Original Article

Perceived Health among Patients with Coronary Heart Disease Four Months after a Percutaneous Coronary Intervention

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Abstract

Background: Perceived health (PH) has become an important outcome measure among coronary heart disease (CHD) patients. Poor PH has been shown to predict morbidity and mortality among CHD patients.
Objective: The objective of this paper was to examine CHD patients' PH after percutaneous coronary intervention (PCI).
Methods: This descriptive cross-sectional study (n = 416) was conducted across five hospitals in Finland during 2013. A self-report questionnaire of PH was used, which comprises EuroQoL five-dimensional scale (EQ-5D-5L), EuroQoL visual analog scale (EQ-VAS), and 18 background variables. Data were analyzed using descriptive statistics and multivariate methods.
Results: Female gender, previous PCI, physical inactivity and slight vegetable consumption were associated with reduced PH among post-PCI patients. Seventy percent of the sample reported problems in some PH dimension.
Conclusions: Post-PCI patients should be encouraged to pursue a healthy lifestyle, which seems to have a beneficial effect on PH. Females, elderly, or those demonstrating lower education, physical inactivity, slight vegetable consumption, longer duration of CHD, hypertension, hypercholesterolemia, or previous invasive treatment should be afforded special attention.

Keywords: perceived health status, coronary heart disease, percutaneous coronary intervention

Introduction

Perceived health (PH) reflects people's overall perceptions of their health. Although an unambiguous definition of PH is lacking, there is some consensus that PH is a multi-faceted construct with physiological, emotional and social components (OECD, 2010; Cepeda-Valery et al., 2011). PH reflects the original World Health Organization (WHO) concept of health as a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity (WHO, 1948). Although this definition of health is somewhat more utopian and difficult to operationalize, it forces one to consider well-being in a broader context of health status (Morgan, 2009).

Coronary heart disease (CHD) is a leading cause of mortality, morbidity and loss of quality of life

globally. The focus of CHD management has been to reduce mortality and the risk of subsequent events. Many conventional risk factors associated with the development of CHD have been identified: family history, increasing age, male gender, smoking, hyperlipidaemia, hypertension, abdominal obesity, diabetes, physical inactivity, unhealthy diet, harmful alcohol consumption and stress. In relation to sociodemographic and psychological factors, unmarried status or lack of a partnership has been found to impair the prognosis in CHD patients. Moreover, low socioeconomic status contributes to both the risk of developing CHD and the progression of the disease (WHO, 2015).

Over the years, how individuals perceive emotional, social and physical health has gained increased attention, particularly in long-term chronic conditions where a full recovery is considered unlikely. Many patients consider the quality of additional life years gained to be equally important to the length of life. Subjective self-assessment of PH is widely used as a health indicator in population health surveys and is a strong predictor of long-term clinical outcomes in patients with CHD. (Cepeda-Valery et al., 2011). Poor PH has been shown to predict mortality (Schenkeveld et al., 2010) and morbidity (Grool et al., 2012) as well as new cardiac events, hospital admissions and the cost of care for patients with CHD (Rumsfeld et al. 2013). PH has also been shown to be a strong predictor of functional capacity, healthcare use and institutionalization (Prattala et al., 2011). These findings highlight the importance of including patients' subjective experiences of their own health during assessment as part of an overall strategy for enhancing clinical management and to reduce the risk of adverse events (Grool et al., 2012).

The medical treatment of CHD has improved significantly in recent years with percutaneous coronary intervention (PCI) and coronary-artery bypass grafting (CABG) being offered as safe and effective options for cardiac revascularization. Both PCI and CABG strategies aim to provide relief from the symptoms of angina, decrease mortality and morbidity, and improve the perceived health and quality of life of patients with CHD (Cohen et al., 2011; Shan, Saxena & McMahon, 2014).

Different CHD patient groups (Acute Coronary Syndrome [ACS] treated noninvasively, PCI, CABG) experience many similar psychosocial and physical symptoms. All three patient groups may experience significant physical limitations during their initial recovery period. Post-CABG patients experience more physical weakness and postoperative pain compared with CHD patients after PCI. (Kattainen, 2005; Barnason et al. 2012.)

Emotional symptoms, such as fatigue, exhaustion and tiredness, have been reported by all three cardiac patients' groups following discharge. Moreover, anxiety and depression are common among all three patient groups post-discharge (Barnason et al., 2006). These symptoms are of particular concern among post-PCI patients (Lauck, Johnson & Ratner, 2009) because anxiety and depression present a four to six fold increase in the risk for new cardiac events (Park, Tahk & Bae, 2014) and predict negative PH (Škodová et al., 2011). Increased anxiety level also predicts ischemic heart disease symptoms after PCI and subsequent readmission (Iles-Smith et al. 2015).

Early convalescence from CABG surgery is fraught with difficulties. However, the long-term picture in terms of PH and cardiac health is better for CABG patients than for those who received angioplasty treatment (Windecker et al., 2014). Moreover, the identification of anxiety and depression can be challenging in PCI patients because of the significantly shorter hospitalization and recovery period (Lauck, Johnson & Ratner, 2009). Previous studies have examined PH after CABG, noting superior benefits with regard to the angina symptoms and quality of life over PCI. However, recent advances in PCI techniques have narrowed the gap in the PH of patients undergoing PCI versus CABG (Cohen et al., 2011). As acute invasive cardiac treatment methods continue to improve, more research on the PH of post-PCI patients is needed, especially during the early recovery period, as PCI has become the primary reperfusion treatment option and is now the most frequently conducted therapeutic procedure in medicine (Windecker et al., 2014).

Aim

This study is a sub-study of a larger research project that aims to develop a model of self-care among patients with CHD after PCI. The aim of

this study is to describe the PH and related socio-demographic, behavioral health, and disease-specific variables after PCI among Finnish patients with CHD.

Research Questions:

1. How is health perceived by patients with CHD after angioplasty treatment?

2. Which patient-specific variables (i.e. socio-demographic, health behavioral, and disease-specific) are related to perceived health among patients with CHD after PCI?

Materials and Methods

Design and sample

This study, which describes patients' PH after an elective or acute procedure of PCI (angioplasty or stent), is a descriptive cross-sectional study conducted across five hospitals, including two university hospitals and three central hospitals in Finland during 2013. Inclusion criteria were patients aged 18 years or older, and the absence of diagnosed memory disorders. The study was conducted four months after PCI because, by this time, patients should have had time to physically recover and to psychosocially adapt to their situation after a cardiac event. A sample of 572 patients who met the inclusion criteria were given information about the study by the nurses working on the medical wards. Informed consent was gained from 520 patients (91%) and the data was obtained from 418 for a final response rate of 80% (n = 418). Two questionnaires were incomplete, thus giving a sample of 416 completed questionnaires for analysis. According to power analyses, this sample size was large enough with relatively small correlations (0.14) to detect statistical significance with a power of 80% and significance level of 0.05. This number of observations and the incidence can detect about 7–13% difference between the groups. Data were collected using postal questionnaires four months after PCI. The questionnaire, cover letter and a stamped return envelope were mailed to participants' home address.

This study was approved by the Ethical Review Board of the University Hospital of Kuopio (ref. 74//2012) and permission to conduct the study was obtained from each research center. Patients who met the inclusion criteria received spoken and written information about the study by the Registered Nurses working on the medical wards. Participants gave their written informed consent after having an opportunity to consider their willingness to participate in the study before being discharged. Information given to participants included the purpose and procedures of the study, the voluntary nature of their participation, anonymity, confidentiality, and their right to withdraw from the study at any point. (World Medical Association, 1964/2013.)

Data collection

Overall PH among CHD patients four months after PCI was measured using the EuroQoL five-dimensional scale (EQ-5D-5L) and EuroQoL visual analog scale (EQ-VAS). The EQ-5D-5L is composed of five items addressing five dimensions of health: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. For each dimension, severity is rated on a five-point Likert scale (1 = *no problems*, 2 = *mild problems*, 3 = *some problems*, 4 = *moderate problems*, 5 = *extreme problems*). The EQ-VAS records the respondents' self-rated health on a vertical visual analog scale with endpoints labelled '*the best imaginable health' (100) to 'the worst imaginable health state' (0)* (Rabin & de Charro, 2001).

Previous literature attests to the applicability of the EQ-5D for use in PH research among CHD patients (Cepeda-Valery et al., 2011; DeSmedt et al., 2014). It is a standardized and validated generic questionnaire used internationally to measure health outcomes (Janssen et al., 2008). In addition, the questionnaire included 18 background variables, which comprised sociodemographic factors (gender, marital status, age, length of education, profession, employment status), health behavioural factors (physical activity, vegetable consumption, alcohol consumption, smoking), and disease-specific factors (duration of CHD, blood pressure, cholesterol, previous acute myocardial infarction (AMI), PCI or coronary artery bypass surgery (CABG).

Data analysis

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS v.21) software for Windows. Descriptive statistics, including frequencies, percentages, means, standard error of the means, medians, ranges, and standard

deviations, were used to present the demographic and clinical characteristics of respondents. Multivariate methods of analysis of variance (EQ-VAS) and logistic regression (EQ-5D-5L) with stepwise backward selection were used to assess relationships between background variables and EQ-VAS (self-rated health) and EQ-5D (dimensions of PH). *P*-values <0.05 were considered statistically significant and statistically significant results are presented in Tables 3 and 4. In the original scale of EQ-5D, the severity of problems on the PH dimension were rated on a five-point Likert scale. In this study, we were interested to know if patients with CHD post-PCI experienced health problems, not the degree of the problems. Therefore, the original five-point EQ-5D-5L scale was assigned to two categories. For the analysis, a value of 1 formed category one, labelled 'no problems'. Values ranging from 2 to 5 were combined and assigned a value of 2; category two was labelled 'problems'.

Results

Background information

This sample of respondents (n = 416) (Table 1) were predominantly male (75.0%), and married or cohabiting (76.9%). Respondents' mean age was 63.2 years (Md 64.0, range 38.0–75.0, SD 8.0), and the mean length of education was eleven years (Md 10.0, range 5.0–24.0, SD 3.3). Majority were retired (60.3%). Somewhat less than half (42.0 %) of the respondents engaged in at least 120 minutes of sustainable physical exercise per week. Daily vegetable consumption averaged 2.4 deciliters per day (Md 2.0, range 0–5.0, SD 1.2). Smokers were 15.4% of the respondents.The average duration of CHD was about five years (Md 1.0, range 0.3–45.0, SD 7.5). One-fourth (24.5%) reported hypertension, and about 14% of the respondents had elevated cholesterol levels. Previously, 23.8% of the respondents had undergone PCI treatment and 12.5% CABG.

Perceived health status among patients with coronary heart disease after percutaneous coronary intervention

The mean EQ-VAS value of PH among the respondents was 76.0 (Md 80.0, range 10.0–100.0 SD 18.0), as seen in the table 2, which contains also the comparison of the values of healthy Finnish population norms based on the report of the EURO-QOL study group (Janssen & Szende, 2014). Background variables' connection with PH (Table 3) indicated that male gender was significantly related to better PH. Regarding health behavior, a better PH was related to physical activity and higher consumption of vegetables. Previous PCI was related to impaired PH (mean of EQ-VAS).

Seventy per cent of the respondents had problems in some dimensions of EQ-5D-5L (mobility, self-care, usual activities, pain/discomfort or anxiety/depression) (Table 2). More than half of the respondents (61%) reported pain and discomfort, and slightly less than half of the respondents (41%) experienced mobility problems. About one-third (31%) reported perceived depression and anxiety. For usual activities, including housework, leisure activities and other normal functions, one-third of the respondents (30%) reported difficulties. Only seven per cent of the respondents reported problems in self-care, such as washing and dressing, and in this dimension of PH.

With regard to the dimensions of PH (Table 4), exhibited frequent problems in mobility were connected with female gender, older age, retired employment status, and prior CABG. Physical activity and normal blood pressure correlated significantly with fewer problems in the dimensions of mobility. Difficulties in the performance of usual activities were more common among female and older respondents. However, length of education, physical activity, and normal systolic blood pressure were good predictors of managing usual activities. Pain and discomfort were more common among female. Respondents who had suffered with CHD for at least ten years had a higher risk of feeling anxiety and depression than others. Additionally, physical activity, modest to high consumption of vegetables, non-smoking, and normal total cholesterol, seemed to have a beneficial effect with regard to experienced anxiety and depression.

Table 1. Background information of patients with coronary heart disease four months after percutaneous coronary intervention (n = 416).

VARIABLES	%(n)	Mean	Median	Range	SD	Missing
SOCIODEMOGRAPHIC FACTORS						
Gender						0.7(3)
Male	75.0(312)					
Female	24.3(101)					
Marital status						0.2(1)
Married, cohabiting	76.9(320)					
Single, widowed, divorced	22.9(95)					
Age (years)		63.2	64.0	38-75	8.0	1.0(4)
≤55 years	17.8(74)					
56–65 years	38.7(161)					
>65 years	42.5(177)					
Length of education		11.0	10.0	5-24	3.3	3.6(15)
< 9 years	39.4(164)					
9–12 years	20.7(86)					
> 12 years	36.3(151)					
Profession						0.2(1)
Worker	31.8(132)					
Clerical worker	28.4(118)					
Entrepreneur/ farmer	21.6(90)					
No vocational education	18.0(75)					
Employment status						0.5(2)
Retired	60.3(251)					
Employed	21.4(89)					
Part-time retired	10.3(43)					
Unemployed	7.5(31)					
HEALTH BEHAVIOURAL FACTORS						
Physical activity (30 min/day)						1.0(4)
> 3 times per week	42.0(175)					
1–3 times per week	44.5(185)					
Occasionally	12.5(52)					
Consumption of vegetables		2.4	2.0	0-5	1.2	2.2(9)
<2 dl/day	55.2(230)					
2–4 dl/day	33.7(140)					
> 5 dl/day	8.9(37)					
Alcohol consumption						15.9(66)
>2 portions/day	43.0(179)					
≤2 portions /day	41.1(171)					
Smoking						0.2(1)
No	84.4(351)					
Yes	15.4(64)					

DISEASE-SPECIFIC FACTORS						
Duration of CHD (year)		4.7	1.0	0.3-45	7.5	10.3(43)
< 1 year	52.9(220)					
1–10 years	18.8(78)					
> 10 years	18.0(75)					
Blood pressure (systolic)		130.0	130.0	90-192	14.5	8.4(35)
≤ 139 mmHg	67.1(279)					
Hypertension	24.5(102)					
Cholesterol (total)		4.0	3.8	2.2-7.5	0.9	33.9(141)
≤ 4.5 mmo1/l	52.4(218)					
Hypercholesterolemia	13.7(57)					
Previous AMI						1.2(5)
No	61.8(257)					
Yes	37.0(154)					
Previous PCI						0.7(3)
No	75.5(314)					
Yes	23.8(99)					
Previous CABG						1.2(5)
No	86.3(359)					
Yes	12.5(52)					

Abbreviations: AMI, acute myocardial infarction; CABG, coronary artery bypass grafting; CHD, coronary heart disease; PCI, percutaneous coronary intervention.

Table 2. EuroQoL visual analog scale (EQ-VAS) means and reported problems by five dimensions of EuroQoL five-dimensional scale (EQ-5D-5L) (% of any problems).

	EQ-VAS mean	Total problems	Pain / discomfort	Mobility	Anxiety / depression	Usual activities	Self-care
1)	76.0	70	61	41	31	30	7
2)	79.4	-	48	26	14	21	9

Abbreviations: EQ-5D-5L, EuroQoL five-dimensional scale; EQ-VAS, EuroQoL visual analog scale.

1) Patients with CDH four months after PCI

2) Finnish population norms (Janssen & Szende, 2014)

Table 3. Background variables' connection to EuroQoL visual analog scale (EQ-VAS) among patients with coronary heart disease four months after percutaneous coronary intervention: EQ-VAS mean, standard error of the mean, mean difference with 95 % Confidence Interval in EQ-VAS to the reference group from multivariate analysis of variance.

Variable	EQ-VAS Mean (S.E. mean)	B (95% CI)	*p*
Gender			**1)<0.000**
Male	77.7 (9.93)	7.93 (3.96/11.90)	2)<0.001
Female	71.5 (2.11)	0	
Physical activity 30 min/day			**1)0.001**
> 3 times per week	77.94 (1.26)	9.33(4.00/14.67)	2)0.001
1–3 times per week	74.35 (1.4)	9.54 (4.30/14.78)	2)<0.001
Occasional	66.16 (2.36)	0	
Consumption of vegetables			**1)0.001**
>5 dl/day	78.05 (3.20)	6.15 (0.13/12.18)	2)0.05
2–5 dl/day	80.22 (1.34)	6.63 (3.02/10.24)	2)<0.001
<2 dl/day	73.36 (1.20)	0	
Prior PCI			**1)0.004**
Yes	71.55 (2.00)	-5.65 (-9.52/-1.79)	2)0.004
No	77.65 (0.96)	0	

Abbreviations: B, mean difference; 95% CI, 95% confidence interval; EQ-VAS, EuroQoL visual analog scale; PCI, Percutaneous coronary intervention; S.E mean, standard error of the mean.

1) Tests of Between-Subjects effects

2) Parameter Estimates

Table 4. Background variables' connection to dimensions of perceived health status among patients with coronary heart disease four months after percutaneous coronary intervention: Odds ratio with 95% Confidence Interval in EuroQoL five-dimensional scale (EQ-5D-5L) multivariate logistic regression.

Variable	Mobility		Usual activities		Pain/discomfort		Anxiety/depression	
	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*
Gender								
Male	1	0.03	1	0.05	1	0.02		
Female	2.79 (1.12/6.98)		2.62 (1.02/6.69)		2.67 (1.19/5.94)			
Age								
≤55 years	1	0.05	1	0.03				
56–65 years	1.19 (0.47/3.05)	0.72	0.81 (0.31/2.13)	0.67				
66–75 years	9.81 (1.47/65.29)	0.02	4.69 (1.24/17.81)	0.02				
Employment status								
Retired	1	0.01						
Part-time retired	1.1 (0.29/4.17)	0.89						
Unemployed	0.24 (0.03/2.05)	0.19						
Employed	0.05 (0.01/0.29)	0.001						
Length of education								
<9 years			1	0.01				
10–12 years			0.53 (0.17/1.63)	0.26				
>12 years			0.14 (0.04/0.47)	0.001				
Duration of CHD								
<1 year							1	0.03
1–10 years							3.8 (0.95/15.35)	0.06
>10 years							6.4 (1.68/24.87)	0.01
Prior CABG								
Yes	1	0.02						
No	0.25 (0.07/0.82)							

Physical activity 30 min/day						
> 3 times/week	1	0.04	1	0.001	1	0.03
1–3 times/week	1.94 (0.80/4.70)	0.14	2.77 (1.04/7.36)	0.04	1.5 (0.7/3.5)	0.3
Occasional	7.61 (1.40/41.24)	0.02	19.13 (4.24/86.26)	<0.00 1	6.6 (1.6/26.5)	0.01
Consumption of vegetables						
>5 dl/day					1	0.01
2 – 5 dl/day					0.73 (0.18/2.90)	0.65
<2 dl/day					2.67 (0.75/9.47)	0.13
Smoking						
Yes					1	0.05
No					3.96 (1.23/15.25)	
Blood pressure (systolic)						
≤ 139 mmHg	1	0.02	1	0.01		
Hypertension	3.12 (1.22/7.96)		3.71 (1.43/9.66)			
Total cholesterol						
≤ 4.5 mmo1/l					1	0.01
Hypercholes-terolemia					4.81 (1.56/14.90)	

Abbreviations: CABG, coronary artery bypass grafting, CHD, coronary heart disease; 95% CI, 95% Confidence Interval.

Discussion

The mean EQ-VAS was 76.0 out of 100, which indicates a reduction in total PH among CHD patients after PCI. According to EQ-5D national population norms for Finland, the mean EQ-VAS is 79.4 [25]. However, respondents reported better PH compared to a study by De Smedt et al. (2015) [26], who reported EQ-VAS values of 67.9 six months after PCI among CHD patients in 22 European countries. This is a noteworthy finding because a number of studies have revealed that self-reported PH is a crucial predictor for the prognosis of CHD with regard to morbidity (Schuz et al., 2011; Grool t al. 2012) and mortality (Schenkeveld et al., 2010; Grool et al., 2012; Rutledge et al., 2012). Our results were consistent with previous studies (Norris et al., 2008; Pragodpol & Ryan, 2013; De Smedt et al., 2015), indicating that females had more problems compared with males in overall PH, and with regard to mobility, usual activities and the prevalence of pain and discomfort, which is seen also by De Smedt et al. (2015). Compared with the EQ-5D Finnish general population norms, post-PCI patients had more problems in other dimensions of PH except self-care (Janssen & Szende, 2014).

In some dimensions of PH, we found that a longer education and employment status predicted fewer problems, which is consistent with previous studies (Kramer et al., 2012). This is thought to be important, because the socioeconomic disadvantage is linked to a greater risk for re-hospitalization and a lower quality of life, a poor total CHD prognosis, and a higher risk for cardiovascular mortality and morbidity (Kramer et al., 2012; Pearson-Stuttard et al., 2012.).

Our results suggest that patients who adopt a healthier lifestyle after their cardiac event perceive

their health better than those who fail to adopt healthy approaches. In particular, physical activity predicted PH, as found also by De Smedt et al. (2015). Several studies have highlighted improvements in physical functioning after PCI among post-PCI patients (Melberg, Nordrehaugh & Nilsen, 2010; Li et al., 2012; Shibayma, 2012; Hoo, Gallagher & Elliot, 2014). These results underscore the importance of encouraging the patient to participate in physical exercise after PCI; conversely, lack of exercise is a known risk factor for the recurrence of cardiac events.

Our results, together with the findings of previous studies, confirm that cardiac patients are at an increased risk for the development of anxiety and depression, as indicated by one-third of the respondents in this study. In previous studies, the prevalence of depression among respondents varied considerably, from 17% to 50% (Luttik et al., 2011; DeSmedt et al., 2014; Pajak et al., 2013; Furuya et al., 2015). As is known, a healthy lifestyle (physical activity and the use of vegetables in diet, and non-smoking), are lifestyle treatments for elevated cholesterol levels and hypertension, and important self-care objectives among cardiac patients. Our results highlighted the significance of support for patients' self-care, because these elements were associated with the occurrence of anxiety and depression.

The majority of CHD patients report lower PH compared with population values. Moreover, anxiety and depression remain a significant problem, and particular attention should be given to screening and identifying these problems among CHD patients after PCI, especially among patients with the longer duration of CHD. Attention should be paid to female and patients with a previous history of PCI treatment, as these populations are particularly vulnerable post-PCI. Therefore, there is a pressing need to ensure adequate follow-up treatment because of the shortened length of stay in hospital for patients after PCI.

There are some limitations in this study. The ability to make direct comparisons between previously published studies is somewhat limited. PH is a multidimensional concept in which the different dimensions (i.e. quality of life, health status, self-rated health, health-related quality of life [HRQoL]) are closely related; however, the concept lacks a clear definition. In addition, the cross-sectional study design makes it difficult to assess the directionality of the association between PH and lifestyle changes. Further research should focus on long-term gains in PH. Results of the present study may be affected by the distinct possibility that participants who did not return their questionnaires, or who declined to participate in this study, might have been those with the poorest PH.

In studies relying on self-report data collection methods, there is always a risk of social desirability, where patients give the answers they think are supposed to be good and what the researchers want rather than reporting what they actually do or feel (Abma & Broerse, 2010). Nonetheless, the main strength of our study was the large sample, and the questionnaires in this study were completed very well, with little missing data.

Conclusion

Post-PCI patients should be encouraged to pursue a healthy lifestyle, which seems to have a protective effect on total PH. Particular attention should be paid to female, elderly, or those demonstrating lower education, physical inactivity, low consumption of vegetables, longer duration of CHD, hypertension, hypercholesterolemia, or previous invasive treatment.

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