

RESEARCH ARTICLE

Prior percutaneous coronary intervention is associated with low health-related quality of life after coronary artery bypass graft

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Abstract

The success of a coronary artery bypass graft surgery has been shown to be related to health-related quality of life, and being able to predict this is extremely useful. We investigate the associations between health-related quality of life and sociodemographic and clinical characteristics, and examine the impact of prior percutaneous coronary interventions on health-related quality of life in Palestinian patients undergoing a coronary artery bypass graft for the first time. A cross-sectional study was conducted on a convenience sample of 119 Palestinian patients. The Short Form-36 Health Survey was applied 1 year after the coronary artery bypass graft surgery. An analysis of variance shows that as age increases, health-related quality of life decreases. In contrast, the higher the level of education, job security, and salary, the higher the health-related quality of life. Patients who had undergone prior percutaneous endovascular interventions had a worse health-related quality of life than those who had not. In conclusion, a history of prior percutaneous endovascular interventions in addition to sociodemographic factors should be considered by nursing staff so that they can deliver high-quality patient care.

KEYWORDS

coronary artery bypass graft, nursing care, Palestine, percutaneous coronary intervention, quality of life

1 | INTRODUCTION

Cardiovascular diseases (CVDs) are the most common cause of death around the world, and are predicted to remain so until 2030 (Lehtonen, Hippeläinen, Kattainen, Kouri, & Kujala, 2009; World Health Organization, 2017). According to 2015 data from the World Health Organization (2017), 31% of deaths globally were the result of CVDs, and 41.2% of these were due to coronary artery disease (CAD), one of the most prevalent CVDs. In addition, 80% of deaths in low-

and middle-income countries are CVD-related. Indeed, CVD was the principal cause of death in 2018 in the Palestinian population, with a death rate of 31.5% (Palestinian Health Information Center-MOH, 2019).

There are currently many methods for treating CAD, including therapeutic medication, percutaneous transluminal coronary angioplasty, and coronary artery bypass graft (CABG) surgery (Staniūtė & Brožaitienė, 2010). The decision to perform a CABG to treat CAD is based on the patient's symptoms, the extent of the coronary artery pathology, and the number of obstructed vessels (Dzayee et al., 2013). The published literature confirms that symptoms are

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reduced in both type and severity post-surgery. Indeed, a prospective study from Taiwan on post-CABG patients reports improvements in most symptoms, including angina, dyspnea, fatigue, sleep problems, and other psychological symptoms (Tsai, Tsay, Moser, Huang, & Tsai, 2019). However, the success of the surgery has been shown to be related to the patient's ability to perform daily activities (Viswanathan, Mayurathan, Hildreth, Worthley, & Zaman, 2011), and predicting this is a useful indicator.

Sixty patients undergoing a CABG were admitted to a randomized controlled trial at a large university hospital in Denmark. These patients presented greater compliance with post-operative interventions, including physical exercise and psychoeducation (Højskov et al., 2016). Pre-operative education is considered an essential and effective way to increase a patient's knowledge and establish individualized goals for improving their health-related quality of life (HRQoL) (Ballan & Lee, 2007). For this reason, HRQoL has taken on a significant role in clinical healthcare as it affects patient and healthcare-provider decision making. Predictions of how successful an operation like a CABG will be have been shown to be related to HRQoL (Jokinen, Hippeläinen, Turpeinen, Pitkänen, & Hartikainen, 2010).

A systematic review conducted by Fatima et al. (2016) concluded that quality of life was higher after CABG surgery in comparison to percutaneous coronary interventions (PCI), especially at 6 and 12 months after these procedures. However, a clinical trial performed by Baron et al. (2017) reported a greater quality of life in patients who underwent PCI, rather than CABG, in the short term, although there were no significant differences in the long term. Moreover, the growing incidence of PCI prior to CABG represents an increased risk of post-operative morbidity and, consequently, decreased HRQoL (Niclauss, Colombier, & Prêtre, 2015). Investigating the factors associated with HRQoL in order to optimize the quality of life in patients undergoing a CABG and, consequently, their health, is therefore of special interest. To our knowledge, no previous research has examined the potential factors influencing HRQoL in patients, either with or without a previous history of PCI, who undergo a CABG for the first time.

1.1 | Aims

We investigated the associations between HRQoL and sociodemographic and clinical characteristics, and examined the impact of prior PCI on HRQoL in Palestinian patients who underwent CABG for the first time.

2 | METHOD AND MATERIALS

2.1 | Study design and participants

A cross-sectional study was conducted in Palestinian Medical Complexes, including An-Najah National University Hospital, Nablus Specialty Hospital, and the Specialized Arab Hospital in Nablus. The

clinical records of 192 potential participants who underwent elective CABG surgery for the first time 12 months prior to the study, both with or without a history of prior PCI, were consulted. Several participants were excluded: 15 had died; six had cognitive impairment; eight had communication impairment; and seven were treated with recurrent CABG. One hundred and fifty-six participants were therefore contacted via phone, and the nature and purpose of the study was explained to them. Twenty-two potential participants declined to participate and there was no response from a further 15. Ultimately, 119 patients (76.5% males) agreed to participate in our study and were given a date for a face-to-face interview. All of the patients had received the same information on the surgical procedure prior to undergoing CABG surgery. The nursing care also involved a standardized care plan based on postoperative and lifestyle care, including exercise and nutrition. Figure 1 details the sample collection. The exclusion criteria included patients with cognitive impairment, communication deficits, and patients with major comorbidities (cancer, and those with kidney disease who were undergoing dialysis), mobility limitations, cerebrovascular disease, and quadriplegia. The latter involves not only disrupted mobility, but further complications that affect HRQoL. Patients treated with recurrent CABG were also excluded.

2.2 | Ethical considerations

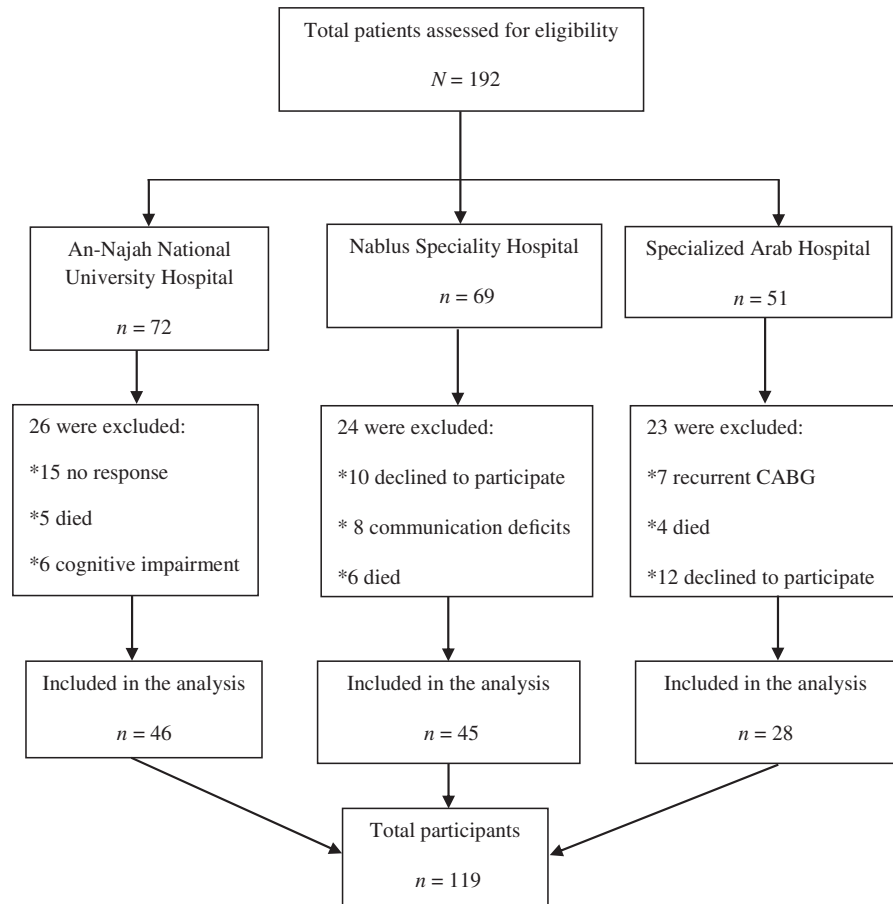
This study was conducted in accordance with the Declaration of Helsinki. Ethical approval for the work was obtained from the Ethics Committees of the An-Najah National University Hospital (approval no. 0419494), Nablus Specialty Hospital (approval no. 2949855), and the Specialized Arab Hospital in Nablus (approval no. 749752).

2.3 | Sociodemographic and clinical characteristics

Sociodemographic characteristics including gender, age, marital status, educational level, job, and income were obtained from each participant at the baseline assessment. Information on clinical characteristics including hypertension, diabetes mellitus, dyslipidemia, and hypercholesterolemia was obtained from the participants and their medical records. Additionally, data on lifestyle factors including smoking and coffee consumption were collected, and any history of prior PCI was recorded, including angioplasty and stent placement.

2.4 | HRQoL

The Short Form-36 Health Survey (SF-36) was used to evaluate HRQoL (McHorney, Ware, & Raczek, 1993; Ware & Sherbourne, 1992). This questionnaire consists of eight multi-item subscales focused on the domains of physical functioning, social functioning, role limitations due to physical problems, role limitations due to emotional problems, emotional well-being, energy/vitality, pain,

FIGURE 1 Sample collection

and general health perception. Each of the SF-36 domains is scored on a scale of 0–100. Higher scores report a better HRQoL. The same interviewer administered the SF-36 to all participants 12 months after CABG surgery, in September 2017, in face-to-face interviews in the patients' homes. These interviews lasted between 15 and 30 min, and averaged 20 min. An Arabic version of the SF-36, previously validated on a Saudi Arabian population, was used in the interviews (Al Abdulmohsin, Coons, Draugalis, & Hays, 1997; Coons, Alabdulmohsin, Draugalis, & Hays, 1998). The Arabic version of the SF-36 questionnaire is in the public domain (RAND, 2020). This questionnaire was highly reliable in our study, with a Cronbach's α score of 0.962 for the total sample. Similarly, in the subgroups of patients who had undergone prior PCI and those who had not, the scores were 0.967 and 0.950, respectively.

2.5 | Statistical analysis

We described numerical variables using the mean \pm standard deviation, while qualitative or nominal variables were described with percentages and frequencies. The independent two-sample *t*-test, or Mann–Whitney U-test, was used to compare the variables between the groups. Pearson's correlation coefficient (*r*) was used to test the correlation between prior PCI and all of the HRQoL domains. Logistic regression analyses were conducted to determine the association

between prior PCI and all of the HRQoL domains in the overall sample after adjusting for age and sociodemographic characteristics (education level, job, and income). There were no missing data. SPSS Statistics version 21.0 (SPSS, Chicago IL, USA) was used for all the analyses; *P* values of <0.05 were considered to be statistically significant.

3 | RESULTS

3.1 | Baseline characteristics of the participants and their association with HRQoL

The personal and clinical characteristics of the sample are presented in Table 1. A total of 119 patients from three hospitals in Palestine participated in this study. Most participants were males (76.5%), ranging in age between 45–64 years (60.5%). Only 29.4% had a high education level, and 43.7% of the participants had a monthly income of between 1500–3000 New Israeli Shekel (NIS). The following comorbidities were present: hypertension (73.1%); diabetes mellitus (55.5%); dyslipidemia (84.0%); and hypercholesterolemia (88.2%). Furthermore, the prevalence of smoking and coffee consumption was 48.7% and 76.5%, respectively. The prevalence of prior PCI was 23.5%.

Sociodemographic factors such as age, educational level, work performed, and income present statistically significant differences

TABLE 1 Sociodemographic and clinical characteristics and global score of HRQoL (*n* = 119)

Items		<i>n</i>	%	SF-36 score	<i>P</i> value
Sociodemographic					
Gender	Male	91	76.5	67.2 ± 27.01	0.103
	Female	28	23.5	57.1 ± 32.12	
Age	35–44 year	9	7.6	83.9 ± 15.76	<0.001
	45–54 year	32	26.9	74.4 ± 20.97	
	55–64 year	40	33.6	68.3 ± 25.48	
	65–74	24	20.2	59.6 ± 29.59	
	75 year and above	14	11.8	30.0 ± 28.14	
Marital status	Married	105	88.2	67.2 ± 27.88	0.064
	Single	1	0.8	50.0	
	Widowed	12	10.1	44.6 ± 28.56	
	Divorced	1	0.8	75.0	
Educational level	Unable to read/write	15	12.6	30.7 ± 26.38	<0.001
	Elementary education	41	34.5	65.2 ± 26.70	
	High school	28	23.5	68.8 ± 26.02	
	High education	35	29.4	75.1 ± 21.26	
Job	Unemployed	35	29.4	39.6 ± 30.75	<0.001
	Retired	15	12.6	74.0 ± 23.61	
	Self employed	38	31.9	74.3 ± 21.81	
	Government employees	17	14.3	74.1 ± 17.52	
	Civil servant	14	11.8	81.1 ± 8.80	
Income	Less than 1,500 NIS	30	25.2	44.7 ± 31.26	<0.001
	1,500–3,000 NIS	52	43.7	67.2 ± 27.83	
	3,001–4,500 NIS	24	20.2	81.5 ± 10.88	
	More than 4,500 NIS	13	10.9	71.2 ± 21.32	
Comorbidities					
Hypertension	Yes	87	73.1	62.5 ± 28.41	0.137
	No	32	26.9	71.25 ± 28.08	
Diabetes mellitus	Yes	66	55.5	60.7 ± 28.67	0.076
	No	53	44.5	70.0 ± 27.63	
Dyslipidemia	Yes	100	84.0	62.5 ± 29.20	0.040
	No	19	16.0	77.1 ± 20.90	
Hypercholesterolemia	Yes	105	88.2	63.6 ± 29.41	0.187
	No	14	11.8	74.3 ± 18.17	
Lifestyle					
Smoking	Yes	58	48.7	68.8 ± 25.41	0.140
	No	61	51.3	61.1 ± 30.85	
Coffee consumption	Yes	91	76.5	68.3 ± 27.04	0.016
	No	28	23.5	53.6 ± 30.57	
Prior PCI	Yes	28	23.5	45.2 ± 33.73	<0.001
	No	91	76.5	70.9 ± 23.76	

Abbreviations: NIS, New Israeli Shekel; PCI, percutaneous coronary interventions, as angioplasty and stent placement.

with respect to HRQoL (Table 1). HRQoL decreases as age increases, as well as in the presence of comorbidities, although statistically significant differences are only seen for dyslipidemia. Higher educational

level, job security, and income all increase the HRQoL. It should be noted that smokers and coffee drinkers report a higher HRQoL, and almost two thirds of patients consume coffee. It should also be

TABLE 2 HRQoL assessed by SF-36 in the overall sample and according to the presence or absence of prior percutaneous coronary interventions

SF-36 domains	Overall sample (n = 119) mean ± SD	Prior PCI (n = 28) mean ± SD	No prior PCI (n = 91) mean ± SD	P value
Physical functioning	70.2 ± 35.55	46.79 ± 40.44	77.42 ± 30.71	<0.001
Role physical	66.0 ± 47.36	42.86 ± 50.40	73.08 ± 44.29	0.003
Role emotional	65.5 ± 46.93	44.05 ± 49.73	72.16 ± 44.24	0.007
Energy fatigue	65.1 ± 30.24	45.36 ± 33.39	71.21 ± 26.57	<0.001
Emotional well-being	66.2 ± 29.40	47.14 ± 32.81	72.04 ± 25.74	<0.001
Social functioning	77.1 ± 31.15	55.36 ± 37.18	83.79 ± 25.79	<0.001
Bodily pain	78.6 ± 31.03	57.14 ± 36.57	85.25 ± 25.95	<0.001
General health	64.8 ± 28.48	45.18 ± 33.73	70.88 ± 23.76	0.001

Abbreviations: PCI, percutaneous coronary interventions; Role emotional, role limitations due to emotional problems; Role physical, role limitations due to physical problems.

TABLE 3 Correlations between prior percutaneous coronary interventions and all domains of HRQoL (n = 119)

SF-36 domains	Prior percutaneous coronary interventions	
	r	P value
Physical functioning	0.367	<0.001
Role physical	0.272	0.003
Role emotional	0.255	0.005
Energy fatigue	0.364	<0.001
Emotional well-being	0.361	<0.001
Social functioning	0.389	<0.001
Bodily pain	0.386	<0.001
General health	0.384	<0.001

Note: Pearson's correlation coefficient (*r*) was used. Role emotional, role limitations due to emotional problems; Role physical, role limitations due to physical problems.

pointed out that patients who had prior PCI report a statistically worse HRQoL than those CABG patients without a history of prior PCI.

3.2 | Influence of prior PCI on HRQoL in one-year post-CABG patients

Table 2 presents the HRQoL domains in the study cohort and shows the results of the domains according to whether the CABG patients had undergone prior PCI or not. All of the domains were significantly lower in patients with prior PCI compared to patients with no prior PCI ($P < 0.05$).

Table 3 presents the correlation analysis between prior PCI and HRQoL domains. Pearson correlations reveal that all HRQoL domains correlated positively with the variable prior PCI ($P < 0.05$). The three highest Pearson correlations were found for social functioning ($r = 0.389$), bodily pain ($r = 0.386$), and general health ($r = 0.384$). Role limitations due to physical and emotional problems presented the lowest results, $r = 0.272$ and $r = 0.255$, respectively.

Results of the association analysis involving prior PCI and all HRQoL domains in the overall population, after adjusting for age and sociodemographic characteristics, are presented in Table 4. Logistic regression analysis revealed significant associations between prior PCI and all HRQoL domains, particularly general health ($\beta = -0.023$, $P = 0.008$), emotional well-being ($\beta = -0.022$, $P = 0.009$), social functioning ($\beta = -0.021$, $P = 0.006$), and bodily pain ($\beta = -0.020$, $P = 0.007$). Only the role physical and role emotional domains had no significant association.

4 | DISCUSSION

In this study we investigated the associations between HRQoL and sociodemographic and clinical characteristics in 119 Palestinian patients who underwent CABG, in addition to the impact of prior PCI on HRQoL. Our findings indicate that HRQoL decreases as age increases, whereas HRQoL increases with higher educational level, greater job security, and higher salary. Additionally, patients who had undergone a prior PCI reported worse HRQoL, with all domains having a significantly lower score.

Our results are consistent with Peric et al. (2015) who reported that patients aged 60–69 showed better improvement in all domains than younger patients, but found that patients under 50 had improved physical mobility, emotional reactions, pain, and sleep parameters. Similarly, Lavdaniti et al. (2015) reported that mental health is influenced by age, as well as educational and occupational status. Also, Najafi, Sheikhvatan, Montazeri, and Sheikhfathollahi (2008) found that older patients had a higher score in the psychological dimension of HRQoL. In contrast, Chen et al. (2017) found that aging had no connection to HRQoL in CABG patients. The inconsistencies between the findings in the various studies could be explained by differences in the division of participants into age groups. Moreover, our research detected no relationship between gender and HRQoL after CABG surgery. However, previous studies have reported contradictory results (Hweidi, Gharaibeh, Al-Obeisat, & Al-Smadi, 2018; Lavdaniti et al., 2015). Hweidi et al. (2018) reported that female

SF-36 domains	Prior percutaneous coronary interventions		P value
	β	OR (95% CI)	
Physical functioning	0.017	1.003, 1.031	0.019
Role physical	0.007	0.997, 1.017	0.193
Role emotional	0.006	0.995, 1.016	0.286
Energy fatigue	0.020	1.005, 1.037	0.011
Emotional well-being	0.022	1.005, 1.038	0.009
Social functioning	0.021	1.006, 1.036	0.006
Bodily pain	0.020	1.006, 1.036	0.007
General health	0.023	1.006, 1.041	0.008

Note: Logistic regression analyses adjusted for age and sociodemographic characteristics (level of education, job and income) were conducted. CI, confidence interval; Role emotional, role limitations due to emotional problems; Role physical, role limitations due to physical problems.

TABLE 4 Beta estimates and confidence intervals for the association between prior percutaneous coronary interventions and all domains of HRQoL in the overall sample ($n = 119$)

patients had higher levels of depression than males, and Lavdaniti et al. (2015) reported that social role was affected by both the gender and the occupational status of the patients.

On the other hand, we found an association between educational level, job, and income with HRQoL, but no association with marital status. Hweidi et al. (2018) reported that unemployed patients had a high prevalence of depression, that patients who were married had lower depression levels than unmarried individuals, and that there was an inverse relationship between the depression score and the patient's monthly income. Additionally, El-Baz et al. (2018) found that patients with higher education levels had better physical health outcomes, and Gierszewska, Jaworska, Skrzypek, Gašior, and Pudlo (2018) reported that degree of education, marital status, and employment influenced an improved HRQoL.

Of the comorbidities, only dyslipidemia was associated with HRQoL in CABG patients. Our findings therefore contradict previous studies. Kuo, Chiu, Tsang, Chiu, and Chien (2015) found that patients with chronic kidney disease (CKD) post-CABG surgery had worse physical function and HRQoL than patients not suffering CKD. Shad et al. (2017) showed that the physical and mental components of HRQoL were better in patients with no comorbidities (diabetes mellitus or hypertension).

In line with Figueiredo Neto et al. (2015), our study found a high frequency of dyslipidemia and hypertension among patients undergoing cardiac surgery. However, in contrast to our findings, other authors, including Taghipour et al. (2011) and Middel et al. (2014), reported a lower prevalence of these comorbidities. Moreover, our research found a higher prevalence of diabetes mellitus among patients who underwent CABG than in previous studies conducted on European (Middel et al., 2014) and American populations (Figueiredo Neto et al., 2015). Nevertheless, the results are similar to those reported by Taghipour et al. (2011) for a study carried out in Iran. The differences in comorbidity prevalence might therefore be due to health standards in the different countries.

In our study, we found a worse HRQoL, and a lower score in all the HRQoL domains, in patients who had a history of prior PCI than those who did not. Numerous published studies involve HRQoL post-PCI vs CABG surgery (Kulik, 2017; McGrath, Norris, Hardwicke-Brown, Welsh, & Bainey, 2017; Wu et al., 2019), but few of these

compare HRQoL in post-CABG patients with or without a previous PCI. Rao et al. (2008) concluded that, in the long term, HRQoL decreases after CABG surgery in patients who had a prior PCI. Altarabsheh et al. (2015) suggested that patients undergoing CABG after a PCI have a higher incidence of mortality in the post-operative period, while Miguel, Sousa, Silva, Colósimo, and Stolf (2020) reported no clear negative influence of previous PCI on mortality and morbidity after CABG surgery. However, according to Mehta et al. (2012), patients with a previous PCI are likely to have a higher risk of developing complications after CABG surgery.

In our study, the differences between post-CABG patients with or without previous PCI are confirmed both in the correlation and the logistic regression analyses. In particular, Pearson's correlation coefficient showed a greater positive correlation between social functioning ($r = 0.389$), bodily pain ($r = 0.386$), and general health ($r = 0.384$) and the prior-PCI variable. Similarly, the logistic regression analysis highlighted significant associations between general health, emotional well-being, and social functioning with the prior-PCI variable, suggesting that patients undergoing CABG who have not had a PCI are more likely to have a greater HRQoL than patients with a history of CABG. It is possible that better results in the emotional well-being, social functioning, and general health domains can be explained by the fact that patients undergoing their first cardiac intervention have better emotional health and a greater recovery prospect than patients requiring recurrent cardiac surgery. In addition, the role physical ($r = 0.272$) and role emotional ($r = 0.255$) domains had the lowest results in the correlation analyses. The β estimations of these two domains were not significant. A possible explanation for the results found in the role physical and role emotional domains is that emotional or physical difficulties in daily activities could be related to economic or social factors.

It is worth noting that HRQoL in patients undergoing CABG has previously been examined in different populations (Figueiredo Neto et al., 2015; Middel et al., 2014; Taghipour et al., 2011). This work from other countries, also using the SF-36, reported slightly different findings to those of our research. In all of these studies, the SF-36 was administered within 6 months to 1 year after CABG surgery. The differences could be the result of different health policies and health promotion in

various geographical regions. In addition, sociodemographic and clinical differences may explain the disparate HRQoL findings.

4.1 | Limitations and strengths

This study has certain limitations that should be addressed. The cross-sectional design may have prevented us from measuring any change in HRQoL over time, and it does not allow us to establish causal relationships. In addition, since our study population comprised a well-characterized cohort of Palestinian adults, the results presented may not be generalizable to other ethnicities or age ranges. Moreover, physical activity level was not measured. In addition, there are no data on the time between the PCI and CABG. Strengths of this study include the fact that, to the best of our knowledge, this is the first study to examine HRQoL level in 1-year post-CABG patients with or without a history of prior PCI. In addition, we used the SF-36, a reliable and valid method for assessing HRQoL in patients undergoing CABG (Lavdaniti et al., 2015; Najafi et al., 2008; Peric et al., 2015).

4.2 | Implications for practice

The results of our study are relevant for health professionals, especially nursing professionals. The novelty of our study is the comparison of HRQoL between post-CABG patients who had a prior PCI and those who did not; our findings reveal a worse HRQoL in the former group. For this reason, it is necessary to make comprehensive assessments of patients undergoing a CABG, in order to prepare high-quality patient care that enables them to have greater HRQoL and better post-operative rehabilitation. In addition, our study also shows that other factors, such as emotional components and certain sociodemographic variables, importantly influence patients undergoing CABG surgery and these should be considered by the nursing staff when developing nursing care plans.

5 | CONCLUSION

In conclusion, the presence of prior PCI in CABG patients was associated with low HRQoL in a convenience sample of 119 Palestinian patients. Increased age was also related to low HRQoL, whereas high levels of education and occupational status increase HRQoL. Thus, nurses should consider the importance of these sociodemographic factors, as well as the presence or absence of a prior PCI, to prepare care plans for patients undergoing CABG. Nursing staff should also consider the impact of HRQoL-associated factors, such as emotional parameters, in CABG patients in order to deliver high quality patient care.

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AUTHOR CONTRIBUTIONS

Study design: J.S.-R., M.C.-R., and M.A.E.

Data collection: A.B. and M.A.E.

Data analysis: M.C.-R., N.S.-M., and Á.F.-A.

Manuscript writing: J.S.-R., M.C.-R., M.A.E., and Á.F.-A.

CONFLICTS OF INTEREST

No conflict of interest has been declared by the authors.

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AUTHORSHIP STATEMENT

All authors listed meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors, and all authors are in agreement with the manuscript.

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