# Correlates of health-related quality of life in patients with myocardial infarction: A literature review

Authors

Kyoungrim Kang, PhD Candidate, University of Technology Sydney, Sydney, Australia

Leila Gholizadeh, PhD, University of Technology Sydney, Sydney, Australia

Sally C Inglis, Associate professor, University of Technology Sydney, Sydney, Australia

Hae-Ra Han, Associate professor, Johns Hopkins University, Baltimore, MD, USA

* The corresponding author: Kyoungrim Kang

E-mail address: Kyoungrim.Kang@student.uts.edu.au

Postal address: HDR space (03.300), Level 3, UTS Building 10, 235 Jones St, Ultimo NSW 2007, Australia

## Abstract

Background: In accordance with the increasing emphasis on HRQoL in patients with MI, it is necessary to explore factors that affect HRQoL in this population. This study aimed to identify the factors affecting health-related quality of life in patients with myocardial infarction.

Methods: Three databases – CINAHL, MEDLINE and PsychINFO - were searched to retrieve relevant peer reviewed journal articles published in English in the last 20 years. A total of 48 studies met the inclusion criteria and were included in the review.

Results: There were four categories of factors that affected HRQoL in patients with MI, including demographic, behavioural, disease-related, and psychosocial factors. There were strong and significant associations between HRQoL and the identified factors such as age and gender for demographic factors, physical activity and smoking for behavioural factors, severity of MI, symptoms, and comorbidities for disease-related factors, and anxiety and depression for psychosocial factors.

Conclusions: Identifying these factors can provide early detection of patients who tend to have worse HRQoL in the recovery or rehabilitation stage of post-MI. focusing on adjustable factors such as behavioural and psychosocial factors would be more effective to help them recover HRQoL after experiencing MI.



Key words: Health-related quality of life; myocardial infarction; factors; predictors; review

## Introduction

Myocardial infarction (MI) is the most frequent manifestation of coronary heart disease (CHD) and one of the leading causes of death worldwide (Saeed, Niazi & Almas 2011; Wang, Chow, et al. 2014). The life threatening nature of the disease, and the need for long term lifestyle changes and medical regimens after MI (Boersma et al. 2006) often result in reduced health-related quality of life (HRQoL) among the patients (Wang, Thompson, et al. 2014). Relevant literature indicates that once HRQoL decreases post-MI, patients hardly recover to the level preceding to MI (Wang, Chow, et al. 2014) or the standard of the general population (Sakai et al. 2011).

HRQoL is a multidimensional concept that examines the physical, emotional, and social impacts of a disease/ illness on patients' life (Sertoz et al. 2013). This patient reported outcome is increasingly used as a means of assessing the overall well-being of patients in the recovery stage of MI (Lidell et al. 2014; Wang, Thompson, et al. 2014). HRQoL also provides a patient-centred assessment of one's own health condition (Norris, Hegadoren & Pilote 2007), which then can be used to evaluate individual patient experiences (Rumsfeld et al. 2013) and to predict the reoccurrence of cardiac events, rehospitalisation, and mortality (Rumsfeld et al. 2013). Thus, HRQoL can be used as indicative of patient health status following discharge from an acute MI (Brink et al. 2005; de Jonge et al. 2006; Sakai et al. 2011).

In accordance with the increasing emphasis on patients reported outcomes including HRQoL in patients with CHD, in particular MI, it is necessary to explore factors that affect HRQoL in this population. Identifying these factors can lead to early identification of patients who are likely to experience poor HRQoL at the time of hospital admission and during recovery (Hawkes et al. 2013) and provide a window of opportunity to improve patient outcomes (Hawkes et al. 2013).

To the best of our knowledge, there are no reviews integrating factors that can predict or affect HRQoL in patients with MI. This study was designed to collect, review and synthesise the results of research on factors affecting HRQoL in this patient population group.

## Method

A comprehensive electronic search was performed using CINAHL, MEDLINE and PsychINFO databases. The terms used for searching the relevant literature included: health-related quality of life/quality of life/HRQoL/QoL, myocardial infarction/heart attack/MI and predict*/factor*, which were chosen according to

the consultation from the librarian. Only peer-reviewed studies published in English language were included. In order to ensure relevancy of journal articles, articles were restricted to those published in the last 20 years, from 1995 to July 2016. This was because the management of MI and assessment of HRQoL has drastically improved over the last couple of decades.

*Study Selection*

A total of 640 articles were found from the database searches. Ninety articles were removed due to duplicates. The title and abstract of the remaining 550 articles were reviewed for relevant articles. Irrelevant articles, scientific letters, or posters were excluded from the review. Qualitative studies or studies of validation or reliability of measurements were also excluded. If a study examined factors or predictors that were associated with HRQoL in patients with MI, it was included in the review. The selection process led to inclusion of 47 articles for the review. One additional article was identified through manual searching of the reference lists of the included studies, increasing the total number of the reviewed articles to 48 (Figure 1).

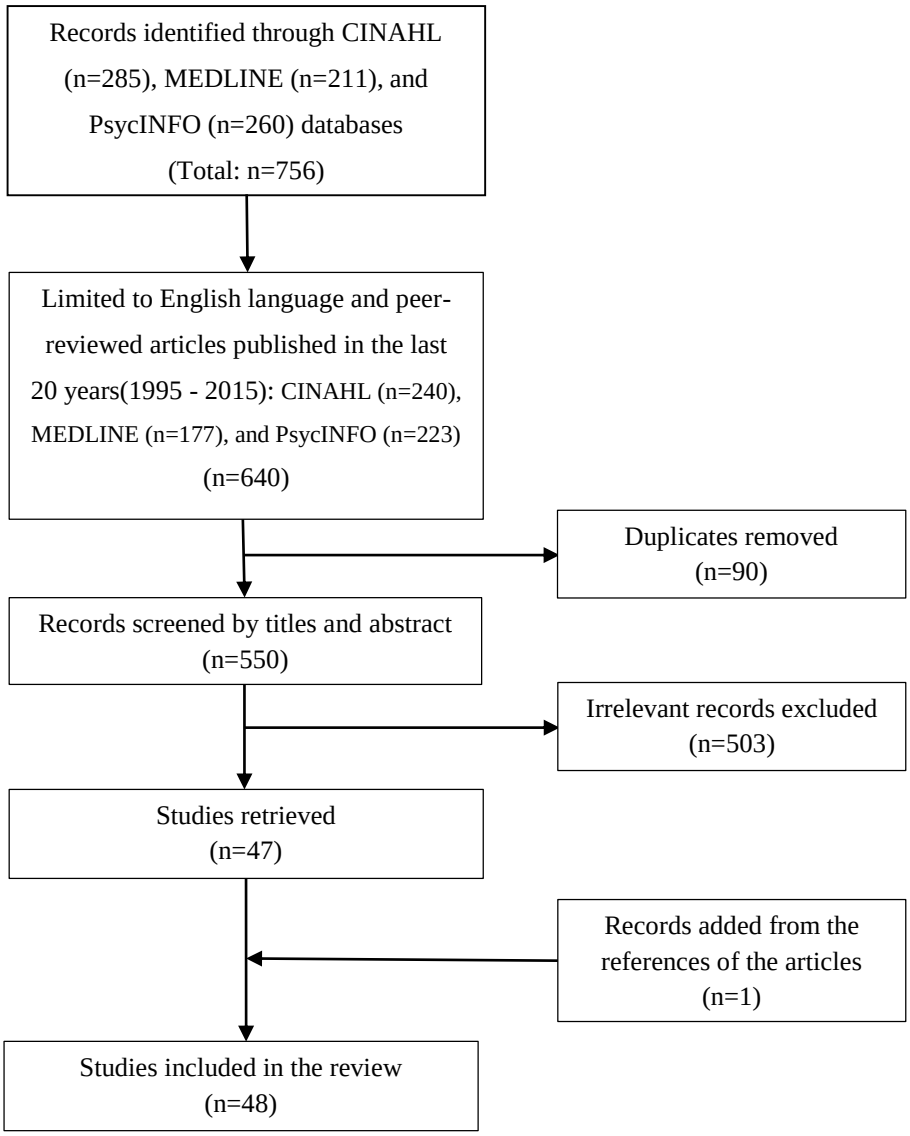


**Figure 1. The process of article selection**

## Results

The characteristics of studies included in this review are summarised in Table 1. The studies were conducted mostly in European countries (1 study each in France and Hungary, 2 in Norway, 3 in Poland, 4 in the Netherlands, and 6 each in Sweden and the UK) including one multinational study that included data from 18 European countries. Also there were 3 studies conducted in Canada and 10 studies in the USA, and one international study involving the USA and Spain. The other studies were conducted in Israel (2 studies), Australia, China, Iran, Japan, Pakistan, Singapore, South Korea, and Turkey (1 study each). Of the 48 studies, 28 studies adapted cohort, longitudinal, prospective designs, or a combination of them. Ten studies applied a cross-sectional design and two studies did not report the study design explicitly, however, these studies seemed to be the prospective studies regarding to the fact that the participants of these two studies were followed up to three months (Mayou et al. 2000; Williams et al. 2012) and 12 months (Mayou et al. 2000). Among the ten cross-sectional studies, the time since MI were not reported in two studies, whereas the other studies reported the time since an MI event. Apart from the cross-sectional studies, the follow-up period of 31 included studies was less than 12 months, ranging from one month to one year, and seven studies followed up the study participants for longer than a year including one with a follow-up period of 10 years. The follow-up period in Table 1 presented the follow-up duration from either baseline or the time since MI.

### *Participant characteristics*

The age of participants in the reviewed studies ranged from 21 to 98 years old. The sample size for the included studies varied from 27 to 3432 participants. Four studies exclusively examined female patients, while one study included male patients only. Excluding these five studies, the proportion of male participants in the remaining 44 studies was mostly more than 60%.

### *The HRQoL measurements*

Table 1 presents the instruments used to measure HRQoL in patients with MI. The included studies used either a generic QoL instrument or a disease specific tool. The Short-Form 36 (SF-36) and 12 (SF-12) and the Medical Outcomes Study 20-item short-form General Health Survey (MOS-20) were used for measuring HRQoL in 28 studies. The World Health Organization Quality of Life Questionnaire Brief Version (WHOQOL-BREF) was used in three studies. Five studies used a disease-specific QoL instrument including the Seattle Angina Questionnaire (SAQ) or the MacNew Heart Disease Health-related Quality of Life Questionnaire (MacNew).

Other disease-specific tools included the Quality of Life after MI (QLMI) questionnaire, the Quality of Life Index-Cardiac Version (QLI-C), the Myocardial Infarction Dimensional Assessment Scale (MIDAS) (2 studies each), the Cardiac Health Profile, and the Minnesota Living with Heart Failure Questionnaire (MLHFQ) (1 study each). There was one study that measured HRQoL using items pulled from three separate QoL instruments: the Duke Activity Status Index (DASI), the Minnesota Living with Heart Failure Questionnaire (MLHFQ), and the SF-36.

Table 1. Summary of the study characteristics

| 1st Author (year) /Country | Study design | Sample N (male %) Mean age (SD) MI diagnostic criteria | HRQoL Assessment | Variables examined (Instruments) | Follow-up period | Key findings |
|---|---|---|---|---|---|---|
| Alsen et al. (2013) / Sweden | Longitudinal | N=155 (72.3%)<br>67.0 (9.0)<br>Acute MI | SF-36 | Fatigue (MFI-20) | 2 years | The physical and mental dimensions of HRQoL two years after MI was predicted by experienced general fatigue at four months ($p<0.01$). |
| Arnold et al. (2014) / USA | Prospective cohort | N=2693 (67.0%)<br>59.9 (11.9)<br>Biomarker evidence of myocardial necrosis and prolonged ischaemic signs/symptoms or electrocardiographic changes during the initial 24 hours of admission | SF-12, SAQ | Age, sex, race, depression (PHQ-9), financial difficulties, current smoking, Stress (PSS), angina | 1 year | Older patients reported higher SAQ HRQoL scores one year after acute MI than younger patients (<50 years) ($p<0.001$). Patients with depressive symptoms, financial difficulties, female sex, current smoking ($p<0.001$ respectively), elevated chronic stress levels ($p=0.001$), more angina before their MI ($p=0.004$), and non-white race ($p=0.017$) reported lower follow-up HRQoL. |
| Baas (2004) / USA | Ex post facto and correlational | N=84 (69.0%)<br>61.0 (11.0)<br>Not reported | The Index of Well-Being | Self-care resources (SCRI-Availability), self-care knowledge (SCRI-Needs), activity level (HAP) | 3 to 6 months | The relationship between HRQoL and self-reported activity level was significant ($r=0.24$). Self-care knowledge and resources had a low relationship with HRQoL. |
| Beck et al. (2001) / Canada | Prospective cohort | N=554 (28.7%)<br>60.9 (12.0)<br>Acute MI (Q or non-Q wave) | SF-36, EuroQol | Depression (BDI), age, in-hospital complications | 6 months and 1 year | Older age and higher levels of depression predicting worse QoL. Shock in-hospital predicted improved physical QoL, at both six months and one year. |
| Bengtsson et al. (2001) / Sweden | Comparative | N=60 (80.0%)<br>58.0 (7.4)<br>No previous history of MI and either 1) ECG with a pathological Q-wave in two parallel leads or 2) typical symptoms and a biochemical marker or 3) suspect ECG changes and a biochemical marker. | SF-36, Cardiac Health Profile | Age, angina (CCS score) | 6 months | Patients below the age of 59 years improved in physical HRQoL ($p=0.002$) only, whereas patients over 59 years improved significantly in both the physical ($p=0.030$) and the mental HRQoL ($p=0.006$). Higher symptom scores predicted low physical HRQoL ($p<0.001$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Benyamini et al. (2013) / Israel | Longitudinal, prospective cohort | N=540 (86.0%)<br>52.1 (8.4)<br>First acute MI | SF-36 | Depression (BDI), anxiety (the State Subscale of STAI), MI severity (infarct location and Killip class) | 10 years | Depression ($p<0.05$) and anxiety ($p=0.05$) were directly related to poorer QoL 10 years later. Their QoL was found to be unrelated to the severity of the initial MI. |
| Boersma et al. (2006) / Netherlands | Longitudinal | N=46 (89.1%)<br>56.4 (8.2)<br>Not reported | MacNew | Goal self-efficacy(a three-item questionnaire) | 4 months | Greater self-efficacy was significantly related to the both physical and social HRQoL ($p<0.05$). |
| Boersma et al. (2005) / Netherlands | Longitudinal | N=113 (74.3%)<br>54.1 (10.3)<br>Not reported | MacNew | Presence of anginal complaints (a self-report NYHA measure), social support (MSQ-H) | 4 months | Significant predictors of a low HRQoL scores were presence of anginal complaints ($p=0.05$), low perceived adequacy of social support ($p<0.01$). |
| Brink et al. (2012) / Sweden | Longitudinal follow-up | N=145 (70.3%)<br>64.4 (9.4)<br>Not reported | SF-36 | General Self-efficacy (GSE) | 2 years | General self-efficacy measured four months after MI was positively related to HRQoL after two years (physical: $p<0.05$, mental: $p<0.01$). |
| Brink et al. (2005) / Sweden | Longitudinal | N=98 (66.3%)<br>Women=71.4 (8.7)<br>Men=64.6 (9.8)<br>First-time acute MI | SF-36 | Depression (HAD), fatigue (SHC) | 1 year | Depression at one week after an acute MI predicted women's physical HRQoL at one year ($p<0.01$) and depression at five months were correlated with both physical and mental HRQoL ($p<0.01$). Depression at five months and fatigue were predictors of men's physical HRQoL ($p<0.01$) and depression at 1 week was a predictor of men's mental HRQoL 1 year after MI ($p<0.01$). |
| Brink et al. (2002) / Sweden | Longitudinal | N=114 (67.5%)<br>Women=72.2 (8.6)<br>Men=65.4 (10.1)<br>First-time acute MI | SF-36 | Depression (HADS), health complaints, coping strategies (GCQ) | 5 months | Depression ($p<0.01$) and the coping strategy ($p<0.05$) were found to be negatively and significantly associated with physical HRQoL, and the coping strategy ($p<0.01$) as well as the variable health complaints ($p<0.001$) with mental HRQoL. |
| Bucholz et al. (2011) / USA | Prospective | N=2264 (68.1%)<br>Living alone=62.7 (13.5)<br>Not living alone=59.3 (12.3)<br>AMI confirmed by cardiac enzymes, and prolonged ischaemia or electrocardiographic ST- | SF-12, SAQ | Living alone | 1 year | Living alone appears to be associated with poorer QoL at 1 year after MI ($p<0.001$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | segment elevation changes. | | | | |
| Bucholz et al. (2014) / USA, Spain | Prospective, observational | N=3432 (32.9%)<br>48.0<br>Acute MI was confirmed by the presence of elevated cardiac enzymes (troponin or creatine kinase) and supporting evidence of myocardial ischaemia, including at least one of the following: symptoms of ischaemia; ECG changes suggestive of new ischaemia; or other evidence of myocardial necrosis on imaging. | SF-12, SAQ | Perceived social support (ESSI) | 1 year | Patients with low social support continued to have lower QoL at 12 months (P<0.01). |
| Coyne et al. (2000) / USA | Cohort | N=1848 (79.0%)<br>59.5<br>The Global Utilisation of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries (GUSTO)-recorded MI | Combination of DASI, MLHFQ, and SF-36 | Infarct artery patency (TIMI flow grade), LVEF (Left ventriculograms) | 2 years | LVEF was significantly related to physical (P=0.021) and social (P=0.014) function, psychological well-being (P=0.042), and perceived health status (P=0.024). Infarct-related artery patency was not directly related to any HRQoL outcome. |
| De Jonge et al. (2006) / Netherlands | Longitudinal, prospective cohort | N=421 (79.6%)<br>61.0 (11.4)<br>Chest pain for at least 20 minutes, creatine kinase concentration 100% higher than normal or creatine kinase MB fraction greater than 10%; or the presence of new pathological Q wave on the ECG in at least two leads. | RAND 36 | Depression (CIDI-Auto) | 1 year | Patients with post-MI depression had a significantly poorer HRQoL at 12 months after the MI than patients without a post-MI depression (p<0.001). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dickens et al. (2006) / UK | Prospective cohort | N=314 (63.0%)<br>57.6 (11.2)<br>First MI | SF-36 PCS | Depression and anxiety (HADS) | 6 and 12 months | Depression and anxiety at 6 months continued to contribute significantly to physical HRQoL at 12 months ($p<0.0005$). Depression and anxiety right before the first MI did not predict the physical HRQoL 12 months later. |
| Doerfler et al. (2005) / USA | Cross-sectional | N=52 (69.2%)<br>57.7 (12.0)<br>History consistent with ischaemic symptoms and electrocardiogram changes with ST elevation or depression of at least 1 mm in 2 contiguous leads with positive cardiac enzymes. | MOS-20 | PTSD (PSS, IES) | 3 to 6 months | Higher depression scores were associated with poorer QoL ($p<0.05$). |
| Ecochard et al. (2001) / France | Prospective | N=671 (84.5%)<br>Women=63.6 (13.4)<br>Men=57.9 (11.2)<br>Acute MI | NHP | Myocardial dysfunction and coronary stenosis (Maximal Killip class) | 1 year | Impaired QoL was not associated with the initial Killip class. |
| French et al. (2005) / UK | Prospective | N=194 (73.2%)<br>63.3 (10.6)<br>Acute MI | QLMI | Illness perception (IPQ), Anxiety and depression (HADS), gender, smoking status, rehabilitation attendance, living alone, previous MI, employment status | 6 months | For emotional HRQoL, anxiety and depression emerged as the only significant predictors. For both physical and social HRQoL, depression emerged as the only significant predictor. For all three HRQoL scales, illness perception was related to emotional ($p=0.05$), physical ($p=0.051$), and social HRQoL ($p =0.044$). Of the categorical variables, only employment status was related to any HRQoL scale ($p=0.002$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Ginzburg et al. (2011) / Israel | Prospective | N=173 (84.0%)<br>Recovered/resilient group=54.0 (8.2)<br>Chronic group=54.7 (9.6)<br>Typical clinical symptomatology, electrocardiographic evidence of MI and typically elevated serum levels of myocardial enzymes | SF-36 | Acute stress disorder (SASRQ), PTSD (PTSD Inventory) | 8 years | HRQoL at 8 years was inversely correlated with the severity of acute stress during their hospitalization ($p<0.01$), PTSD approximately 7 months after their admission ($p<0.001$), and PTSD approximately 8 years after their MI ($p<0.001$). |
| Hawkes et al. (2013) / Australia | Randomised controlled trial | N=294 (79.0%)<br>60.5 (10.7)<br>Newly diagnosed MI | SF-36 | Age, alcohol intake, health behaviours (the Active Australia Survey, a 5-item measure of physical activity intention), self-efficacy (a 10-point scale), smoking, depression and anxiety (HADS), social support (ESSI) | 6 months | Older age ($p<0.001$), lower confidence levels ($p<0.001$), no intention to be physically active ($p<0.001$), and greater sedentary behaviour ($p=0.001$) were strong independent predictors of lower physical HRQoL. Younger age ($p=0.01$), depression ($p<0.001$), lower social support ($p=0.001$) and greater sedentary behaviour ($p=0.01$) were predictors of lower mental HRQoL. |
| Ho et al. (2008) / USA | Prospective cohort | N=2498 (67.0%)<br>60.9 (13.0)<br>Biomarker evidence of myocardial necrosis and clinical evidence of an acute MI during the initial 24 hours of admission, prolonged (>20 minutes) ischaemic signs / symptoms or electrocardiographic ST changes. | SAQ | Age | 12 months | Increasing age was associated with better HRQoL at 12 months ($p<0.0001$). |
| Hosseini et al. (2014) / Iran | Prospective cohort | N=196 (74.0%)<br>55.8 (11.1)<br>Acute non-fatal MI, MI from the results of coronary bypass graft surgery or angiography was excluded | SF-12 | Depression (BDI), Anxiety (STAI) | 5 years | The association of depression and poor QoL survived in the model ($p<0.0001$). Only a trend of lower physical HRQoL score with anxiety was observed ($p=0.004$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Joekes et al. (2007) / Netherlands | Longitudinal dyadic | N=73 MI patients (86.0%) and their partners<br>Male=54.7 (9.8)<br>Female=55.3 (8.8)<br>Not reported | MacNew | Overprotection and active engagement (subscales from a questionnaire measuring support styles), chest pain, illness duration | 3 and 9 months | When partners had been more overprotective, patients reported worsening physical HRQoL 9 months later ($p<0.05$). More active engagement perceived by the patient significantly predicted enhanced emotional, social and global HRQoL ($p<0.05$). Illness duration was associated with reduced social HRQoL ($p=0.006$). Patients who experienced chest pain reported lower emotional, physical, social and global HRQoL ($p=0.000$). |
| Kim et al. (2015) / S. Korea | Descriptive correlational | N=105 (79.0%)<br>65.0 (10.9)<br>LVEF at less than 50% | MLHFQ | Gender, monthly income, NYHA class and symptoms (Friedman-Heart Failure Symptom Checklist) | 12 months and over after the initial cardiac event | Patients who were female, with low income, and had greater functional limitation and more symptoms had worse HRQoL ($p<0.001$). |
| Kristofferzon et al. (2005) / Sweden | Cross-sectional and descriptive-comparative | N=171 (56.7%)<br>Women=76.8 (11.6)<br>Men=71.3 (12.1)<br>Not reported | SF-36, QLI-C | Gender | 1 month | Women reported significantly lower HRQoL than men in both the physical ($p=0.01$) and mental ($p=0.007$) components of the SF-36 and the QLI ($p=0.04$). |
| Lane et al. (2001) / UK | Cohort | N=257 (75.0%)<br>61.6 (11.4)<br>Typical ischaemic chest pain lasting at least 20 minutes, presence of new pathological Q waves on the electrocardiogram, a peak creatinine phosphokinase level >1.5 times the normal limit, or a CK-MB (myocardial isoenzyme of creatinine phosphokinase) value ≥25 IU/litre or >5% of a simultaneous creatinine phosphokinase value exceeding the normal limit. | COOP chart system | Depression (BDI), anxiety (STAI), Living alone, severity of infarction (Peel Index score) | 12 months | Symptoms of depression ($p=0.001$) and anxiety ($p=0.008$) predicted 12-month QoL among survivors, as did living alone ($p=0.001$), and indices of disease severity ($p=0.001$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lane et al. (2000) / UK | Cohort | N=263 (75.3%)<br>61.9 (11.4)<br>Typical ischaemic chest pain lasting at least 20 min; presence of new pathological Q-waves on the electrocardiogram; a peak creatinine phosphokinase level greater than 1.5× the normal limit, or a CK-MB (the myocardial isoenzyme of CK) value ≥25 IU/l or > 5% of a simultaneous CK value exceeding the normal limit. | Dartmouth COOP charts | Depression (BDI), anxiety (STAI), severity of infarction (Peel Index score), previous exercise behaviour, demographic characteristics (gender, partner status, living alone, and employment status) | 4 months | Baseline depression score (p=0.001), anxiety (p=0.001), and previous exercise behaviour (p=0.003) correlated significantly with QoL. QoL was also positively associated with being male, having a partner, not living alone, and being employed (p<0.05). The higher the Peel Index score, the poorer the QoL (p=0.001). |
| Leifheit-Limson et al. (2012) / USA | Prospective | N=1951 (67.0%)<br>60.9 (13.0)<br>Acute MI with increased troponin or creatine kinase-MB levels and (>20 min of ischaemic symptoms or electrocardiographic ST changes. | SF-12, SAQ (QoL subscale) | Social support (ESSI) | 1, 6, and 12 months | Patients with persistently high support experienced higher disease-specific QoL (p<0.001) and general physical (p<0.001 at 1 month, p=0.049 at 6 months, and p=0.006 at 12 months) and mental functioning (p<0.001) across time points. |
| Lidell et al. (2015) / 18 European countries | International cross-sectional | N=452 (0.0%)<br>61.0 (11.8)<br>Not reported | MacNew | Socio-demographic factors (marital status, BMI, managerial responsibility) | 6 months | In the Northern Europe region, physical HRQoL was predicted by marital status (p<0.02), and social HRQoL by managerial responsibility (p<0.01) in the Eastern Europe region. Emotional HRQoL was predicted by marital status (p=0.02), and physical HRQoL by BMI (p=0.02) in the older age group. |
| Mayou et al. (2000) / UK | Not reported | N=344 (73.0%)<br>63.2<br>Daily screening of biochemistry records for requests for cardiac enzyme and electrocardiographic tests | SF-36 | Depression and anxiety (HADS) | 3 and 12 months | Patients who had been distressed at baseline had a significantly worse outcome at both 3 months and 1 year on all dimensions of the SF-36 than non-distressed patients (p<0.05). |

| | | | | | | |
|---|---|---|---|---|---|---|
| McBurney et al. (2002) / USA | Cross-sectional | N=200 (68.0%)<br>63.4 (13.1)<br>Acute MI (International Classification of Diseases-9 code 410) | SF-12 | Patient and disease characteristics (age, personal history, comorbidities, and rehospitalisation) | 7 months | History of chronic heart failure (p=0.02) and transient ischaemic attack (p=0.04), the total number of other illnesses (p=0.001), and rehospitalisation due to heart disease (p<0.001) were related to lower physical HRQoL. Age (p=0.006) was related to lower mental HRQoL. |
| Norekval et al. (2010) / Norway | Survey | N=145 (0.0%)<br>72.0<br>International Classification of Diseases-9 code 410 | WHOQOL-BREF | Sense of coherence (SOC-29) | 6 months | There was a significant difference between all sense of coherence groups on overall QoL (p<0.001). The significant positive relationships between SOC and all QoL domains at three months to five years after MI remained stable at a follow-up after six months (p<0.001). |
| Norris et al. (2007) / Canada | Prospective cohort | N=486 (79.0%)<br>Women=66.0<br>Men=59.0<br>Q or non-Q wave acute MI | SF-36 | Gender | 1 year | Significant gender differences were found for worse HRQoL among women at both baseline and 1-year post-acute MI compared to men (p<0.05). |
| Oginska-Bulik (2014) / Poland | Cross-sectional | N=86 (72.1%)<br>60.5 (10.1)<br>Not reported | Life Satisfaction Questionnaire | Personality type (DS-14 scale), age, gender | The mean time since MI was 2.81± 2.62 years. | Subjects with D type of personality showed lower QoL compared to non-type D subjects (p<0.05). Gender was also not related to HRQoL. Those younger than 58 years showed a slightly higher HRQoL compared to those older than 58 years (p<0.05). |
| Oldridge et al. (1998) / Canada | Randomised controlled trial | N=201 (89.0%)<br>53.2 (9.0)<br>Acute MI | QLMI, Quality of Well-Being Scale, Time Trade-off | Baseline cardiovascular risk | 8-week and 12-month follow-ups | More improvement in HRQoL was associated with the absence of a previous MI, absence of angina, less smoking, and higher exercise tolerance as well as the absence of shortness of breath at 8 weeks (p<0.05) and 12 months (p<0.04). |
| Pettersen et al. (2008) / Norway | Cohort | N=408 (71.0%)<br>66.0 (12.0)<br>Acute MI, defined as codes I21 and I22 in the International Statistical Classification of Diseases and Related Health Problems, tenth revision | SF-36 | Socio-demographic factors, medical records | 2.5 (SD 0.2) years | Age, time since the index MI, COPD, previous MI, and stroke predicted physical HRQoL in women (p<0.02). Education, COPD, infarct localisation, and subsequent MI predicted physical HRQoL in men (p<0.02). Smoking status, education, and Q-wave MI were determinants for mental HRQoL in men (p<0.02). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Rafael et al. (2014) / Hungary | Descriptive correlational and cross-sectional survey | N=97 (69.1)<br>56.1 (10.1)<br>The basis of the electrocardiogram and subsequent enzyme rise | WHO Well-Being Scale | Depression (BDI), anxiety (STAI-T), vital exhaustion (MQ), sleep disturbance (AIS) | 8.5 days after MI on average (3–14 days) | Vital exhaustion ($p<0.0001$) and anxiety ($p<0.05$) were found to have a significant correlation with subjective QoL. |
| Rankin et al. (2003) / USA | Repeated measure descriptive | N=30 (0.0%)<br>65.0 (12.8)<br>Not reported | SF-36, QLI-C | Social support (PSP), psychological distress (POMS), cardiac functional status (DASI) | 1 year | Social support ($p=0.014$) and mood states ($p=0.034$) were the only predictors of QoL for women. Cardiac functional status did not explain a significant proportion of the variance. |
| Saeed et al. (2011) / Pakistan | Cross-sectional | N=80 (61.0%)<br>Age group (years)<br>45-50=14.0%<br>50-55=47.0%<br>56-60=39.0%<br>The first MI by a consultant cardiologist, excluding silent MI | WHOQOL-BREF | Type D personality (DS-14) | Not reported | Higher scores on type-D personality had a negative impact on QoL in MI patients ($p<0.001$). |
| Sakai et al. (2011) / Japan | Prospective cohort | N=215 (100.0%)<br>No post-discharge depressive symptoms=62.0 (10.0)<br>Post-discharge depressive symptoms=59.0 (11.0)<br>Ischaemic chest discomfort lasting at least 30 min; electrocardiographic changes, such as elevation of ST segment, abnormal Q-wave, and inverted T-wave; and elevated serum creatine phosphokinase that was more than twice the normal upper limit. | SF-36 | Post-discharge depressive symptoms (MHI-5) | 6 months post-discharge | The presence of depressive symptoms at 1 month after discharge adversely affected the recovery of HRQoL at 6 months ($p<0.05$). |
| Sertoz et al. (2013) / Turkey | Cross-sectional | N=998 (79.2%)<br>57.4 (10.1)<br>Chest pain or shortness of breath, ST segment elevation, loss of R waves, and/or new pathological Q waves, elevation of creatinine phosphokinase-MB | WHOQOL-BREF | Depression (BDI), comorbid medical conditions, age | Not reported | Both depression and comorbid medical conditions were found to have a negative impact on QoL of post-MI patients ($p<0.03$). Increasing age had a negative effect on both the physical ($p<0.01$) and social ($p<0.0001$) domains of QoL. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | exceeding the normal limit or elevation of creatinine phosphokinase, serum troponin T or I to > 2 times normal | | | | |
| Uchmanowicz et al. (2013) / Poland | Prospective | N=120 (63.0%)<br>62.5 (9.8)<br>a positive troponin blood test and electrocardiographic changes (ST-segment elevation, ST-segment depression, or T-wave inversion) | SF-36 | Diabetes, demographic and clinical variables | 6 months | The influence of diabetes, multi-vessel disease, hypertension, and the high triglyceride level have negative impact on life quality evaluation ($p<0.05$). |
| Wang et al. (2014) / Singapore | Cross-sectional correlational | N=128 (89.8%)<br>55.4 (9.5)<br>At least two of the following three conditions, including typical ischaemia chest pain, elevated cardiac enzyme levels in the serum, usually creatine kinase-myocardial band, and typical ECG changes of the pathological Q-wave that are consistent with ischaemia | SF-12v2, MIDAS | Depression and anxiety (HADS), monthly household income, ex-smoker, alcohol user, hypertension | The length of diagnosis of MI ranged from 15 days to 30 months. | Monthly household income ($p=0.002$) was identified as a predictor of physical HRQoL. For mental HRQoL, four predictors were identified—hypertension ($p=0.017$), ex-smoker ($p=0.034$), alcohol user ($p=0.007$), and anxiety ($p<0.001$). For overall HRQoL, anxiety ($p=0.030$), and depression ($p=0.004$) were significant predictors. |
| Wang et al. (2014) / China | Cross-sectional | N=192 (76.6%)<br>59.8 (12.1)<br>At least two of the following three criteria: typical ischaemic chest pain, elevated cardiac enzyme levels in the serum, usually creatine kinase-MB, and typical ECG changes consistent with ischaemia | SF-36, MIDAS | Depression and anxiety (HADS), socio-demographic and clinical variables (smoking status, hypertension, heart failure) | 1 and 4 weeks (mean of 13 days) after the MI. | Six predictors were identified for poor physical HRQoL: increasing age, smoking status, heart failure, hypertension, anxiety, and depression ($p<0.05$). Heart failure, anxiety, and depression were identified for poor mental HRQoL ($p<0.05$). Four predictors were identified: age, heart failure, anxiety, and depression for overall HRQoL ($p<0.05$). |
| White et al. (2007) / USA | Descriptive | N=27 (0.0%)<br>60.7 (15.4)<br>Not reported | SF-36 | Depression (BDI) | Surveys were completed an average of 11 months after MI (SD = 9.88 months) | Depression had a significant negative correlation with mental HRQoL ($p=0.0005$), but not correlated with physical HRQoL ($p=0.360$). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Williams et al. (2012) / UK | Not reported | N=192 (71.9%)<br>66.0 (10.8)<br>Not reported | MacNew | Type D personality (DS14) | 3 months | Type D was significantly associated with poor QoL in MI patients ($p<0.001$). |
| Wrzesniewski et al. (2012) / Poland | Prospective | N=83 (59.0%)<br>50.2 (6.2)<br>First uncomplicated MI | MacNew | Sense of coherence (SOC-13), level of education | 1 year | Sense of coherence is a good predictor of HRQoL one year after MI both in men ($p<0.05$) and in women ($p<0.01$). Significant HRQoL predictors in the physical dimension included level of education ($p=0.03$). |

AIS=Athens Insomnia Scale; BDI=Beck Depression Inventory; BMI=Body Mass Index; BMS=Bare-Metal Stents; CCS=Canadian Cardiovascular Society; CIDI-Auto=Composite International Agnostic Interview; COPD=Chronic Obstructive Pulmonary Disease; CVA=Cerebro Vascular Accident; DASI=Duke Activity Status Index; DES=Drug-Eluting Stents; DS-14=the 14-item type D Scale; EF=Ejection Fraction; ESSI=ENRICHD Social Support Instrument; GCQ=General Coping Questionnaire; GSE=General Self-Efficacy; HADS=Hospital Anxiety and Depression Scale; HAP= Human Activity Profile; HCS=Health Complaints Scale; HRQoL=Health-Related Quality of Life; IES=Impact of Events Scale; IPQ=Illness Perception Questionnaire; LVEF=Left Ventricular Ejection Fraction; MacNew=the MacNew Heart Disease Health-Related Quality of Life Questionnaire; MFI-20=Multidimensional Fatigue Inventory; MHI-5=Mental Health Inventory; MI=Myocardial Infarction; MIDAS=Myocardial Infarction Dimensional Assessment Scale; MLHFQ=Minnesota Living with Heart Failure Questionnaire; MOS-20=Medical Outcomes Study 20-item short-form General Health Survey; MQ=Shortened Maastricht Vital Exhaustion Questionnaire; MSQ-H=Multidimensional Support Questionnaire for Heart Patients; NHP=Nottingham Health Profile; NYHA=New York Heart Association; PCI=Percutaneous Coronary Intervention; POMS=Profile of Mood States; PSP=Preferred Support Profile; PSS=PTSD Symptom Scale; PTSD=Post Traumatic Stress Disorder; QLI-C=Quality of Life Index-Cardiac Version; QLMI=Quality of Life after MI questionnaire; QoL=Quality of Life; SAQ=Seattle Angina Questionnaire; SASRQ=Stanford Acute Stress Reaction Questionnaire; SCRI=Self-care Resource Inventory; SD=Standard Deviation; SF-12=Short Form-12; SF-36=the 36-item Short Form Health Survey; SHC=Somatic Health Complaints; SOC=Sense of Coherence Scale; STAI=Spielberger State-Trait Anxiety Inventory; TIMI=Thrombolysis In Myocardial Infarction; WHOQOL-BREF= World Health Organization Quality of Life Instrument Abbreviated.

Table 2. Summary of factors that affect HRQoL of patients with MI

| | |
|---|---|
| *Demographic factors* | |
| Age | (Arnold et al. 2014; Beck et al. 2001; Bengtsson, Hagman & Wedel 2001; Hawkes et al. 2013; Ho et al. 2008; McBurney et al. 2002; Oginska-Bulik 2014; Sertoz et al. 2013; Wang, Thompson, et al. 2014) |
| Education level | (Pettersen et al. 2008; Wrzesniewski & Wlodarczyk 2012) |
| Employment status | (French et al. 2005; Lane et al. 2000) |
| Financial status | (Arnold et al. 2014; Kim, Kim & Hwang 2015; Wang, Chow, et al. 2014) |
| Gender | (Arnold et al. 2014; French et al. 2005; Kim, Kim & Hwang 2015; Kristofferzon, Löfmark & Carlsson 2005; Lane et al. 2001; Lane et al. 2000; Norris, Hegadoren & Pilote 2007; Oginska-Bulik 2014; Pettersen et al. 2008; Uchmanowicz et al. 2013; Wang, Thompson, et al. 2014) |
| Living alone | (Bucholz et al. 2011; French et al. 2005; Lane et al. 2001; Lane et al. 2000) |
| / marital status | (Lane et al. 2000; Lidell et al. 2014) |
| Managerial responsibility | (Lidell et al. 2014) |
| Race | (Arnold et al. 2014) |
| *Bivavioural factors* | |
| Physical activity | (Baas 2004; Hawkes et al. 2013; Lane et al. 2000; Oldridge et al. 1998) |
| Alcohol | (Hawkes et al. 2013; Wang, Chow, et al. 2014) |
| Smoking | (Arnold et al. 2014; French et al. 2005; Hawkes et al. 2013; Oldridge et al. 1998; Pettersen et al. 2008; Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014) |
| BMI | (Lidell et al. 2014) |
| *Disease-related factors* | |
| Severity of MI | (Benyamini et al. 2013; Coyne et al. 2000; Ecochard et al. 2001; Kim, Kim & Hwang 2015; Lane et al. 2001; Lane et al. 2000; Pettersen et al. 2008; Rankin & Fukuoka 2003; Uchmanowicz et al. 2013) |
| Health complaints | (Brink, Karlson & Hallberg 2002) |
| / chest pain | (Joekes, Maes & Warrens 2007) |
| / shortness of breath | (Oldridge et al. 1998) |
| / symptoms | (Kim, Kim & Hwang 2015) |
| / angina | (Arnold et al. 2014; Bengtsson, Hagman & Wedel 2001; Boersma, Maes & van Elderen 2005; Oldridge et al. 1998) |
| Fatigue | (Alsén & Brink 2013; Brink et al. 2005) |
| / vital exhaustion | (Rafael et al. 2014) |
| Sleep disturbance | (Rafael et al. 2014) |

| | |
|---|---|
| Illness duration | (Joekes, Maes & Warrens 2007) |
| In-hospital complications | (Beck et al. 2001) |
| Previous MI | (French et al. 2005; Oldridge et al. 1998; Pettersen et al. 2008) |
| Comorbidities | (Joekes, Maes & Warrens 2007; McBurney et al. 2002; Pettersen et al. 2008; Sertoz et al. 2013; Uchmanowicz et al. 2013; Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014) |
| *Psychosocial factors* | |
| Anxiety | (Benyamini et al. 2013; Dickens et al. 2006; French et al. 2005; Hawkes et al. 2013; Hosseini et al. 2014; Lane et al. 2001; Lane et al. 2000; Mayou et al. 2000; Rafael et al. 2014; Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014) |
| Depression | (Arnold et al. 2014; Beck et al. 2001; Benyamini et al. 2013; Brink et al. 2005; Brink, Karlson & Hallberg 2002; de Jonge et al. 2006; Dickens et al. 2006; French et al. 2005; Hawkes et al. 2013; Hosseini et al. 2014; Lane et al. 2001; Lane et al. 2000; Mayou et al. 2000; Rafael et al. 2014; Sakai et al. 2011; Sertoz et al. 2013; Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014; White & Groh 2007) |
| Psychologic distress | (Rankin & Fukuoka 2003) |
| Stress | (Arnold et al. 2014; Doerfler, Paraskos & Piniarski 2005; Ginzburg & Ein-Dor 2011) |
| Illness perception | (French et al. 2005) |
| Coping strategies | (Brink, Karlson & Hallberg 2002) |
| Overprotection / active engagement | (Joekes, Maes & Warrens 2007) |
| Self-care | (Baas 2004) |
| Self-efficacy | (Boersma et al. 2006; Brink et al. 2012; Hawkes et al. 2013) |
| Sense of coherence | (Norekvål et al. 2010; Wrzesniewski & Wlodarczyk 2012) |
| Social support | (Boersma, Maes & van Elderen 2005; Bucholz et al. 2014; Hawkes et al. 2013; Leifheit-Limson et al. 2012; Rankin & Fukuoka 2003) |
| Type D personality | (Oginska-Bulik 2014; Saeed, Niazi & Almas 2011; Williams et al. 2012) |

The results of this review on factors affecting HRQOL of MI patients were presented under three categories including demographic, clinical and psychosocial factors (Table 2).

### *Demographic factors and HRQoL*

There were nine factors that were closely associated with MI patients' HRQoL. Those factors included age, education level, employment status, managerial responsibility, race, financial status, gender, living lone and marital status were considered to have a close relationship with HRQoL in patients with MI in various studies.

**Age**

Nine studies examined the correlation between age and HRQoL of participants with MI (Arnold et al. 2014; Beck et al. 2001; Bengtsson, Hagman & Wedel 2001; Hawkes et al. 2013; Ho et al. 2008; McBurney et al. 2002; Oginska-Bulik 2014; Sertoz et al. 2013; Wang, Thompson, et al. 2014) and reported that . age was closely associated with HRQoL in patients with MI. However, patients over 50 years old reported better HRQoL at 12-month follow-up than patients under 50 years old, as measured by the SAQ (Arnold et al. 2014). This result was in line with the study conducted by Ho et al. (2008), who also found that the older age patients indicated better HRQoL measured by the SAQ too (Ho et al. 2008). The study by Bengtsson, Hagman & Wedel (2001), consistently, claimed that patients above the age of 59 years had significantly higher HRQoL in both physical and mental domains of the SF-36, while patients under 59 years showed improved physical HRQoL but not mental HRQoL (Bengtsson, Hagman & Wedel 2001). Another study that followed patients up to seven months reported decreased mental HRQoL, measured using SF-12, among the patients aged below 65 years than those over 65 years (McBurney et al. 2002). On the contrary, the study conducted by Oginska-Bulik (2014) found that patients who were younger than 58 years had slightly higher HRQoL than those older than 58 years. Likewise, Beck et al. (2001) showed that older age predicted decreased HRQoL, particularly in the physical domains, when measured using the SF-36 and the EoruQol at six-month and 12-month follow-ups (Beck et al. 2001). In Hawkes et al.'s study (2013), increasing age was also one of the predictors of impaired physical HRQoL among patients who were newly diagnosed with MI, however, the mental dimension of the SF-36 was scored lower in younger patients than patients over 60 years at six months after discharge (Hawkes et al. 2013). Similarly, older age negatively affected the physical and social dimensions of the WHOQOL-BREF in a cross-sectional study (Sertoz et al. 2013) as well as the physical dimension of the SF-36 and all the subscales of the MIDAS (Wang, Thompson, et al. 2014). The results of these studies suggest that except for the physical dimension of the HRQOL, which is more adversely affected in older patients, younger patients with MI experience poorer HRQOL life than older patients.

**Education level**

Education level was one of the predictors of low physical HRQoL in men, as measured by the MacNew at one year (Wrzesniewski & Wlodarczyk 2012) and by the SF-36 at 2.5-year follow-ups (Pettersen et al. 2008). Both studies reported that men with lower education level had significantly pooper physical HRQoL after MI.

**Employment status**

Being employed was strongly related to improved HRQoL at four months using the Dartmouth COOP charts (Lane et al. 2000). Similarly, patients who were employed showed better physical HRQoL at the six-month follow-up measured by the QIMI (French et al. 2005).

**Managerial responsibility and race**

Of the 49 studies reviewed, there was only one study that identified an association between having a managerial responsibility and HRQOL (Lidell et al. 2014) and race and HRQOL in patients with MI (Arnold et al. 2014). These studies found that non-white race was associated with poor HRQoL one year after first MI (Arnold et al. 2014). Women from Eastern European countries including Hungary, Poland, Russia, and Ukraine had better HRQoL in social dimension if they had managerial responsibilities (Lidell et al. 2014).

**Financial status**

The financial status of participants was one of the predictors of HRQoL in the three papers reviewed. Two of the studies examined monthly income with an objective question (Kim, Kim & Hwang 2015; Wang, Chow, et al. 2014) and one study questioned participants about their financial difficulties (Arnold et al. 2014). The results of these studies consistently suggested that patients who had lower income or financial difficulties reported lower HRQoL than patients who had higher income or no financial difficulties.

**Gender**

Eleven studies examined the association between gender and HRQoL (Arnold et al. 2014; French et al. 2005; Kim, Kim & Hwang 2015; Kristofferzon, Löfmark & Carlsson 2005; Lane et al. 2001; Lane et al. 2000; Norris, Hegadoren & Pilote 2007; Oginska-Bulik 2014; Pettersen et al. 2008; Uchmanowicz et al. 2013; Wang, Thompson, et al. 2014). Except for three studies, all the other eight studies showed a consistent result, suggesting that women after MI report lower HRQoL than their male counterparts. In Wang, Thompson et al.'s

study (2014), women, immediately after MI, reported lower HRQoLthan men, particularly, in physical-related subscales of the SF-36 and the MIDAS (Wang, Thompson, et al. 2014). Similarly, one month after MI, Swedish female patients showed significantly poorer HRQoL in both physical and mental dimensions of the SF-36 as well as the total score of the QLI-C in comparison with male patients (Kristofferzon, Löfmark & Carlsson 2005). Another short-term study showed HRQoL was negatively affected by female sex at four months from MI, as measured by the Dartmouth COOP Charts (Lane et al. 2000). Furthermore, being female was strongly related to poor HRQoL at the six-month follow-up when HRQoL was measured using the SF-36 (Uchmanowicz et al. 2013), while another study found no relation between gender and the QLMI scores at six months after MI (French et al. 2005). Likewise, following patients up to one year, female patients with MI showed poorer HRQoL than male patients, as measured by different instruments including the SF-36 (Norris, Hegadoren & Pilote 2007), the SF-12, the SAQ (Arnold et al. 2014), the MLHFQ (Kim, Kim & Hwang 2015), and the COOP Chart System (Lane et al. 2001). However, two long-term studies (Oginska-Bulik 2014; Pettersen et al. 2008) claimed contradictory outcomes. In one of the studies, after adjusting sex and age to the general population, there was no different effect of gender on HRQoL, as measured by the SF-36, an average of 2.5 years since MI (Pettersen et al. 2008). The other study reported women had even a higher HRQoL than men, scored by the Life Satisfaction Questionnaire, at the mean time of 2.81 years since MI (Oginska-Bulik 2014).

**Living alone / marital status**

The effect of either living alone or marital status on HRQoL was examined in five studies reviewed in the current study (Bucholz et al. 2011; French et al. 2005; Lane et al. 2001; Lane et al. 2000; Lidell et al. 2014). Two studies, which used the COOP Chart System for measuring HRQoL in patients with MI, identified the positive association of HRQoL with having a partner or not living alone at four months (Lane et al. 2000) and 12 months (Lane et al. 2001). Consistently, a better HRQoL was observed in patients who did not live alone at one year after MI, as scored using the SF-12 and the SAQ (Bucholz et al. 2011). Moreover, marital status was a predictor of higher physical and emotional HRQoL in scores of the MacNew in a cohort of patients from European countries (Lidell et al. 2014). However, the QLMI scores of the British patients were not affected by their living status at six months (French et al. 2005).

### *Behavioural factors and HRQoL*

Physical activity, alcohol consumption, smoking, and body mass index (BMI) were found to be behavioural factors significantly affecting HRQoL in patients after experiencing MI, as measured with either a generic tool or a disease-specific tool.

**Physical Activity**

Four studies examined the relationship between physical activity and HRQoL (Baas 2004; Hawkes et al. 2013; Lane et al. 2000; Oldridge et al. 1998). Patients who were physically activeright before MI showed better HRQoL at four months after MI (Lane et al. 2000). Also, patients who participated in physical activities after discharge from MI reported significantly higher HRQoL at three to six months follow up (Baas 2004). Similarly, patients who had an intention to be involved in physical activity and who had less sedentary behaviour showed more improved HRQoL in both physical and mental domains of the SF-36 at six months follow up (Hawkes et al. 2013). In addition, a higher exercise tolerance after the 8-week rehabilitation program also promised better HRQoL, as measured with the QLMI (Oldridge et al. 1998).

**Alcohol**

The association between alcohol use and HRQoL among patients with MI seemed to be controversial. Alcohol users in Wang, Chow, et al.'s study (2014) scored significantly lower in the mental dimension of the SF-12 than non-alcohol users, while another study did not find any associations between alcohol consumption and physical and mental dimensions of the SF-36 at six months after MI (Hawkes et al. 2013).

**Smoking**

Seven studies found that smoking status of MI patients was associated with HRQoL (Arnold et al. 2014; French et al. 2005; Hawkes et al. 2013; Oldridge et al. 1998; Pettersen et al. 2008; Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014). Patients who had a history of smoking (Wang, Chow, et al. 2014) or were smoking at time of MI (Pettersen et al. 2008) scored low in the mental dimension of HRQOL. Patients who smoked at the time of MI, also reported poorer physical functioning shortly after MI, as measured by the SF-36 immediately after MI (Wang, Thompson, et al. 2014), and the SAQ (Arnold et al. 2014) and the QLMI (Oldridge et al. 1998) at one-year follow-up. Yet, two studies showed that smoking status had no relation with any dimensions of HRQoL, scored with the SF-36 (Hawkes et al. 2013) and the QLMI at six months (French et al. 2005).

**Body Mass Index (BMI)**

There was only one study that identified BMI as an indicator of low HRQoL in MI patients, particularly in the physical domain of the MacNew. This study recruited female patients aged over 65 years and examined the relationship between baseline BMI of MI patients and HRQoL at the six-month follow-up (Lidell et al. 2014).

### *Disease-related factors*

Disease-related factors including severity of MI, symptoms, illness duration, in-hospital complications, previous MI, and comorbidities had a strong prediction to some aspects of HRQoL, measured using different instruments.

**Severity of MI**

The reviewed studies used several indicators to assess the severity of patient MI and examine the relationship between disease severity and HRQoL. These indicators included infarct location, left ventricular ejection fraction (LVEF), infarct-related artery patency, the Killip class, the Peel index scores, the NYHA class, the DASI, Q-wave, and ST-elevation. Poor HRQoL was strongly associated with the higher Peel index score at four months (Lane et al. 2000) and 12 months from MI (Lane et al. 2001) as well as the higher NYHA class at longer than 12-month follow-ups (Kim, Kim & Hwang 2015). Baseline LVEF was also related with decreased HRQoL (Coyne et al. 2000; Kim, Kim & Hwang 2015) and Q-wave MI limitedly predicted the mental component of HRQoL in men at 2.5-year follow-up (Pettersen et al. 2008). However, infarct-related artery patency (Coyne et al. 2000) or cardiac functional status measured using the DASI scores (Rankin & Fukuoka 2003) was unrelated to HRQoL outcomes.

The location of infarction and the Killip class showed mixed results. Benyamini et al. (2013) did not find any association between infarct location and the Killip class with MI patients' HRQoL at the 10-year follow-up (Benyamini et al. 2013). Likewise, Ecochard et al. (2001) claimed that HRQoL was not affected by the Killip class of MI patients one year after MI (Ecochard et al. 2001). While, in another study, the location of infarction could predict men's physical HRQoL measured by the SF-36 at 2.5 years from MI (Pettersen et al. 2008), and the worse Killip class indicated more impaired HRQoL of the Dartmouth COOP Charts 12 months after MI (Lane et al. 2001).

**Symptoms**

The reviewed studies consistently reported negative association between angina symptoms and HRQoL scores (Arnold et al. 2014; Bengtsson, Hagman & Wedel 2001; Boersma, Maes & van Elderen 2005; Oldridge et al. 1998). Baseline cardiac-specific symptoms such as chest pain and dyspnoea, fatigue, weakness, lack of energy, sleep disturbance showed a strong associations with the mental component of the SF-36 at the five-month follow-up (Brink, Karlson & Hallberg 2002). Likewise, higher symptom scores on the Friedman-Heart Failure Symptom Checklist was associated with worse HRQoL measured by the MLHFQ at one year or longer follow-ups (Kim, Kim & Hwang 2015).

Among the cardiac symptoms, chest pain seemed to have an obvious and negative effect on emotional, physical, and social dimensions as well as the total score of the MacNew at three months and nine months of the follow-ups (Joekes, Maes & Warrens 2007). The absence of angina could predict improved HRQoL at 8-week and 12-month after MI (Oldridge et al. 1998). Patients, who had frequent angina symptoms prior to the MI event, reported lower HRQoL measured by the SF-12 and the SAQ at one year (Arnold et al. 2014). The severity of angina, as measured by the Canadian Cardiovascular Society tool, was also adversely related to the impaired physical HRQoL of the SF-36 six months after MI (Bengtsson, Hagman & Wedel 2001). Similarly, the presence of angina complaints, measured using a self-report New York Heart Association (NYHA) tool, was significantly associated with low HRQoL scores of the MacNew at four months (Boersma, Maes & van Elderen 2005). Additionally, patients with dyspnoea at baseline scored lower than those who did not experience shortness of breath in the QLMI measured HRQoL at the 8-week and 12-month follow-ups (Oldridge et al. 1998). Moreover, patients with the higher scores on the multidimensional Fatigue Inventory-20 (MFI-20) at four months after MI reported poorer HRQoL at the two-year follow-up, as measured by the SF-36 (Alsén & Brink 2013). The Somatic Health Complaints (SHC) scale at one week after MI had also a prediction of the SF-36 scores at five months, particularly in men's physical HRQoL (Brink et al. 2005). Excessive fatigue shortly after MI, measured with the Shortened Maastricht Vital Exhaustion Questionnaire, and sleep disturbance, measured by the Athens Insomnia Scale and WHO Well-Being Scale, were also negatively associated with HRQoL scores at acute phase of MI (Rafael et al. 2014).

**Illness duration / in-hospital complications**

There was only one study each identified the impact of illness duration (Joekes, Maes & Warrens 2007) and in-hospital complications, which included reinfarction, shock, congestive heart failure, recurrent ischaemia, any

arrhythmia, acute mitral regurgitation or acute ventriculoseptal defect or tamponade (Beck et al. 2001). It was found that illness duration had a negative relationship with the social dimension of HRQOL measured using MacNew at three and none months from a diagnosis of MI (Joekes, Maes & Warrens 2007). Among the in-hospital complications, shock predicted more improved physical HRQoL of the SF-36 at both six months and one year (Beck et al. 2001).

**Previous MI**

Patients with a history of MI experienced greater impaired HRQoL than those with first-time MI at both eight weeks and 12 months, measured using the Quality of Well-Being questionnaire (Oldridge et al. 1998). Likewise, women in Pettersen et al.'s study (2008) scored lower in the physical domain of the SF-36 if they had a previous experience of MI (Pettersen et al. 2008). However, in another study, there was found no association between MI and HRQoL, measured by the QLMI at six months (French et al. 2005).

**Comorbidities**

Presence of comorbidities seems to negatively affect HRQoL of patient with MI. Several studies found patients with hypertension reported impaired HRQoL in the total score of the SF-36 at six months (Uchmanowicz et al. 2013), low mental HRQoL of the SF-12 after being diagnosed from 15 days to 30 months (Wang, Chow, et al. 2014), poor physical HRQoL of the SF-36 at the acute phase of MI (Wang, Thompson, et al. 2014), and decreased physical and social dimensions of the WHOQOL-BREF in a cross-sectional study (Sertoz et al. 2013).

In addition to hypertension, HRQoL was also adversely affected by the total number of comorbidities, history of heart failure, transient ischaemic attack (McBurney et al. 2002), diabetes, multi-vessel disease, or high triglyceride level (Uchmanowicz et al. 2013). In particular, comorbid heart failure was identified as a predictor of worse scores in both physical and mental domains of the SF-36 and the total score of the MIDAS at acute phase of MI(Wang, Thompson, et al. 2014). Moreover, the comorbidity of chronic obstructive pulmonary disease (COPD) in both genders and stroke in women had a negative effect on the physical domain of the SF-36 of MI patients at longer follow-ups (Pettersen et al. 2008). In one study conducted by Joekes, Maes & Warrens (2007), the presence of other chronic illnesses, which were not specified, was negatively associated with physical and global HRQoL scores (Joekes, Maes & Warrens 2007).

### *Psychosocial factors and HRQoL*

There were 12 psychosocial factors that affected HRQoL in patients with MI, including anxiety, depression, stress, illness perception, coping strategies, overprotection, active engagement, self-care, self-efficacy, sense of coherence, social support, and type D personality. Anxiety and depression were most commonly investigated factors among the 12 factors.

#### Anxiety

The impact of anxiety on HRQoL of patients with MI has been widely studied. Eleven studies identified anxiety, measured with either the Hospital Anxiety and Depression Scale (HADS) or the Spielberger State-Trait Anxiety Inventory (STAI), as a predictor of HRQoL among MI patients. A higher anxiety level at baseline was associated with poorer HRQoL at six-month follow-up, as measured by different generic and disease-specific quality of life tools including the SF-36 (Hawkes et al. 2013; Mayou et al. 2000; Wang, Thompson, et al. 2014), the SF-12 (Wang, Chow, et al. 2014), the Dartmouth Coop Chart (Lane et al. 2000), WHO Well-Being Scale (Rafael et al. 2014), the MIDAS (Wang, Chow, et al. 2014; Wang, Thompson, et al. 2014), and the QLMI (French et al. 2005). Anxiety was also predicted HRQoL of the patients in longer follow-ups (one year), using the SF-36 (Dickens et al. 2006; Mayou et al. 2000) and the Dartmouth COOP Chart (Lane et al. 2001). Baseline anxiety was significantly and negatively associated with impaired HRQoL one year after MI (Lane et al. 2001; Mayou et al. 2000). A finding was not supported by Dickens et al. study that found a significant association between HRQoL at one year with anxiety, assessed at six months, but not baseline anxiety (Dickens et al. 2006).

#### Depression

The impact of depression on HRQoL of MI patients has also been widely studied and revealed mainly consistent results. The Beck Depression Inventory (BDI) and the HADS were mostly used to assess the level of depression, followed by the other tools including the 9-Item Patient Health Questionnaire Depression Score (PHQ-9), the Composite International Diagnostic Interview (CIDI-Auto), and the five-item version of the Mental Health Inventory (MHI-5).

A cross-sectional study found that depression negatively affected physical and social dimensions as well as the total score of the WHOQOL-BREF (Sertoz et al. 2013). The total scores of the MIDAS (Wang, Chow, et al. 2014) and the WHO Well-Being Scale (Rafael et al. 2014) were also affected by the experience of depression immediately after MI. These results are consistent in a study that used a shorter follow-up. Patients who

experienced depression after MI scored lower in the SF-36 and the MIDAS (Wang, Thompson, et al. 2014) at the one-month follow-up. At the six-month follow-up, depression at baseline (Beck et al. 2001; French et al. 2005) and depression at one month (Sakai et al. 2011) had also a significant prediction to all the dimensions including emotional, physical, and social of the QLMI scores (French et al. 2005) as well as physical and mental domains of the SF-36 (Beck et al. 2001; Sakai et al. 2011) and overall HRQoL of the EuroQol (Beck et al. 2001). The results are in line with the result of a four-month follow-up study, which found an independent and strong correlation between depression and HRQoL, as measured by the Dartmouth COOP Charts (Lane et al. 2000).

On the other hand, a five-month follow-up study claimed that depression right after MI was significantly associated with the physical component of HRQoL but not with the mental dimension (Brink, Karlson & Hallberg 2002). This result showed contrast with the study which showed depression had an adverse correlation with the mental component, but was not related to the physical component of the SF-36 an average of 11 months after MI (White & Groh 2007). In addition, depression was found to be a predictor of decreased mental HRQoL, but not of the physical component at six months (Hawkes et al. 2013). Also, higher depression one week after MI predicted lower physical HRQoL in women and mental HRQoL in men at one year (Brink et al. 2005). However, a study that found a significant negative relationship between baseline depression and all the dimensions of HRQoL at three months, also reported that the negative association were remained for both physical and mental domains of the SF-36 at the one-year follow-up (Mayou et al. 2000). Similarly, three other studies identified that patients who reported higher depression scores had lower HRQoL one year after MI, as measured by the SAQ (Arnold et al. 2014), the RAND 36 (de Jonge et al. 2006), and the COOP Charts (Lane et al. 2001). This association was consistently observed at the five-year follow-up (Hosseini et al. 2014) and at the ten-year follow-up (Benyamini et al. 2013). On the contrary, one study found that depression immediately after MI did not have prediction of impaired HRQoL in the physical aspect at one year, however, depression assessed at six months predicted physical HRQoL of patients 12 months after MI (Dickens et al. 2006).

Psychologic distress was measured using the short form Profile of Mood States (POMS) in women who experienced MI one year prior. Patients who scored higher in the POMS, that is, who presented greater mood disturbance had worse HRQoL measured by the QLI-C (Rankin & Fukuoka 2003).

**Stress**

The impact of stress on HRQoL of patients after MI was consistent across the studies. The level of stress immediately after MI (Arnold et al. 2014; Ginzburg & Ein-Dor 2011), three to six months after MI (Doerfler,

Paraskos & Piniarski 2005) and approximately seven months after discharge from hospital (Ginzburg & Ein-Dor 2011) negatively affected HRQoL of MI survivors at the three to six-month follow-up (Doerfler, Paraskos & Piniarski 2005), at the one-year follow-up (Arnold et al. 2014), and at the eight-year follow-up (Ginzburg & Ein-Dor 2011). The stress level, assessed using the Post Traumatic Stress Disorder (PTSD) symptom Scale, was also significantly associated with low HRQoL, including mental health, social functioning, role functioning, and physical health, measured by the MOS-20 at three to six months after MI (Doerfler, Paraskos & Piniarski 2005). MI patients who scored higher in the Perceived Stress Scale had more impaired HRQoL of the SAQ at the one-year follow-up (Arnold et al. 2014). Stress, measured with the Stanford Acute Stress Reaction Questionnaire (SASRQ) shortly after MI and with the PTSD inventory about seven months after discharge from the hospital, remained adversely influential on both physical and mental HRQoL of the SF-36 in MI patients after eight years (Ginzburg & Ein-Dor 2011).

**Illness perception**

The relationship between illness perception and HRQoL among patients with MI has not been widely studied, yet one study found that the scores of the Illness Perception Questionnaire were positively associated with HRQoL of the patients at the six-month follow-up, assessed using the QLMI (French et al. 2005).

**Coping strategies**

Only one study examined the association between applied coping strategies including adaptation and management of illness and stress and HRQoL of patients with MI. This study found that copying strategies were positively associated with both physical and mental dimensions of HRQoL, measured by the SF-36 at five months after discharge from hospital (Brink, Karlson & Hallberg 2002).

**Overprotection / active engagement**

Patients' HRQoL was also influenced by patients' perception of their partner's overprotection and active engagement. The more patients perceived their partners overprotecting them, the worse physical HRQoL they showed after nine months, while active engagement, which presented patients' perception towards partner's support in patient's emotion and solving problems, was positively linked to enhanced emotional, social and overall HRQoL, as measured by the MacNew (Joekes, Maes & Warrens 2007).

**Self-care**

In one study, self-care factors including self-care knowledge and resources, assessed by the Self-care Resource Inventory (SCRI), showed a low association with HRQoL scores in patients with MI (Baas 2004).

**Self-efficacy**

Three studies included in this review examined self-efficacy in general (Brink et al. 2012), with respect to the achievement of goals (Boersma et al. 2006), and in regards to physical activity (Hawkes et al. 2013). This concept reflected MI patients' beliefs that their behaviours were responsible for the outcomes (Brink et al. 2012). General self-efficacy, measured with the General Self-Efficacy (GSE) scale at four months after MI, was able to predict patients' HRQoL after two years (Brink et al. 2012). In this study, patients who had higher general self-efficacy scores at four months reported better HRQoL at the 2-year follow-up.

Additionally, higher self-efficacy on goal attainment predicted better physical and social dimensions of HRQoL, assessed by the MacNew at four months (Boersma et al. 2006), while low level of confidence in undertaking physical activities was a predictor of low physical HRQoL, measured with the SF-36 at six months (Hawkes et al. 2013).

**Sense of coherence (SOC)**

The association between HRQoL and SOC was examined in two studies. SOC refers to the extent to which one has a pervasive, enduring though dynamic feeling of confidence (Wrzesniewski & Wlodarczyk 2012, p. 158). This concept was found to be significantly and positively associated with HRQoL in patients with MI at six months (Norekvål et al. 2010) and one year after MI (Wrzesniewski & Wlodarczyk 2012).

**Social support**

Lower social support, assessed with the ENRICHD Social Support Instrument (ESSI), could predict worse physical and mental HRQoL scores on the SF-36 at six months (Hawkes et al. 2013). Also, in the other two studies, scores of the ESSI were significantly related to HRQoL scores in both physical and mental domains of the SF-12 and the overall scores of the SAQ at 12 months post-MI (Bucholz et al. 2014; Leifheit-Limson et al. 2012). Likewise, social support, measured by the Preferred Support Profile (PSP) showed a significant prediction for HRQoL in female patients at the 12-month follow-up (Rankin & Fukuoka 2003). A lower level of

perceived social support, measured with the Multidimensional Support Questionnaire for Heart Patients (MSQ-H), also predicted lower scores in the MacNew at four months (Boersma, Maes & van Elderen 2005).

**Type D personality**

The current review revealed that the Type D personality, assessed by the 14-item Type D Personality Scale (DS-14), was strongly related to the low level of HRQoL in patients with MI (Oginska-Bulik 2014; Saeed, Niazi & Almas 2011; Williams et al. 2012), as was assessed using the MacNew (Williams et al. 2012), the WHOQOL-BREF (Saeed, Niazi & Almas 2011), and the Life Satisfaction Questionnaire (Oginska-Bulik 2014).

## Discussion

The influence of demographic, behavioural, disease-related and psychosocial factors on HRQoL among MI patients has been reviewed comprehensively in the present review. The results of these studies suggest that except for the physical dimension of the HRQOL, which is more adversely affected in older patients, younger patients with MI experience poorer HRQOL life than older.

Most studies suggest that MI can impose greater adverse impact on women than men. .. However, there was a need to take into account ages of female patients in comparison with those of male patients with MI (Wang, Thompson, et al. 2014). Several studies in the review showed the fact that the mean age of female patients were older than that of male patients, and that can indirectly affect HRQoL in patients with MI (Brink et al. 2005; Brink, Karlson & Hallberg 2002; Ecochard et al. 2001; Joekes, Maes & Warrens 2007; Kristofferzon, Löfmark & Carlsson 2005; Norris, Hegadoren & Pilote 2007; Wang, Thompson, et al. 2014). Women in the general population also score lower on the SF-36 than men in the general population (Pettersen et al. 2008),

What are the main results on other demographics? Are there adequate evidence to come to a conclusion, if not further studies needed.

Summarise the main results on behavioural, disease-related and psychosocial factors separately and talk about the implications, what can be done….,

However, behavioural factors, which can be modifiable including physical activity, alcohol usage, smoking, and BMI, need more attention to make improvement of HRQoL in patients after MI. A previous review found that

the cardiac rehabilitation programs with exercise, which can also help modify individual BMI, were helpful for recovering HRQoL after MI (Kang et al. 2016). Promoting patient participation in cardiac rehabilitation programs can be one of the ways to enhance patients' physical activities, and risk reducing behaviours in the form of smoking cessation and reducing alcohol consumption in of the recovery phase of MI. Likewise, despite the fact that sleep disturbance, as one of the risk factors for MI, had a strong association with HRQoL, the relationship between sleep disturbance and HRQoL has been scarcely studied (Rafael et al. 2014).

It was consistent throughout the previous literature that anxiety, depression and stress had significantly negative impact on MI patients' HRQoL. Early identification and interventions of depression, anxiety, and stress may help improve HRQoL in the early stage of recovery from MI (Arnold et al. 2014; Rafael et al. 2014; Wang, Chow, et al. 2014). Moreover, the relationship between illness perception and HRQoL among patients with MI has not been widely studied, yet there is an evidence that the scores of the Illness Perception Questionnaire had an association with HRQoL in patients with MI after six months assessed using the QLMI (French et al. 2005).

Although the current review covered broad facets, there are some limitations in this review. First, despite rigorous search and study selection, there may have been some potential relevant studies omitted due to limitation to the English language, the search duration of 20 years, and the exclusion of grey literature. Second, due to the heterogeneity among the studies included in the review, only a descriptive review was possible. Third, the quality of the included articles was not evaluated nevertheless it was unlikely to influence on the results. Despite these limitations, the current review addressed critical factors, which were significantly associated with HRQoL among patients with MI throughout the previous literature.

## Conclusion

There seems to be various types of factors including modifiable and non-modifiable factors that affect different dimensions of HRQoL in patients with MI. Identifying these factors can provide early detection of patients who tend to have worse HRQoL in the recovery or rehabilitation stage of post-MI. focusing on adjustable factors such as behavioural and psychosocial factors would be more effective to help them recover HRQoL to the normative level after experiencing MI.

## Funding sources

Authors have no funding source to declare.

## Disclosures

The authors have no conflict of interest to disclose.

## Conflict of interest

None.

## Acknowledgement

None.

## Conflicts of interest

We have no financial support or relationship that may create a conflict of interest.

# References


Alsén, P. & Brink, E. 2013, 'Fatigue after myocardial infarction - a two-year follow-up study', *Journal of Clinical Nursing*, vol. 22, no. 11-12, pp. 1647-52.

Anderson, L. & Taylor, R.S. 2014, 'Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews', *International journal of cardiology*, vol. 177, no. 2, pp. 348-61.

Arnold, S.V., Masoudi, F.A., Rumsfeld, J.S., Li, Y., Jones, P.G. & Spertus, J.A. 2014, 'Derivation and validation of a risk standardization model for benchmarking hospital performance for health-related quality of life outcomes after acute myocardial infarction', *Circulation*, vol. 129, no. 3, pp. 313-20.

Baas, L.S. 2004, 'Self-care resources and activity as predictors of quality of life in persons after myocardial infarction', *Dimensions Of Critical Care Nursing: DCCN*, vol. 23, no. 3, pp. 131-8.

Beck, C.A., Joseph, L., Belisle, P., Pilote, L. & Investigators, Q. 2001, 'Predictors of quality of life 6 months and 1 year after acute myocardial infarction', *American Heart Journal*, vol. 142, no. 2, pp. 271-9.

Bengtsson, I., Hagman, M. & Wedel, H. 2001, 'Age and angina as predictors of quality of life after myocardial infarction: a prospective comparative study', *Scandinavian Cardiovascular Journal*, vol. 35, no. 4, pp. 252-8.

Benyamini, Y., Roziner, I., Goldbourt, U., Drory, Y. & Gerber, Y. 2013, 'Depression and anxiety following myocardial infarction and their inverse associations with future health behaviors and quality of life', *Annals Of Behavioral Medicine: A Publication Of The Society Of Behavioral Medicine*, vol. 46, no. 3, pp. 310-21.

Blair, J., Corrigall, H., Angus, N.J., Thompson, D.R. & Leslie, S. 2011, 'Home versus hospital-based cardiac rehabilitation: a systematic review', *Rural & Remote Health*, vol. 11, no. 2, pp. 1-17.

Boersma, S.N., Maes, S., Joekes, K. & Dusseldorp, E. 2006, 'Goal processes in relation to goal attainment: predicting health-related quality of life in myocardial infarction patients', *Journal of Health Psychology*, vol. 11, no. 6, pp. 927-41 15p.

Boersma, S.N., Maes, S. & van Elderen, T. 2005, 'Goal disturbance predicts health-related quality of life and depression 4 months after myocardial infarction', *British Journal of Health Psychology*, vol. 10, no. 4, pp. 615-30.

Brink, E., Alsén, P., Herlitz, J., Kjellgren, K. & Cliffordson, C. 2012, 'General self-efficacy and health-related quality of life after myocardial infarction', *Psychology, Health & Medicine*, vol. 17, no. 3, pp. 346-55.

Brink, E., Grankvist, G., Karlson, B.W. & Hallberg, L.R.M. 2005, 'Health-related quality of life in women and men one year after acute myocardial infarction', *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care & Rehabilitation*, vol. 14, no. 3, pp. 749-57.

Brink, E., Karlson, B. & Hallberg, L.-M. 2002, 'Health experiences of first-time myocardial infarction: Factors influencing women's and men's health-related quality of life after five months', *Psychology, health & medicine*, vol. 7, no. 1, pp. 5-16.

Bucholz, E.M., Rathore, S.S., Gosch, K., Schoenfeld, A., Jones, P.G., Buchanan, D.M., Spertus, J.A., Krumholz, H.M., Bucholz, E.M., Rathore, S.S., Gosch, K., Schoenfeld, A., Jones, P.G., Buchanan, D.M., Spertus, J.A. & Krumholz, H.M. 2011, 'Effect of living alone on patient outcomes after hospitalization for acute myocardial infarction', *American Journal of Cardiology*, vol. 108, no. 7, pp. 943-8 6p.

Bucholz, E.M., Strait, K.M., Dreyer, R.P., Geda, M., Spatz, E.S., Bueno, H., Lichtman, J.H., D'Onofrio, G., Spertus, J.A. & Krumholz, H.M. 2014, 'Effect of low perceived social support on health outcomes in young patients with acute myocardial infarction: results from the VIRGO (Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients) study', *Journal of the American Heart Association*, vol. 3, no. 5, p. e001252.

Chan, C.L.-W., Wang, C.-W., Ho, R.T.-H., Ho, A.H.-Y., Ziea, E.T.-C., Taam Wong, V.C.-W. & Ng, S.-M. 2012, 'A Systematic Review of the Effectiveness of Qigong Exercise in Cardiac Rehabilitation', *American Journal of Chinese Medicine*, vol. 40, no. 2, pp. 255-67.

Coyne, K.S., Lundergan, C.F., Boyle, D., Greenhouse, S.W., Draoui, Y.C., Walker, P. & Ross, A.M. 2000, 'Relationship of infarct artery patency and left ventricular ejection fraction to health-related quality of life after myocardial infarction: the GUSTO-I Angiographic Study experience', *Circulation*, vol. 102, no. 11, pp. 1245-51 7p.

de Jonge, P., Spijkerman, T.A., van den Brink, R.H. & Ormel, J. 2006, 'Depression after myocardial infarction is a risk factor for declining health related quality of life and increased disability and cardiac complaints at 12 months', *Heart*, vol. 92, no. 1, pp. 32-9.

Dickens, C.M., McGowan, L., Percival, C., Tomenson, B., Cotter, L., Heagarty, A. & Creed, F.H. 2006, 'Contribution of depression and anxiety to impaired health-related quality of life following first myocardial infarction', *The British Journal of Psychiatry*, vol. 189, no. 4, pp. 367-72.

Doerfler, L.A., Paraskos, J.A. & Piniarski, L. 2005, 'Relationship of quality of life and perceived control with posttraumatic stress disorder symptoms 3 to 6 months after myocardial infarction', *Journal of Cardiopulmonary Rehabilitation*, vol. 25, no. 3, pp. 166-72 7p.

Ecochard, R., Colin, C., Rabilloud, M., de Gevigney, G., Cao, D., Ducreux, C., Delahaye, F. & group, P. 2001, 'Indicators of myocardial dysfunction and quality of life, one year after acute infarction', *European Journal of Heart Failure*, vol. 3, no. 5, pp. 561-8.

French, D.P., Lewin, R.J.P., Watson, N. & Thompson, D.R. 2005, 'Do illness perceptions predict attendance at cardiac rehabilitation and quality of life following myocardial infarction?', *Journal Of Psychosomatic Research*, vol. 59, no. 5, pp. 315-22.

Ginzburg, K. & Ein-Dor, T. 2011, 'Posttraumatic stress syndromes and health-related quality of life following myocardial infarction: 8-year follow-up', *General Hospital Psychiatry*, vol. 33, no. 6, pp. 565-71.

Hawkes, A.L., Patrao, T.A., Ware, R., Atherton, J.J., Taylor, C.B. & Oldenburg, B.F. 2013, 'Predictors of physical and mental health-related quality of life outcomes among myocardial infarction patients', *BMC Cardiovascular Disorders*, vol. 13, p. 69.

Ho, P.M., Eng, M.H., Rumsfeld, J.S., Spertus, J.A., Peterson, P.N., Jones, P.G., Peterson, E.D., Alexander, K.P., Havranek, E.P., Krumholz, H.M. & Masoudi, F.A. 2008, 'The influence of age on health status outcomes after acute myocardial infarction', *American Heart Journal*, vol. 155, no. 5, pp. 855-61.

Hosseini, S.H., Ghaemian, A., Mehdizadeh, E. & Ashraf, H. 2014, 'Contribution of depression and anxiety to impaired quality of life in survivors of myocardial infarction', *International Journal of Psychiatry in Clinical Practice*, vol. 18, no. 3, pp. 175-81.

Joekes, K., Maes, S. & Warrens, M. 2007, 'Predicting quality of life and self-management from dyadic support and overprotection after myocardial infarction', *British Journal of Health Psychology*, vol. 12, no. 4, pp. 473-89.

Kang, K., Gholizadeh, L., Inglis, S.C. & Han, H.-R. 2016, 'Interventions that improve health-related quality of life in patients with myocardial infarction', *Quality of Life Research*, pp. 1-13.

Kim, H.M., Kim, J. & Hwang, S.Y. 2015, 'Health-related quality of life in symptomatic postmyocardial infarction patients with left ventricular dysfunction', *Asian Nursing Research*, vol. 9, no. 1, pp. 47-52.

Kristofferzon, M., Löfmark, R. & Carlsson, M. 2005, 'Perceived coping, social support, and quality of life 1 month after myocardial infarction: a comparison between Swedish women and men', *Heart & Lung*, vol. 34, no. 1, pp. 39-50 12p.

Lane, D., Carroll, D., Ring, C., Beevers, D.G. & Lip, G.Y. 2001, 'Mortality and quality of life 12 months after myocardial infarction: effects of depression and anxiety', *Psychosomatic Medicine*, vol. 63, no. 2, pp. 221-30.

Lane, D., Carroll, D., Ring, C., Beevers, D.G. & Lip, G.Y.H. 2000, 'Effects of depression and anxiety on mortality and quality-of-life 4 months after myocardial infarction', *Journal of Psychosomatic Research*, vol. 49, no. 4, pp. 229-38.

Leifheit-Limson, E.C., Reid, K.J., Kasl, S.V., Lin, H., Buchanan, D.M., Jones, P.G., Peterson, P.N., Parashar, S., Spertus, J.A. & Lichtman, J.H. 2012, 'Changes in social support within the early recovery period and outcomes after acute myocardial infarction', *Journal of Psychosomatic Research*, vol. 73, no. 1, pp. 35-41.

Lidell, E., Höfer, S., Saner, H., Perk, J., Hildingh, C. & Oldridge, N. 2014, 'Health-related quality of life in European women following myocardial infarction: A cross-sectional study', *European Journal Of Cardiovascular Nursing: Journal Of The Working Group On Cardiovascular Nursing Of The European Society Of Cardiology*.

Mayou, R.A., Gill, D., Thompson, D.R., Day, A., Hicks, N., Volmink, J. & Neil, A. 2000, 'Depression and anxiety as predictors of outcome after myocardial infarction', *Psychosomatic Medicine*, vol. 62, no. 2, pp. 212-9.

McBurney, C.R., Eagle, K.A., Kline-Rogers, E.M., Cooper, J.V., Mani, O.C., Smith, D.E. & Erickson, S.R. 2002, 'Health-related quality of life in patients 7 months after a myocardial infarction: factors affecting the Short Form-12', *Pharmacotherapy:The Journal of Human Pharmacology & Drug Therapy*, vol. 22, no. 12, pp. 1616-22.

Norekvål, T.M., Fridlund, B., Moons, P., Nordrehaug, J.E., Sævareid, H.I., Wentzel-Larsen, T. & Hanestad, B.R. 2010, 'Sense of coherence -- a determinant of quality of life over time in older female acute myocardial infarction survivors', *Journal of Clinical Nursing*, vol. 19, no. 5/6, pp. 820-31 12p.

Norris, C.M., Hegadoren, K. & Pilote, L. 2007, 'Depression symptoms have a greater impact on the 1-year health-related quality of life outcomes of women post-myocardial infarction compared to men', *European Journal of Cardiovascular Nursing*, vol. 6, no. 2, pp. 92-8 7p.

Oginska-Bulik, N. 2014, 'Type D personality and quality of life in subjects after myocardial infarction', *Kardiologia Polska*, vol. 72, no. 7, pp. 624-30.

Oldridge, N., Gottlieb, M., Guyatt, G., Jones, N., Streiner, D. & Feeny, D. 1998, 'Predictors of health-related quality of life with cardiac rehabilitation after acute myocardial infarction', *Journal Of Cardiopulmonary Rehabilitation*, vol. 18, no. 2, pp. 95-103.

Pettersen, K.I., Reikvam, A., Rollag, A. & Stavem, K. 2008, 'Understanding sex differences in health-related quality of life following myocardial infarction', *International Journal of Cardiology*, vol. 130, no. 3, pp. 449-56.

Rafael, B., Simon, A., Drótos, G. & Balog, P. 2014, 'Vital exhaustion and anxiety are related to subjective quality of life in patients with acute myocardial infarct before cardiac rehabilitation', *Journal of Clinical Nursing*, vol. 23, no. 19-20, pp. 2864-73.

Rankin, S.H. & Fukuoka, Y. 2003, 'Predictors of quality of life in women 1 year after myocardial infarction', *Progress in Cardiovascular Nursing*, vol. 18, no. 1, pp. 6-62 8p.

Rumsfeld, J.S., Alexander, K.P., Goff, D.C., Graham, M.M., Ho, P.M., Masoudi, F.A., Moser, D.K., Roger, V.L., Slaughter, M.S. & Smolderen, K.G. 2013, 'Cardiovascular health: The importance of measuring patient-reported health status a scientific statement from the american heart association', *Circulation*, vol. 127, no. 22, pp. 2233-49.

Saeed, T., Niazi, G.S. & Almas, S. 2011, 'Type-D personality: a predictor of quality of life and coronary heart disease', *Eastern Mediterranean Health Journal*, vol. 17, no. 1, pp. 46-50.

Sakai, M., Nakayama, T., Shimbo, T., Ueshima, K., Kobayashi, N., Izumi, T., Sato, N., Yoshiyama, M., Yamashina, A. & Fukuhara, S. 2011, 'Post-discharge depressive symptoms can predict quality of life in AMI survivors: a prospective cohort study in Japan', *International Journal of Cardiology*, vol. 146, no. 3, pp. 379-84.

Schweikert, B., Hunger, M., Meisinger, C., König, H.-H., Gapp, O. & Holle, R. 2009, 'Quality of life several years after myocardial infarction: comparing the MONICA/KORA registry to the general population†', *European heart journal*, vol. 30, no. 4, pp. 436-43.

Sertoz, O.O., Aydemir, O., Gulpek, D., Elbi, H., Ozenli, Y., Yilmaz, A., Ozan, E., Atesci, F., Abay, E., Semiz, M., Direk, N., Hocaoglu, C., Elyas, Z., Ozmen, M., Ozen, S. & Konuk, N. 2013, 'The impact of physical and psychological comorbid conditions on the quality of life of patients with acute myocardial infarction: A multi-center, cross-sectional observational study from turkey', *International Journal of Psychiatry in Medicine*, vol. 45, no. 2, pp. 97-109 13p.

Soo Hoo, S.Y., Gallagher, R. & Elliott, D. 2014, 'Systematic review of health-related quality of life in older people following percutaneous coronary intervention', *Nursing & Health Sciences*, vol. 16, no. 4, pp. 415-27.

Uchmanowicz, I., Loboz-Grudzien, K., Jankowska-Polanska, B. & Sokalski, L. 2013, 'Influence of diabetes on health-related quality of life results in patients with acute coronary syndrome treated with coronary angioplasty', *Acta Diabetologica*, vol. 50, no. 2, pp. 217-25.

Wang, W., Chow, A., Thompson, D.R., Koh, K., Kowitlawakul, Y. & He, H.-G. 2014, 'Predictors of health-related quality of life among patients with myocardial infarction', *Western Journal Of Nursing Research*.

Wang, W., Thompson, D.R., Ski, C.F. & Liu, M. 2014, 'Health-related quality of life and its associated factors in Chinese myocardial infarction patients', *European Journal of Preventive Cardiology*, vol. 21, no. 3, pp. 321-9.

White, M.L. & Groh, C.J. 2007, 'Depression and quality of life in women after a myocardial infarction', *Journal of Cardiovascular Nursing*, vol. 22, no. 2, pp. 138-44.

Williams, L., O'Connor, R.C., Grubb, N.R. & O'Carroll, R.E. 2012, 'Type D personality and three-month psychosocial outcomes among patients post-myocardial infarction', *Journal of Psychosomatic Research*, vol. 72, no. 6, pp. 422-6.

Wrzesniewski, K. & Wlodarczyk, D. 2012, 'Sense of coherence as a personality predictor of the quality of life in men and women after myocardial infarction', *Kardiologia Polska*, vol. 70, no. 2, pp. 157-63.