among women with CAD and are associated with poorer recovery after cardiac events (10).16

Our results showed that physical functioning declined with age, whereas vitality, mental health, social functioning, MCS, and total SF-36 scores improved. Similar findings have been reported in recent studies (8,13–15), suggesting that older patients experience poorer physical but better mental HRQoL. J Am Coll et al. (13) proposed that higher mental health and vitality scores in older adults reflect greater acceptance of reduced health status compared with younger patients.

The decline in physical functioning observed with advancing age has also been reported elsewhere (8,16) and is likely related to the higher burden of chronic diseases and comorbidities among older patients, resulting in poorer physical HRQoL

The mean age of our population was 62.7 ± 12.8 years, with 39.3% of patients aged 60–70 years, consistent with previous studies (8). This finding is expected, as age is a well-established cardiovascular risk factor for CAD (13).

Our results showed that physical functioning declined with age, whereas vitality, mental health, social functioning, MCS, and total SF-36 scores improved. Similar findings have been reported in recent studies (8,10–12), suggesting that older patients experience poorer physical but better mental HRQoL. J Am Coll et al. (13) proposed that higher mental health and vitality scores in older adults reflect greater acceptance of reduced health status compared with younger patients.

Socio-economic factors: education and occupation

Our study showed that lower educational attainment (illiterate or primary education) and unemployment were associated with poorer HRQoL. Patients with lower education experienced greater bodily pain and reduced physical functioning, whereas unemployed patients had the lowest HRQoL scores. Similar associations have been reported in previous studies (1,2,14,17).

Falide et al. (17) and Barbareschi et al. (18) suggested that lower educational attainment limits patients' understanding of their disease and treatment, leading to poorer adherence, missed medical appointments, increased psychological distress, and reduced HRQoL. Conversely, higher education promotes better disease awareness, adherence to therapy, and healthier lifestyle behaviors, resulting in better physical health and overall HRQoL.

Most unemployed patients in our study attributed their job loss to recurrent chest pain after returning to work despite complete revascularization or to losing their employment following their first cardiac event, reflecting the substantial impact of CAD on daily functioning. Similar findings were reported by Crilley JG et al. (19). In contrast, employed patients reported better physical and overall HRQoL, likely reflecting the financial security, social support, and sense of purpose associated with continued employment.

Smoking and Comorbidities:

In our study, a history of tobacco smoking and comorbidities including obesity, diabetes, arterial hypertension, and chronic kidney disease (CKD) were associated with significantly poorer HRQoL.

Several studies have similarly reported lower HRQoL among CAD patients with a history of smoking compared with non-smokers (2,8,20). This effect, particularly on the physical component, has been attributed to reduced muscle strength and impaired physical performance associated with smoking (21). In addition, the lifestyle changes required for smoking cessation may temporarily increase psychological stress and adversely affect mental HRQoL.

Obesity was also associated with poorer HRQoL, consistent with previous studies showing higher rates of depression and lower HRQoL among obese patients compared with those with a normal BMI (10,22,23). Conversely, weight loss has been shown to improve HRQoL in patients with established CAD (24). These findings may be explained by obesity-related physical limitations and impaired self-image, which negatively affect both physical and mental well-being.

Patients with arterial hypertension also experienced poorer HRQoL, as reported in previous studies (2,8,20,25). The chronic nature of hypertension, long-term pharmacological treatment, dietary restrictions, and lifestyle modifications may adversely affect both the physical and mental components of HRQoL.

Similarly, diabetic patients had significantly lower PCS and total SF-36 than non-diabetic patients, in agreement with previous reports (2,4,9,10,25,26). Sherman et al. (27) attributed this decline to the chronic course of diabetes and its complications, including peripheral vascular disease, renal failure, and diabetic retinopathy.

Finally, CKD was associated with reduced HRQoL, consistent with several studies (28). Fraser et al. (29) attributed this impairment mainly to anemia-related symptoms such as weakness, dizziness, and dyspnea, whereas Sharma et al. (30) emphasized the limitations imposed by CKD on physical functioning, self-care, energy levels, and mental health, even in the early stages of the disease.

Disease Severity and Clinical History

Our findings indicate that disease severity and clinical history are major determinants of HRQoL in patients with CAD.

-Number and cause of hospitalizations: HRQoL declined as the number of hospitalizations for cardiac events increased, consistent with previous studies (31). Recurrent hospitalizations negatively affect both mental and physical well-being. Repeated cardiac events and their symptoms (angina, dyspnea, fatigue) increase anxiety about future events (32), reduce patients' expectations of returning to their premorbid health, and may contribute to depression. Moreover, persistent symptoms and complications such as heart failure further limit physical functioning, resulting in poorer overall HRQoL.

Patients hospitalized for STEMI or acute heart failure also had lower HRQoL scores than the rest of the cohort. STEMI often results in more extensive myocardial damage, prolonged recovery, and a higher risk of complications,

whereas hospitalization for acute heart failure was identified in our multivariate analysis as an independent predictor of impaired SF-36 total, physical, and mental scores. These findings are consistent with previous studies reporting poorer physical, psychological, and social HRQoL among CAD patients with heart failure (20,33).

Coronary artery status and left ventricular function. An increasing number of diseased coronary vessels was associated with lower PF, GH, PCS, and SF-36 scores, reflecting the impact of greater disease severity and the need for repeated hospitalizations and revascularization procedures on HRQoL. Likewise, reduced left ventricular ejection fraction impaired nearly all SF-36 domains, with the lowest scores observed in patients with LVEF <40%, consistent with previous reports (32-34). Wilson et al. (35) suggested that symptoms associated with left ventricular systolic dysfunction, including fatigue, dyspnea, and sleep disturbances, together with additional treatments, lifestyle modifications, and recurrent admissions for heart failure, contribute to poorer functional status and reduced HRQoL.

Lifestyle Modifications

Our study demonstrated a significant positive association between regular physical activity and HRQoL, with physically active patients presenting higher PCS and SF-36 scores. These findings are consistent with previous studies highlighting the role of exercise in slowing disease progression and improving both quality and length of life (36). Kontoangelos et al. (37) further showed that greater exercise intensity and duration were associated with better HRQoL.

In contrast, we found no significant association between smoking cessation and PCS, MCS, or SF-36 scores. However, previous studies have consistently reported poorer HRQoL among persistent smokers following coronary revascularization (38). Persistent smoking impairs endothelial function and coronary blood flow, resulting in persistent angina and reduced exercise capacity after angioplasty (39).

Medication adherence

Optimal medical therapy adherence was achieved in 73.3% of our patients and was associated with higher PCS and overall SF-36 scores. These findings agree with previous studies (39). The American College of Cardiology/American Heart Association Task Force (40) emphasized that sustained adherence to evidence-based therapy improves clinical outcomes and, consequently, HRQoL. This benefit is likely mediated by favorable cardiac remodeling, maintenance of coronary perfusion after revascularization, and improved physical functioning, ultimately enhancing both physical and overall HRQoL

CONCLUSION

Coronary artery disease (CAD) remains a major global health challenge, imposing a substantial burden on healthcare systems and patients, including in Tunisia. Although recent therapeutic advances have improved prognosis and survival, health-related quality of life (HRQoL) among Tunisian CAD patients remains insufficiently explored.

In our study, the majority of patients reported a good HRQoL based on the overall SF-36 score and its physical and mental component summaries. However, several factors were significantly associated with lower HRQoL, including female sex, advanced age, low educational level, unemployment, dyslipidemia, diabetes, hypertension, renal failure, obesity, smoking, physical inactivity, recurrent hospitalizations, admissions for acute heart failure or STEMI, multivessel coronary disease, recent cardiac events, mildly reduced left ventricular ejection fraction, and poor adherence to medical treatment.

Our findings highlight the importance of identifying and addressing these determinants, many of which are modifiable, to improve the well-being of CAD patients. Regular assessment and management of cardiovascular risk factors, optimization of medical therapy, and reinforcement of therapeutic education should be integrated into routine care.

A multidisciplinary approach involving cardiologists, primary care physicians, rehabilitation specialists, and mental health professionals is essential. Particular attention should be given to the psychological status of CAD patients, with psychiatric support provided when necessary. Ultimately, improving HRQoL should be a central objective of CAD management and a continuous, patient-centered process throughout the course of the disease.

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