

# Health-related Quality of life and its related factors in patients undergoing Coronary angioplasty, Zanjan, northwest Iran

## Research Article

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## Abstract

**Background:** The quality of life of patients after percutaneous coronary interventions (PCI) is definitely not clear. The aim of this study was to evaluate the health-related quality of life (HRQL) and related factors in patients undergoing angioplasty. **Methods:** This analytical cross-sectional study was performed on patients with coronary artery disease who underwent PCI and had a history of hospitalization in Zanjan, Iran in 2020. 920 patients based on specific inclusion and exclusion criteria were included by census method. The study tool was a 36-item Short Form Health Survey questionnaire (SF-36). Mann-Whitney U test and Kruskal-Wallis tests were used to data analysis in SPSS 19 with a significance level of 5%. **Results:** In total, 70% (644 people) were female, 86% (791) angina, 34.2% (315) Myocardial infarction. median (IQR) of age, Physical Component Summary (PCS), and Mental component summary (MCS) were 60 (15), 65.78 (9.48), 64.18 (7.68), respectively. Multivariate linear regression showed that PCI type ( $B=-2.52$ ,  $p=0.013$ ) and age ( $B=-0.21$ ,  $p<0.001$ ) had a negative effect and education level ( $B=3.15$ ,  $p=0.002$ ), income ( $B=1.34$ ,  $p=0.002$ ), angina ( $B=1.27$ ,  $p=0.02$ ) and number of drugs ( $B=0.609$ ,  $p<0.001$ ) had a positive effect on PCS. Also, PCI type ( $B=-3.024$ ,  $p=0.001$ ), age ( $B=-0.123$ ,  $p<0.001$ ), diabetes ( $B=-1.19$ ,  $p=0.008$ ), blood pressure ( $B=-0.728$ ,  $p=0.05$ ) and duration of disease ( $B=-0.309$ ,  $p=0.022$ ) had a negative effect and education, income ( $B=2.57$ ,  $p=0.022$ ), number of drugs ( $B=0.615$ ,  $p<0.001$ ) had a positive effect on MCS. **Conclusion:** Age, type of PCI, diabetes, blood pressure, level of education, income were the most important factors related to HRQL of cardiovascular patients undergoing coronary angioplasty. Therefore, to improve the HLQL, these factors must be considered.

**Key Words:** Quality of life, Angioplasty, Heart disease, Zanjan.

## Introduction

One of the most common causes of death in the world is cardiovascular disease(1), so it is predicted that at least 30.5% of deaths will occur due to cardiovascular diseases in the next ten years(2). Mortality due to cardiovascular diseases in Iran is also significant, so that 26% of deaths in the middle-aged population were due to cardiovascular disease(3).

Different medications and surgeries have been used to treat heart disease. Coronary angioplasty is also used as a routine intervention in the treatment of this disease(4). The percutaneous coronary intervention (PCI) performed in the angioplasty method leads to an acceptable improvement of the patient's symptoms(5). Any therapeutic intervention, regardless of its effectiveness, has a significant effect on the quality of life related to the patient's health. Health-related quality of life means a deep link between health and quality of life(6). This multidimensional concept encompasses the physical, mental, emotional, and social dimensions(7).

Angioplasty as a beneficial intervention can significantly improve the patient's physical limitations and perception, so it is expected that the quality of life related to health will also improve (4). Harson 2021 have been shown to improve physical function and vitality after angioplasty(8). One of the successful tools in measuring quality of life related to health is the 36-

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items Short Form Health Survey questionnaire ) SF-36) (9). This questionnaire has been used to assess health related quality of life in various samples, for instance in heart disease(10), diabetes(11), kidney(12), gastrointestinal(13), osteoarthritis(14) etc., as well as healthy samples of the community(15).

Despite many studies on health-related quality of life in heart patients(4, 10, 16, 17), a study to evaluate the health-related quality of life in patients who have undergone angioplasty are limited (18). literature review showed various factors have been introduced as factors affecting the quality of life of angioplasty patients, including breathlessness, angina grade, exercise time, age, the number of diseased vessels, the number of comorbidities, diabetes, a history of cardiovascular disease and symptoms of shortness of breath(16-23).

Therefore, the main aim of this study was to identify the factors affecting the health-related quality of life of heart patients who have at least 6 months since their angioplasty in Zanjan in northwest of Iran.

## Materials and Methods

This analytical cross-sectional study was performed in 2020 on patients with coronary artery disease who underwent PCI and had a history of hospitalization in Zanjan city, Iran. 920 patients were enrolled in the study by census method with review of inclusion and exclusion criteria. Inclusion criteria included age over 18 years, and Six months have passed since the angioplasty procedure. Exclusion criteria include unwillingness to continue cooperation during the study, acute cardiovascular problems and worsening of the patient during the study.

The study tool for assessing health related quality of life was a 36-item Short Form Health Survey questionnaire ) SF-36). This questionnaire includes 8 sub-sections such as Physical functioning, Role limitations due to physical health, Role limitations due to emotional problems, Vitality, Mental Health, Social functioning, Pain, General health (24). According to what suggested by designers of this questionnaire, the SF 36 scale does not have an overall score and a score should be calculated separately for its dimensions or two main components(20). The score of each dimension of the questionnaire is considered from zero to 100. A higher score indicates better health related quality of life.

The SF 36 questionnaire was developed and presented by Stewart and Ware in 1992(25). This was localized in Iran by Montazeri et al. In 2005 and the Cronbach's alpha coefficient was reported between 0.77 and 0.90 in its various dimensions(26).

Table 1 shows the internal consistency values calculated through Cronbach's alpha for each subsection as well as for the two main components and the whole questionnaire. In general, the questionnaire had good reliability.

In this study, based on the demographic part of the questionnaire the variables such as Sex, Marital

status, Job , Education level, Income, Diabetes, Blood pressure, Blood lipid, Kidney, Carotid stenosis, Angina, Angiography results, Percutaneous coronary interventions (PCI) type. Age, Duration of disease, Drug number, Myocardial infarction (MI), Physical functioning, Role limitations due to physical health, Role limitations due to emotional problems, Vitality, Mental Health, Social functioning, Pain, General health.

Our study was registered in Zanjan University of Medical Sciences, Iran with the ethical code IR.ZUMS.REC.1393.121. Conscious consent was obtained from all patients for this study.

For descriptive statistics, frequency, percentage, median and interquartile range (IQR) were used(27). Kolmogorov-Smirnov test was used to evaluate the normality of error distribution in quantitative variables. Also, to examine the relationship between different dimensions of the questionnaire and demographic variables, Mann-Whitney U test and Kruskal-Wallis tests were used. In order to identify the factors affecting the quality of life score, two main components of the questionnaire named PCS, MCS were used as dependent variables in the multivariate linear regression model (two simultaneous response variables). All analyzes were performed in SPSS software version 19 with a significance level of 5%.

**Table 1: sf-36 questionnaire dimension, scoring and internal consistency coefficients**

Scale	Number of items	Item order in SF-36	Cronbach alpha
Physical functioning	10	3 4 5 6 7 8 9 10 11 12	0.94
Role limitations due to physical health	4	13 14 15 16	0.83
Role limitations due to emotional problems	3	17 18 19	0.82
Vitality	4	23 27 29 31	0.87
Mental health	5	24 25 26 28 30	0.92
Social functioning	2	20 32	0.87
Bodily Pain	2	21 22	0.80
General health	6	1 2 33 34 35 36	0.80

## Results

A total of 920 patients were enrolled in the study, of which 70% (644) were women, 99.9% (919) were married, 43.6% (401) were employees, and 74.1% (682) were literate. 75.5% (695 people) in average monthly income, 16.5% (152 people) diabetic, 56.8% (523 people) blood pressure, 94.9 (873 people) hyperlipidemia, 2.8% (26 people) kidney pain, 1% (9) carotid, 86% (791) angina, 34.2% (315) MI, 56.6% (521) had 3 problematic blood vessels in angiography, 39.2 (361 people) type one PCI (Table 2).

**Table 2. Descriptive of patients characteristics- qualitative variables**

Variables	%	N	levels
Gender	30	276	Male
	70	644	Female
Marital status	0.1	1	Single
	99.9	919	Married
Job	43.6	401	Employee
	34.5	317	Unemployed house worker
	22.0	202	Retired
	0.7	6	illiterate
Education level	74.1	682	Read writing
	22.1	203	Diploma
	3.2	29	University education
	2.3	21	Rials 10000000<
Income	75.5	695	40000000-10000000 Rials 0
	22.2	204	Rials 40000000>
Diabetes	16.5	152	Yes
	83.5	768	No
Blood pressure	56.8	523	Yes
	43.2	397	No
Blood lipid	94.9	873	High Cholesterol
	5.1	47	Tri glyceride
Kidney	2.8	26	Yes
	97.2	894	No
Carotid stenosis	1	9	Yes
	99	911	No
Angina	86	791	Yes
	14	129	No
Myocardial infarction	34.2	315	Yes
	65.8	605	No
Angiography results	11.5	106	1 Vessel
	31.8	293	2 Vessel
	56.6	521	3 Vessel
Percutaneous Coronary Intervention (PCI) type	39.2	361	LAD
	9.8	90	LCX
	15.2	140	RCA
	13.8	127	LCX, LAD
	9.9	91	RCA, LAD
	7.8	72	RCA, LCX, LAD
	4.2	39	LCX, RCA

LAD: Left Anterior Descending artery; LCX: Left Circumflex; RCA: Right Coronary artery; LMA: Left Main Artery

Examination of the normality of error distribution in quantitative variables by Kolmogorov-Smirnov test showed that none of the quantitative variables have a normal distribution ( $p<0.05$ ).

The description of the non-normal quantitative variables through the median and interquartile range (IQR) is given in Table3. According to Table 3, 50% of the subjects were over 60 years old ( $60\pm 15$ ).

**Table 3. Description of Non- normal distribution quantitative variables**

Variables	IQR	Median
Age	15	60
Duration of disease	2	5
Ejection fraction	15	50
Drug number	1	4
Role - emotional (RE)	18.31	71.4
Vitality(VT)	13	65.2
Mental Health (MH)	10.26	66.6
Social functioning (SF)	10	60
Bodily Pain (BP)	27.36	45.45
General Health (GH)	15.1	59.2
Physical functioning (PF)	23.3	79.92
Role-Physical (RP)	37.5	87.5
Physical component summary (PCS)	9.48	65.78
Mental component summary (MCS)	7.68	64.18

The effect of factors on the components of the SF36 quality of life scale were investigated through multivariate linear regression and results showed that in PCS dimension, PCI type and age variables had a negative effect and education level, income, angina and number of drugs had a positive effect on PCS. In MCS dimension, PCI type, age, diabetes, blood pressure and duration of illness had a negative effect and variables of education, income, number of drugs had a positive effect on MCS (Table 4).

**Table 4. Results of multivariate regression analysis with two dependent variables**

Dependent Variables	Parameter	B	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
PCS	PCI Type=LAD	-2.888	0.986	0.003	-4.822	-0.953
	PCI Type=LCX	-1.885	1.065	0.077	-3.974	0.205
	PCI Type=RCA	-2.522	1.010	0.013	-4.505	-0.539
	PCI Type=LCX, LAD	-0.889	0.917	0.333	-2.687	0.910
	PCI Type=RCA, LAD	-1.544	0.965	0.110	-3.437	0.349
	PCI Type=RCA, LCX, LAD	-2.685	1.297	0.039	-5.230	-0.140
	PCI Type=LCX, RCA	Reference	.	.	.	.
MCS	Age	-0.210	0.021	0.000	-0.252	-0.168
	Education Level= Illiterate	3.141	2.281	0.169	-1.337	7.619
	Education Level=Read Writing	3.154	1.005	0.002	1.181	5.127
	Education Level=Diploma	1.516	1.034	0.143	-0.514	3.545
	Education Level =University Education	Reference	.	.	.	.
	Income>100000000 Rials	3.908	1.176	0.001	1.599	6.217
	Income =40000000-100000000 Rials	1.345	0.441	0.002	0.480	2.209
Income<40000000 Rials	Reference	.	.	.	.	

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	Angina=Yes	1.279	0.557	0.022	0.185	2.372
	Drug Number	0.609	0.106	0.000	0.401	0.817
	Duration Of Disease	0.705	0.537	0.190	-0.349	1.759
MCS	PCI Type=LAD	-3.024	0.940	0.001	-4.870	-1.179
	PCI Type=LCX	-2.220	1.016	0.029	-4.214	-0.227
	PCI Type=RCA	-2.655	0.964	0.006	-4.546	-0.764
	PCI Type=LCX, LAD	-0.802	0.874	0.359	-2.518	0.913
	PCI Type=RCA, LAD	-1.368	0.920	0.137	-3.174	0.438
	PCI Type=RCA, LCX, LAD	-1.368	1.237	0.269	-3.795	1.060
	PCI Type=LCX, RCA	Reference	.	.	.	.
	Age	-0.123	0.020	0.000	-0.163	-0.083
Education Level= Illiterate	2.946	2.176	0.176	-1.326	7.217	
Education Level=Read Writing	2.724	0.959	0.005	0.842	4.606	
Education Level=Diploma	0.573	0.986	0.562	-1.363	2.509	
Education Level =University Education	Reference	.	.	.	.	
Income>100000000 Rials	2.573	1.122	0.022	0.371	4.776	
Income =40000000-100000000 Rials	1.287	0.420	0.002	0.462	2.112	
Income<40000000 Rials	Reference	.	.	.	.	
Diabetes=Yes	-1.196	0.449	0.008	-2.077	-0.314	
Blood Pressure= Yes	-0.728	0.371	0.050	-1.456	0.000	
Blood Lipids=Yes	-1.889	0.737	0.010	-3.335	-0.443	
Duration Of Disease	-0.309	0.135	0.022	-0.573	-0.044	
Drug Number	0.615	0.101	0.000	0.417	0.814	

The relationship between the eight dimensions of the SF 36 questionnaire and the study variables is presented in Table 5. According to Table 5, PF score had a significant relationship with gender, type of job, education, blood pressure, kidney pain, heart attack, angiography and PCI typing. RP was related to gender, job, income, blood pressure and type of PCI. RE was related to job, blood pressure, and type of PCI. VT was related to gender, job, education, income, blood pressure, kidney pain, carotid, angiography and PCI type. MH was related to gender, job, education, income, kidney pain, carotid artery, angiography, and type of PCI. SF was only related to angiography. BP was related to gender, job, kidney pain, carotid artery, angiography. GH had a significant relationship with education, income, angina, angiography and type of PCI (Table 5).

**Table 5. Study Relation Between Eight Dimension Of Sf-36 Questionnaire With Patients Characteristics**

Variables	levels	PF	RP	RE	VT	MH	SF	BP	GH								
		Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Sex	Male	83.25	20	87.50	25.33	71.40	28.68	65.20	13.89	66.60	24.26	60.00	0	45.45	27.03	59.2	15.6
	Female	69.93	24.94	75	37.5	71.4	28.12	69.55	8.20	69.93	13	60	10	54.55	27.63	59.20	15.6
	P	<b>&lt;0.001</b>		<b>0.001</b>		0.39		<b>&lt;0.001</b>		<b>&lt;0.001</b>		0.259		<b>&lt;0.001</b>		0.831	
Job	Employee	86.6	14.01	100	25	85.7	13.6	65.2	8.4	66.6	13.8	60	0	36.4	8.6	59.2	14.7
	Unemployed house worker	73.2	26.42	75	37.52	71.4	27.96	69.6	12.32	66.6	12.35	60	10	54.6	27.8	59.2	15.42
	Retired	73.3	29.4	75	50	71.4	37.41	69.6	8.12	69.9	13.2	60	0	54.5	27.41	59.2	15.22
	P	<b>&lt;0.001</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		0.484		<b>&lt;0.001</b>		0.589	
Education	Illiterate	89.9	23.11	93.81	31.41	85.74	19.23	65.23	10.97	68.33	13.94	55	10	40.91	13.95	59.23	16.24
	Read writing	76.6	23.41	87.5	37.14	71.4	28.2	69.6	12.81	66.6	12.93	60	10	45.5	27.21	59.49	15.29
	Diploma	86.6	15.41	87.5	25.01	71.4	27.03	65.23	9.52	63.31	9.44	60	0	36.14	8.71	51.18	10.31
	University education	89.9	10.7	87.5	25.01	85.7	14.09	60.9	8.07	63.3	6.71	60	0	36.41	9.7	55.52	9.23
	P	<b>&lt;0.001</b>		0.718		0.282		<b>&lt;0.001</b>		<b>&lt;0.001</b>		0.284		<b>&lt;0.001</b>		<b>&lt;0.001</b>	
Income	100000000< Rials	79.9	22.71	100	25	85.13	27.44	69.53	13.3	73.3	14.77	60	10	45.55	27.94	62.91	15.53
	-10000000 40000000 Rials	79.9	22.75	87.88	37.5	71.44	28.47	69.6	12.84	66.6	12.91	60	0	45.55	27.5	59.21	15.51
	40000000> Rials	79.96	24.6	75.13	37.5	71.4	28.5	65.33	9.5	66.6	10	60	10	45.51	27.5	55.5	14.5
	P	0.933		<b>0.035</b>		0.357		<b>0.044</b>		<b>0.021</b>		0.219		0.215		<b>0.013</b>	
Diabetes	Yes	76.6	23.2	87.5	25	71.4	27.3	69.6	13.8	66.6	9.7	60	10	45.5	27.4	59.2	14.5
	No	79.9	23.2	87.5	37.5	71.4	27.4	65.2	12.8	66.6	13.5	60	0	45.5	27.4	59.2	15.5
	P	0.124		0.816		0.686		0.282		0.997		0.559		0.133		0.47	
Blood pressure	Yes	76.6	23.4	75	37.5	71.4	27.5	69.6	13.4	66.6	12.8	60	10	45.5	27.5	59.2	15.4
	No	83.3	19.1	87.5	25	85.7	14.5	65.2	9.3	66.6	14.2	60	10	45.5	23.4	59.2	15.2
	P	<b>&lt;0.001</b>		<b>0.001</b>		<b>0.001</b>		<b>&lt;0.001</b>		0.115		0.596		0.11		0.352	

Hyperlipidemia	High Cholesterol	79.2	23.2	87.5	37.5	71.4	37.2	65.2	12.5	66.6	14.2	60	10	45.5	27.5	59.2	15.4
	Tri glyceride	76.6	19.5	87.5	37.5	85.7	14.2	65.2	13.9	66.6	13.2	60	0	45.5	27.5	62.9	14.7
P		0.372		0.403		0.131		0.793		0.309		0.108		0.912		0.232	
Kidney	Yes	69.9	37.5	68.7	30.7	71.4	43.2	69.6	23.2	73.2	13.5	60	10	59.1	27.3	59.2	15.4
	No	79.2	24.5	87.5	25	71.4	27.5	65.2	13.8	66.6	9.5	60	10	45.5	27.3	59.2	15.5
P		<b>0.014</b>		<b>0.002</b>		0.551		<b>0.033</b>		<b>0.036</b>		0.856		<b>0.004</b>		0.663	
Carotid stenosis	Yes	66.6	26.5	62.5	50	85.7	25.5	73.9	7.9	73.3	4.7	60	10	63.6	27.2	66.6	10.7
	No	79.92	23.2	87.5	37.5	71.4	27.2	65.2	12.8	66.6	13.9	60	10	45.45	27.4	59.2	15.6
P		0.056		0.399		0.905		<b>0.006</b>		<b>0.007</b>		0.397		<b>0.017</b>		0.085	
Angina	Yes	79.92	26.2	87.5	37.5	71.4	27.5	69.55	13.2	66.6	9.7	60	0	45.45	27.4	59.2	15.5
	No	79.92	23.5	87.5	37.5	71.4	27.5	65.2	13.8	66.6	14	60	10	45.45	27.4	55.5	15.5
P		0.431		0.369		0.946		0.096		0.214		0.993		0.311		<b>0.023</b>	
Myocardial infarction	Yes	79.9	23.2	87.5	25	71.4	27.5	65.3	13.2	66.6	14.2	60	10	45.5	27.4	59.2	15.5
	No	76.6	26.2	87.5	37.5	71.4	27.5	69.6	13.2	66.6	12.7	60	10	45.5	27.5	59.2	14.5
P		<b>0.048</b>		0.296		0.231		0.087		0.211		0.977		0.086		0.349	
Angiography results	1 Vessel	68.3	28.9	87.5	50	71.5	31.5	69.6	7.9	71.6	12.7	60	0	54.6	17.5	62.9	14.7
	2 Vessel	79.9	22.7	87.5	25	85.7	27.5	69.6	12.4	66.6	12.7	60	10	45.5	27.4	59.2	15.5
	3 Vessel	79.9	25.5	87.5	37.5	71.4	27.5	65.2	12.9	66.6	13.4	60	10	45.5	27.5	55.5	14.2
P		<b>&lt;0.001</b>		0.150		0.111		<b>&lt;0.001</b>		<b>&lt;0.001</b>		0.052		<b>&lt;0.001</b>		<b>&lt;0.001</b>	
PCI type	LAD	79.9	23.2	87.5	37.5	71.4	27.4	65.2	12.7	63.3	13.3	60	0	45.5	27.4	55.5	14.5
	LCX	79.9	21.2	87.5	25	85.6	27.5	69.6	12.4	66.6	13.1	60	10	45.5	27.5	55.5	15.5
	RCA	83.3	23.3	87.5	25	71.4	23.4	65.2	9.1	66.6	13.5	60	10	45.5	27.2	55.5	11.2
	LCX, LAD	79.9	26.5	100	25	85.6	27.5	69.6	8.2	66.6	12.7	60	0	45.5	27.5	62.9	18.5
	RCA, LAD	79.9	22.7	87.5	25	85.7	14.5	69.6	13.8	66.6	9.9	60	10	45.5	27.5	59.2	18.5
	RCA, LCX, LAD	66.6	22.1	75	50	71.4	42.5	71.7	7.5	73.3	12.2	60	0	54.6	18.5	62.9	19.5
P		<b>&lt;0.001</b>		<b>0.034</b>		<b>0.012</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		0.059		<b>&lt;0.001</b>		<b>&lt;0.001</b>	

LAD: Left Anterior Descending artery; LCX: Left Circumflex; RCA: Right Coronary artery; LMA: Left Main Artery; PF: Physical Functioning, RP|: Role Physical, BP: Bodily Pain, GH: General Health, VT: Vitality, SF: Social Functioning, RE: Role Emotional, MH: Mental Health

## Discussion

Our study aimed to identify the factors affecting health related quality of life in patients undergoing coronary angioplasty. The majority of patients were female (70%), and 39.2% had PCI type 1. Results of determining the factors affecting the physical component (PCS) showed that PCI types Left Anterior Descending artery (LAD), Right Coronary artery (RCA) and RCA and LAD and Left Circumflex (LCX) had a significant negative effect on PCS. Also, with increasing age, the PCS score decreased, which seems logical and increasing age reduces strength and the symptoms of aging will reduce the quality of physical life, this finding is consistent with the results of Luciane 2012(28), Ronika 2017(29), Merry GOTT 2006 (30), Wenrue 2014(23).

Our results showed with increasing level of education, income, angina and the number of drugs, the quality of life and PCS score increased, which can be justified in the case of income variable, and more income brings a higher level of well-being and thus a higher quality of life. However, Alexandera stated in his study findings that angina has reduced the PCS score(21). This discrepancy can vary due to different sample size and population.

Our results showed that PCI types LAD, LCX, RCA had a significant negative effect on mental component (MCS). Also, with increasing age, quality of life related to mental health score decreased. But with increasing level of education and income and the number of drugs, the quality of life score increased which can be justified in the case of income variable, and more income brings a higher quality of life related

to mental health(31). In a similar study, Alexandera 2016 (21) identified age as a reducing factor for MCS, a finding that is consistent with the findings of our study.

In this study, the relationship between the eight dimensions of the SF 36 questionnaire and the demographic variables of the study was also investigated (Table 4). The results of the study of the relationship between PF score and gender showed a significant difference in the scores of women and men, so that men had higher physical performance scores. This finding was consistent with the findings of the study Alexandera 2016(21), Merry 2006(30), they stated that women had lower quality of life scores than men.

Study the relationship between quality of life score related to PF and type of job showed that the quality of life score in different jobs was significantly different so that employees had the highest quality of life score and this finding is consistent with the findings of Alizadeh et.al 2016 (32), Coloni 2014(33) studies. The study of the relationship between PF and education also showed that different educational levels had different quality of life scores so that illiterate patients and patients with university education had the highest quality of life scores. This finding was consistent with previous studies (Luciane 2013(28), Alizadeh(32)). There was also a significant difference in quality of life scores related to PF in patients with and without hypertension, kidney pain, and MI, so that patients without these diseases had higher quality of life scores, which was consistent with the findings of previous studies (Wenru 2014(23), Merry 2006(30)). There was a significant difference in the quality of life score related

to PF according to the results of the angiograph, so that patients with three blocked arteries had a higher quality of life. This issue has not been addressed in other similar articles.

Health-related quality of life score in role-physical dimension (RP) had a significant difference in level of gender, job and income, so that men, employees and patients with good income level had a higher quality of life score, respectively. Ronika et al. 2016(29), In their study, they stated that men had a higher quality of life score than women. Also, the quality of life score in patients with hypertension and kidney disease was significantly different, so that patients without blood pressure and kidney pain had a higher score. Luciane et al. 2013(28) in their study, stated that chronic diseases reduce the quality of life score, which is consistent with the findings of our study. There were also significant differences in the quality of life scores associated with RP at different levels of the PCI type, so that types 4 and 7 had highest quality of life scores. PCI effect on quality of life was not studied in previous studies.

There was a significant difference in quality of life scores related to role- emotional (RE) in different levels of job, hypertension, PCI type, and employees, so that people without blood pressure and PCI type 5 and 7 had higher quality of life scores. Wenru *et al.* 2014 (23)Have identified blood pressure as an important factor in reducing the quality of life, which is in line with the findings of our study.

There was a significant difference in the quality of life scores associated with vitality at different levels of gender, job, education, income, hypertension, kidney pain, carotid, angiography, and PCI type. Women, unemployed, illiterate patients, middle and high income, people with blood pressure, people with kidney pain, carotid and people who had one or two vessels blocked in angiography result and people with PCI type 6 had the highest score of quality of life. Contrary to popular belief, people who did not have a job or higher education had higher quality of life scores. Ronika et al. 2016 (29) in the results of their study, stated that education has no effect on quality of life, which is not in line with the findings of our study. More studies have pointed to the effect of education (3, 8, 18, 28, 29, 34).

There was a significant difference in the quality of life scores related to mental health at different levels of gender, job, education, income, kidney, carotid, angiography and type of PCI so that women, retirees, illiterate, have a good income, kidney Pain, carotid artery, single vessel angiography and type 6 PC had the highest quality of life scores.

Quality of life scores in terms of social functioning (SF) were significantly different only at different levels of angiography. This issue has not been investigated in previous studies.

There was a significant difference in quality of life score according to bodily pain (BP) in different levels of gender, job, education, kidney pain, carotid, angiography and PCI type, so that women, patients without jobs, patients with read and writing education,

kidney pain, Carotid and first vein angiography and PCI 6 and 7 had the highest quality of life scores.

The quality of life in terms of general health (GH) at different levels of education, income, angina, and angiography were significantly different. So that people read and write educating, and illiteracy, good income, have angina, angiography a vessel and type 6 and 7 PCI had the highest quality of life scores. Luciane et al. 2012(28) in their study, stated that education and age have the negative effect on quality of life, so this finding is consistent with the findings of our study.

According to a meta-analysis study conducted in Iran by Doosti et al. 2018(34), The quality of life score in the Iranian population in all eight dimensions was between 47.85 and 59.55, and this range is called moderate level. Therefore, in the present study, the median (IQR) of PCS was equal to 65.78 (9.48) and median (IQR) of MCS was equal to 64.18 (7.68), therefore, they can be classified in the above-moderate category.

### **Strengths and limitations**

One of the strengths of this study is that, as far as we know, it is one of the first quality of life studies of patients six months after angiography, and it examined useful variables that were not studied in previous studies. One of the limitations of this study is the imbalance in the marital status variable that the single level was only one sample and therefore we were not able to maneuver about this variable. Another limitation of the study was the impossibility of calculating the total score of the interpretation SF-36 questionnaire, which was mentioned in guideline of the questionnaire. This questionnaire does not have a general score, so calculations were performed for its eight domains and its two main components.

### **Conclusion**

Assessing the quality of life of patients undergoing angioplasty treatment is essential to identify effective factors and improve it. The Health-related quality of life score in both physical and mental dimensions was moderate (50-75). Age, type of PCI, diabetes, blood pressure, level of education, income were the most important factors related to HRQL of patients undergoing angioplasty.

### **Supplementary materials**

Supplementary material is available at <http://www.e-epih.org/>.

### **Conflict of interest**

The authors have no conflicts of interest to declare for this study.

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