**Resilience is an independent predictor of health-related quality of life in employed persons one year after acute myocardial infarction**

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**Abstract**

**Aims**

The objective of this study was to examine the association between resilience and health-related quality of life (HRQOL) in employed patients after acute myocardial infraction (AMI) using a direct assessment of resilience in a longitudinal study design and considering a potential interaction effect between resilience and effort-reward imbalance (ERI) at work.

**Methods**

Patients with confirmed AMI and regular paid employment of at least 10 hours per week were included in the study and filled in questionnaires during their hospital stay and 6 and 12 months after discharge. The Resilience Questionnaire (RS-11) and the Effort-Reward Imbalance Questionnaire were used to assess resilience and ERI, respectively. HRQOL was measured by the Short-Form 36 Health Survey (SF-36) mental and physical component summary scales. Generalized estimating equations (GEE) adjusted for relevant potential confounding variables (demographic, social, stress-related and clinical) were used to determine the association between resilience and HRQOL in the study course.

**Results**

From the 346 patients enrolled in the study, 270 patients (78.0%) had completed all surveys. High baseline resilience was a significant, independent predictor of high physical HRQOL (p<0.0001) and high mental HRQOL (p<0.0001) one year post AMI. No significant interaction effects between resilience and ERI were found in the physical HRQOL GEE model (p=0.7241) and in the mental HRQOL model (p= 0.3478).

**Conclusions**

The results highlight the role of resilience as an independent and strong predictor of post-AMI HRQOL irrespective of ERI at work. Interventions to strengthen resilience may positively affect the post-AMI adaptation process.

**KEYWORDS**

Myocardial infarction; psychological resilience; job-related stress; health-related quality of life

**INTRODUCTION**

Survivors of acute myocardial infarction (AMI) often experience impairments of functioning and health-related quality of life (HRQOL).1 HRQOL is a concept intended to capture the patient´s perspective on health and is increasingly recognized as an additional outcome measure complementary to clinical measures in research on cardiovascular diseases.2 Besides clinical AMI characteristics and cardiovascular risk factors which were shown to be related with HRQOL post AMI, a number of personal and environmental factors are suspected to influence the process of adaptation to living with an AMI.3 One factor which may play a key role in coping with AMI is resilience. A generally accepted definition refers to resilience as “successful adaptation and swift recovery after experiencing severe adversity during life”.4 Physical illness is a common adversity throughout life. Thus, resilience is increasingly addressed in studies on adults with various health conditions. However, according to a systematic review of studies which have examined resilience and related concepts in physically ill persons, from the 52 papers only six studied patients with cardiovascular disease.5

Although a few studies are available so far, which indicate that concepts related with resilience (such as sense of coherence) are associated with the HRQOL of persons with AMI6,7 there is an apparent lack of studies on the effects of resilience on HRQOL in patients with AMI which provide a direct assessment of resilience, although a number of questionnaires exist that enable a reliable and valid measurement of this construct.8

Work-related stress is another factor that may affect HRQOL in patients after AMI. It is commonly assessed with two theoretical models, the Job Strain Model by Karasek9 and the Effort-reward Imbalance (ERI) model developed by Siegrist10. The ERI model emphasizes that a perceived imbalance between high effort spent at work and low reward is associated with adverse effects on health. High effort is characterized by time pressure, frequent interruptions, numerous responsibility, increased workload, mandatory overtime and overcommitment. Reward refers to respect and esteem, money, and career opportunities including job security.

Several studies have investigated the effects of ERI at work on the incidence of CHD events and found increased relative risks.11 Although a number of studies are available which found an association between ERI and impaired HRQOL in employees,12 studies investigating this association in employees after AMI are completely lacking.

In addition, so far no studies have been published which analyze the mechanism how resilience may affect HRQOL after AMI. Similar to the mechanism proposed for social support, resilience might affect HRQOL directly (main effect) or it might work as a buffer between stress and HRQOL (interaction effect).13

Accordingly, the objective of this study was to examine the association between resilience and HRQOL in employed patients after AMI using a direct assessment of resilience in a longitudinal study design and considering a potential interaction effect between resilience and ERI at work.

**METHODS**

Ethical approval was obtained from the ethics committee of the Bavarian Medical Association (No. 14007) in March 2014. A pilot phase with ten patients was started thereafter in order to test the study processes and the feasibility of the baseline questionnaire. The first patient was enrolled in April 2014, the last one-year follow up took place in June 2017.

**Study design**

A longitudinal observation study was conducted. After the AMI-patient´s inclusion in the study with informed consent, a baseline survey was performed during the hospital stay. Follow-up data was collected using postal surveys 6 months and one year after the AMI.

**Study population**

The study population consisted of patients with AMI who were admitted to a hospital in the study region of the MONICA/KORA Myocardial Infarction Registry. This population-based AMI registry was initiated in 1984 as part of the World Health Organization MONICA (**Moni**toring Trends and Determinants in **Ca**rdiovascular Disease) project.14 After the termination of the MONICA project in 1995, the registry became part of the framework of KORA (Cooperative Health Research in the Region of Augsburg). Data on hospitalized patients are obtained from eight hospitals within the study region and two in the adjacent areas.

For the identification of eligible patients, records of all patients admitted to the participating hospitals in the study region are scanned to identify patients with AMI. Identified patients are visited routinely by the registry’s study nurses and if possible enrolled. Inclusion criteria for the current study were confirmed AMI, regular paid employment of at least 10 hours per week before the AMI, sufficient knowledge of the German language, and informed written consent.

**Data collection**

The study nurses initially contacted eligible patients at the ward, provided information on the study, obtained informed consent, distributed the baseline questionnaire, and collected the completed questionnaire during the following days. Follow-up questionnaires were administered by postal delivery. If patients did not respond, the nurse called them by telephone and reminded or asked for any problems with completing the questionnaires. For patients who did not provide a telephone number or could not be reached, a postal reminder was sent.

*Survey data*

The survey consisted of a questionnaire which includes a number of self-administered instruments in order to assess predictor, outcome and confounding variables (see Table 1).

The Resilience Questionnaire (RS-11)15contains 11 questions on self-esteem, optimism and internal locus of control and is a short-form of the 25-item questionnaire developed by Wagnild & Young.16 Schumacher et al.15 reported on the psychometric evaluation of the German version in a large population sample and developed a unidimensional, short-form comprising 11 items. The RS-11 short form showed good internal consistency and a high correlation (r=0.95) with the 25-item version.

The primary outcome of this study was HRQOL. It was measured using the German version of the Short-Form 36 Health Survey (SF-36)17 which is a 36-item generic questionnaire assessing eight single domains of HRQOL and two summary component scales on physical and mental HRQOL. It is frequently used and validated worldwide, and has already been applied in studies with AMI patients.18 For the present analysis, the physical and the mental component summary scales were used.

Furthermore, a number of other potential confounders were assessed. Work-related stress was measured using the Effort-Reward Imbalance Questionnaire (ERI).10The short form of the ERI questionnaire includes 16 questions about effort, reward and overcommitment at work. This questionnaire has its focus on the relation between commitment to work and received reward. The aspect of reward is regarded in different dimensions such as material and immaterial gratification: appreciation, payment/upgrading and job security. The questionnaire was validated in Germany by Siegrist et al.10 and has been applied in European cohorts, including patients with coronary heart disease.19 Besides work-related stress, financial and private strain were considered by self-developed questions about stressors related to finances, partner or family according to the INTERHEART study. 20 Additionally, overall perceived stress has been assessed using the Perceived Stress Scale (PSS4). 21 The PSS4 comprises four questions on the perception of stress in general and provides a useful and economic measure of perceived stress.

Depression and anxietywere assessed using the Hospital Anxiety and Depression Scale (HADS), which is a 14 item scale with seven items relating to anxiety and seven items relating to depression.22 It has been frequently applied and validated in studies with AMI patients.23

The Questionnaire on Social Support (Fragebogen zur sozialen Unterstützung, F-SozU) was selected to gather information on the received social support.24 The 14 questions of the short form showed good psychometric item properties, as well as a very acceptable reliability.25

*Clinical data*

For patients who are registered at the MONICA/KORA Myocardial Infraction Registry (n=301, 87%), information on clinical characteristics, such AMI risk factors, AMI type, recurrent infarction, and in-hospital treatment, was extracted from this database. For not-registered patients (n=45, 13%), the corresponding information was extracted from their medical records.

**Statistical Analysis**

Sample size estimation was performed using G\*Power 3.1 program.26 Given an effect size of 0.3 and a power of 80% at a two-sided type I error level of 5%, at least 240 patients are required for a regression model with 10 covariates. Based on the experiences from previous studies conducted within the KORA MI Registry framework, it was expected expect that not more than 30% of the included patients will be lost to follow-up or die. Consequently, 343 patients should have been enrolled in the study.

Besides descriptive statistics, changes of scores over time were tested with repeated measures ANOVA or paired t-tests, if appropriate. Cohen’s D was calculated as a measure of effect size. Generalized estimating equations (GEE) with exchangeable correlation matrix were used to determine the association between resilience and mental as well as physical HRQOL in the study course. In contrast to linear regression models, GEE provides estimates of the regression coefficients without completely specifying the response distribution. Instead, GEE uses the correlation between a subject’s repeated measurements. GEE models were adjusted for relevant potential confounding variables (sex, age, marital status, ERI, perceived stress, private and financial strain, obesity, diabetes, smoking, AMI type, reinfarction, recanalization therapy, left ventricular ejaction fraction). Since social support, depression and anxiety were not administered at all three surveys, it was not possible to consider these variables as covariables in the GEE models. Interaction effects of age and sex, as well as resilience and stress-related measures including ERI were tested. Level of significance was set to 0.05. Statistical analyses were performed with SAS version 9.4.

**RESULTS**

From the 348 patients enrolled in the study, 296 (85.1%) completed the survey at 6 months and 288 (82.8%) at one year post AMI. All three surveys were available for 272 patients (78.2%). For the data analysis, two patients were excluded because the AMI diagnosis was withdrawn or the resilience questionnaire was not completed at baseline, leaving 346, 294 and 287 patients, respectively, to be analyzed for the three measure points, and 270 patients (78.0%) who had completed all surveys.

**Sample characteristics**

The characteristics of the total sample are shown in Table 2. The sample mainly consisted of men (83.5%) with a mean age of 54.1 ± 7.7 years. Most persons were married (71.9%) and fully employed (84.4%) before the AMI event. White-collar workers were slightly more frequent than blue-collar workers (40.1% and 36.3%, respectively). The sample had a risk factor profile typical for AMI with a high percentage of current smokers (51.3%), history of hypertension (58.3%) or hyperlipidemia (50.3%). AMIs with and without ST-segment elevation were almost equally represented (43.9% and 48.0%, respectively), and 12.2% of the participants had a recurrent AMI. AMI treatment consisted of recanalization therapy in 94.5% of the patients, most of them (88.6%) had a percutaneous transthoracic coronary angiography and 9.6% had a coronary artery bypass graft surgery. The majority of participants (65.0%) showed normal (>50%) left ventricular ejection fractions.

In terms of most characteristics, patients who completed all surveys did not differ significantly from those who had not completed all surveys. However, patients with incomplete study participation were significantly more likely to be unmarried (41.9% vs. 24.1%, p=0.0027), blue-collar workers (48.7% vs. 33.0%, p=0.0224) and current smokers (66.2% vs. 47.2%, p=0.0140) and had a significantly lower mean resilience score at the baseline survey (59.3±10.4 vs. 62.0±9.7, p=0.0352).

**Changes of scores over time**

A number of measures changed over the observation period of one year (see Table 3). While physical HRQOL and ERI significantly improved, a deterioration was found in terms of mental HRQOL, resilience and social support. Effect sizes of most variables that changed significantly were small (<0.28), only the improvement in physical HRQOL with an effect size of 0.70 can be considered as a moderate change.

**Association between resilience and HRQOL**

High baseline resilience was found to be an independent and significant predictor (p<0.0001) of high physical HRQOL one year post AMI (see Table 4). A high level of ERI was negatively associated (p=0.0077) with physical HRQOL whereas other measures of stress showed no significant associations. In addition, higher age (p<0.0001), obesity (p=0.0007) and diabetes (p=0.0005) had an adverse association with physical HRQOL, whereas male sex (p=0.0205) and married status (p=<0.0001), were significant predictors of good physical HRQOL one year post AMI.

In terms of mental HRQOL one year post AMI, baseline resilience was the strongest independent predictor (p<0.0001) (see Table 5). ERI (p=0.0302) as well as other stress measures such as perceived stress (p<0.0001) and permanent private strain (p=0.0375) and moderate financial strain (p=0.0293) showed negative associations with mental HRQOL. Again, men had significantly (p=0.0034) better post AMI mental HRQOL scores than women.

**Interaction effects**

No significant interaction effects were found for resilience and ERI in the physical HRQOL GEE model (p=0.7241 ) and in the mental HRQOL model (p= 0.3478). In addition, resilience did not significantly interact with perceived stress in the model on physical HRQOL (p=0.4930) and mental HRQOL (p=0.6797). Similarly, no significant interactions were found between resilience and private strain (Physical HRQOL: p=0.2104, mental HRQOL: p=0.5220) as well as resilience and financial strain (Physical HRQOL: p=0.8311, mental HRQOL: p=0.6543). Furthermore, the interaction between age and sex was not significant (Physical HRQOL: p=0.8808, mental HRQOL: 0.7137).

**DISCUSSION**

This study indicates that the level of resilience plays a crucial role for both the mental and the physical dimension of HRQOL one year after AMI in younger, employed persons. It was shown that the association between resilience and HRQOL was independent from other demographic, social and clinical factors. Moreover, resilience was found to be the strongest predictor of mental HRQOL and the second strongest predictor of physical HRQOL one year after AMI. The hypotheses that resilience might act as a stress buffer could not be confirmed.

The finding that resilience is an independent predictor of HRQOL confirms other studies on populations with cancer, diabetes, nephrectomy, Parkinson’s disease and coronary heart disease.27 Contrary to the results from the present study, no significant association between resilience and HRQOL was found in some previous studies on chronic heart failure and digestive cancer.28,29 However, it should be kept in mind that previous studies partly used different instruments to measure resilience and HRQOL. This might have affected results and limited comparability among these studies.

Although previous studies already suggested an association between resilience and HRQOL, it is surprising that resilience emerged as the strongest predictor of mental HRQOL and the second strongest predictor (following age) of physical HRQOL in the current study, despite the adjustment for a number of clinically relevant variables. Of interest, in our study, none of the clinical variables such as AMI type, recurrent infarction, revascularization therapy or LVEF were significant predictors of HRQOL one year post AMI. This result highlights the role of personal and social factors in the adjustment and coping process after AMI.

Besides level of resilience, baseline ERI emerged as a significant independent predictor of both mental and physical HRQOL post AMI. This is in line with the results from cross-sectional studies in healthy working populations and persons with spinal cord injury.12,30 While other stress-related measures, namely perceived stress and private strain were also significantly related with mental HRQOL one year after AMI, ERI was the only measure of stress, which contributed negatively to physical HRQOL. The finding that the mean ERI score significantly (but with a small effect size) improved over one year may reflect the patients’ efforts to improve a stressful job situation in order to prevent a recurrent AMI event.

In the current study, resilience had a main effect on HRQOL and did not work as a buffer of ERI, perceived stress or private and financial strain in employed persons with AMI. This is a unique finding that requires further investigation. Given that this finding is valid, all persons with low resilience - irrespective of their experienced stress level - may benefit from interventions aiming at fostering resilience. Appropriate intervention programs are already available and their implementation into post-AMI aftercare may be considered.31

To our knowledge, this is the first study, which examined the association between resilience and HRQOL in the subgroup of employed persons after AMI taking ERI into account. The long-term study design and appropriate sample size are major strengths of the current study. In addition, standardized assessment of resilience and adjustment for a number of demographic, stress-related and clinical variables in elaborate statistical GEE models have contributed to the quality of this study. Unfortunately, statistical analyses have to be restricted to the study participants with complete follow-up information since study drop-out was not at random. Thus, for instance, the results can only be generalized to persons who continued working after the AMI. Another study limitation refers to the inability to include measures of social support, depression and anxiety as covariables since they were not administered at every measure point. Finally, we cannot exclude residual confounding.

In conclusion, the results of this study highlight the role of resilience as an independent and strong predictor of post-AMI HRQOL. Interventions to strengthen resilience may positively affect the post-AMI adaptation process and may be implemented in AMI rehabilitation settings.

**Author contributions**
IK, KB and CM contributed to the conception and design of the study. IK, KB, CM, MH and CT contributed to the acquisition, analysis, or interpretation of data for the work. IK drafted the manuscript. KB, CM, MH, and CT critically revised the manuscript. All gave final approval and agree to be accountable for all aspects of work ensuring integrity and accuracy.

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**Declaration of conflicting interests**

The authors declare that there is no conflict of interest.

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Table 1: Overview on concepts and instruments

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Concept | Instrument | Scoring | Baseline survey | Follow-up surveys |
|  |  |  |  | 6 months | 12 months |
| **Predictor** |  |
| Resilience | Resilience-questionnaire (RS-11) | Summary score, range 11-77, higher score indicates more resilience | X | X | X |
| **Outcomes** |  |
| Physical health-related quality of life | Short Form 36 Health Survey (SF-36), physical summary component scale  | Weighted score, German reference population, range -0.33 – 77.31, higher score indicates better physical HRQOL | X | X | X |
| Mental health-related quality of life | Short Form 36 Health Survey (SF-36), physical summary component scale  | Weighted score, German reference population, range -0.60 – 78.17, higher score indicates better physical HRQOL | X | X | X |
| **Confounder** |  |
| Effort-Reward Imbalance at work | Effort-Reward Imbalance Questionnaire (ERI) | Weighted summary score, range 0.25-3.99, higher score indicates more effort for less reward | X | X | X |
| Private strain | Self-developed question according to the INTERHEART study | Likert scale, range, range 1-4, higher score indicates more strain | X | X | X |
| Financial strain | Self-developed question according to the INTERHEART study | Likert scale, range, range 1-3, higher score indicates more strain | X | X | X |
| Perceived stress | Perceived Stress Scale (PSS4) | Summary score, range 0-16, higher score indicates more stress | X | X | X |
| Depression | Hospital Anxiety and Depression Scale (HADS-D) | Summary score, range 0-21 higher score indicates more depression |  | X | X |
| Anxiety | Hospital Anxiety and Depression Scale (HADS-D) | Summary score, range 0-21, higher score indicates more anxiety |  | X | X |
| Social support | Social Support Questionnaire (F-SozU)  | Summary score, range 1-5, higher score indicates more social support | X |  | X |

Table 2: Characteristics of the total sample of 364 included patients

|  |  |  |
| --- | --- | --- |
|  | Mean | SD |
| **Age** [years] | 54.1  | 7.7 |
|  |  |  |
|  | n | % |
| **Sex** |  |  |
| Male | 289 | 83.5  |
| Female  | 57 | 16.5 |
| **Marital status** |  |  |
| Married | 238 | 71.9 |
| Unmarried | 93 | 28.10 |
| **Employment** |  |  |
| ≥35 hours/week | 291 | 84.4 |
| 15-34 hours/week | 46 | 13.3 |
| 10-15 hours/week | 7 | 2.0 |
| n/a | 1 | 0.3 |
| Blue-collar worker | 125 | 36.3 |
| White-collar worker | 138 | 40.1 |
| Public officer | 17 | 4.9 |
| Self-employed | 64 | 18.6 |
| **Smoking** |  |  |
| Current smoker | 175 | 51.3 |
| Ex-smoker | 106 | 31.1 |
| Never smoker | 60 | 17.6 |
| **Disease history** |  |  |
| Stroke | 9 | 2.6 |
| Hypertension | 200 | 58.3 |
| Angina pectoris | 24 | 7.1 |
| Hyperlipidemia | 172 | 50.3 |
| Diabetes | 64 | 18.7 |
| Coronary heart disease | 53 | 15.5 |
| Obesity | 99 | 29.1 |
| **AMI characteristics** |  |  |
| First AMI | 301 | 87.8 |
| Re-infarction | 42 | 12.2 |
| STEMI | 150 | 43.9 |
| NSTEMI | 164 | 48.0 |
| Bundle branch block | 19 | 5.6 |
| Undefined | 9 | 2.6 |
| LVEF |  |  |
| >50% | 221 | 65.0 |
| 41-50% | 68 | 20.0 |
| 31-40% | 34 | 10.0 |
| <=30% | 12 | 3.5 |
| n/a | 5 | 1.5 |
| **AMI treatment** |  |  |
| Any recanalization therapy | 324 | 94.5 |
| PTCA yes | 304 | 88.6 |
| CABG yes | 33 | 9.6 |

n/a: not available, AMI: acute myocardial infarction, STEMI: ST-segment elevation myocardial infarction, NSTEMI: Non-ST-segment elevation myocardial infarction, LVEF: left ventricular ejection fraction, PTCA: percutaneous transluminal angioplasty, CABG: coronary artery bypass graft

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Concept | Instrument | Baseline | 6 months | 12 months | p-value\* | Effect size |
|  |  | n | Mean  | SD | n | Mean  | SD | n | Mean  | SD |  |  |
| Resilience | Resilience-questionnaire (RS-11) | 270 | 61.96 | 9.69 | 268 | 59.21 | 11.42 | 270 | 59.77 | 11.15 | <0.0001 | 0.21 |
| Mental HRQOL | Short Form 36 Health Survey (SF-36) | 262 | 49.28 | 11.94 | 265 | 47.12 | 10.73 | 266 | 47.88 | 10.21 | 0.0046 | 0.13 |
| Physical HRQOL | Short Form 36 Health Survey (SF-36) | 262 | 41.41 | 10.65 | 265 | 47.63 | 9.63 | 266 | 48.38 | 9.24 | <0.0001 | 0.70 |
| Effort-reward imbalance | Effort-Reward Imbalance Questionnaire (ERI) | 233 | 1.25 | 0.47 | 183 | 1.14 | 0.42 | 196 | 1.15 | 0.44 | 0.0045 | 0.22 |
| Perceived stress | Perceived Stress Scale (PSS4) | 270 | 6.01 | 3.07 | 267 | 5.84 | 3.03 | 270 | 5.89 | 2.96 | 0.6349 | 0.04 |
| Private strain | Modified item from INTERHEART | 271 | 2.33 | 0.77 | 267 | 2.30 | 0.78 | 271 | 2.31 | 0.72 | 0.8911 | 0.03 |
| Financial strain | Modified item from INTERHEART | 271 | 1.72 | 0.76 | 256 | 1.68 | 0.76 | 268 | 1.69 | 0.73 | 0.6381 | 0.04 |
| Social support | Social Support Questionnaire (F-SozU) | 270 | 4.51 | 0.87 | - | - | - | 270 | 4.29 | 0.79 | <0.0001 | 0.27 |
| Depression | Hospital Anxiety and Depression Scale (HADS) | - | - | - | 267 | 4.57 | 4.09 | 253 | 4.65 | 4.27 | 0.8153 | 0.02 |
| Anxiety | Hospital Anxiety and Depression Scale (HADS) | - | - | - | 268 | 5.93 | 4.11 | 253 | 5.99 | 4.16 | 0.9040 | 0.01 |
| \* repeated measures ANOVA or paired t-test  |  |

Table 3: Change of scores over one year

Table 4: General equation estimation model: dependent variable physical health-related quality of life (SF-36 physical component summary scale)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Estimate | Standard error | 95% confidence interval | Z | p |
| Resilience |  | 0.15 | 0.04 | 0.078 | 0.22 | 4.12 | <.0001 |
| Effort-reward-imbalance |  | -15.90 | 0.60 | -27.59 | -0.42 | -2.67 | 0.0077 |
| Perceived stress |  | -0.08 | 0.14 | -0.35 | 0.19 | -0.59 | 0.5540 |
| Private strain1 | Always | -13.08 | 20.55 | -53.37 | 27.20 | -0.64 | 0.5244 |
|  | Sometimes | -0.82 | 11.07 | -29.92 | 13.46 | -0.74 | 0.4570 |
|  | Rarely | -0.18 | 0.99 | -21.15 | 17.57 | -0.18 | 0.8561 |
| Financial strain2 | Severely | -0.89 | 0.97 | -27.94 | 10.11 | -0.92 | 0.3584 |
|  | Moderately | -0.49 | 0.73 | -19.23 | 0.95 | -0.66 | 0.5064 |
| Age |  | -0.25 | 0.06 | -0.36 | -0.13 | -4.32 | <.0001 |
| Sex3 | Male | 32.00 | 13.81 | 0.49 | 59.07 | 2.32 | 0.0205 |
| Marital status4 | Married | 39.60 | 10.17 | 19.67 | 59.52 | 3.89 | <.0001 |
| Reinfarction5 | Yes | -0.35 | 13.18 | -29.28 | 22.38 | -0.26 | 0.7935 |
| Recanalization therapy5 | Yes | 22.83 | 13.41 | -0.35 | 49.12 | 1.70 | 0.0888 |
| LVEF6 |  ≤50%  | 0.68 | 0.94 | -11.61 | 25.27 | 0.73 | 0.4678 |
|  | Not determined | -13.54 | 27.17 | -66.79 | 39.72 | -0.50 | 0.6184 |
| Obesity5 | Yes | -30.23 | 0.90 | -47.79 | -12.68 | -3.37 | 0.0007 |
| Diabetes5 | Yes | -42.91 | 12.28 | -66.97 | -18.85 | -3.50 | 0.0005 |
| Smoking7 | Current smoker | 0.14 | 11.77 | -21.66 | 24.46 | 0.12 | 0.9051 |
|  | Ex-smoker | -0.77 | 11.97 | -31.14 | 15.79 | -0.64 | 0.5215 |
| AMI type8 | NSTEMI | 0.50 | 0.88 | -12.21 | 22.16 | 0.57 | 0.5706 |
|  | Bundle branch block | -26.04 | 20.51 | -66.24 | 14.16 | -1.27 | 0.2042 |
|  | Undefined | 28.67 | 20.25 | -11.02 | 68.37 | 1.42 | 0.1569 |

1Reference category.: never; 2Ref. Not at all/little; 3Ref.: female; 4Ref.: unmarried; 5Ref.: No; 6Ref.: >50%; 7Ref.: Never; 8Ref.: ST-segment elevation myocardial infarction; LVEF: left ventricular ejection fraction; AMI: AMI: acute myocardial infarction; NSTEMI: Non-ST-segment elevation myocardial infarction

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |

Table 5: General equation estimation model: dependent variable mental health-related quality of life (SF-36 mental component summary scale)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Estimate | Standard error | 95% confidence interval | Z | p |
| Resilience |  | 0.37 | 0.04 | 0.30 | 0.44 | 9.76 | <.0001 |
| Effort-reward-imbalance |  | -13.31 | 0.64 | -25.34 | -0.13 | -2.17 | 0.0302 |
| Perceived stress |  | -0.70 | 0.14 | -0.98 | -0.42 | -4.91 | <.0001 |
| Private strain1 | Always | -41.28 | 19.84 | -80.16 | -0.24 | -2.08 | 0.0375 |
|  | Sometimes | -14.42 | 0.98 | -33.71 | 0.49 | -1.47 | 0.1428 |
|  | Rarely | 0.05 | 0.86 | -16.35 | 17.42 | 0.06 | 0.9504 |
| Financial strain2 | Severely | 0.71 | 0.92 | -10.91 | 25.07 | 0.77 | 0.4402 |
|  | Moderately | 15.01 | 0.69 | 0.15 | 28.51 | 2.18 | 0.0293 |
| Age |  | -0.00 | 0.05 | -0.10 | 0.098 | -0.01 | 0.9893 |
| Sex3 | Male | 36.62 | 12.52 | 12.09 | 61.16 | 2.93 | 0.0034 |
| Marital status4 | Married | -0.71 | 0.88 | -24.34 | 10.06 | -0.81 | 0.4158 |
| Reinfarction5 | Yes | -10.57 | 11.74 | -33.57 | 12.43 | -0.90 | 0.3678 |
| Recanalization therapy5 | Yes | 22.83 | 13.41 | -0.35 | 49.12 | 1.70 | 0.0888 |
| LVEF6 |  ≤50%  | 12.42 | 0.85 | -0.42 | 29.04 | 1.47 | 0.1429 |
|  | Not determined | 75.22 | 37.57 | 0.16 | 148.86 | 2.00 | 0.0453 |
| Obesity5 | Yes | -0.04 | 0.88 | -17.56 | 16.82 | -0.04 | 0.9663 |
| Diabetes5 | Yes | 0.07 | 10.80 | -20.42 | 21.90 | 0.07 | 0.9455 |
| Smoking7 | Current smoker | -0.61 | 11.12 | -27.90 | 15.70 | -0.55 | 0.5833 |
|  | Ex-smoker | 0.31 | 11.14 | -18.77 | 24.89 | 0.27 | 0.7835 |
| AMI type8 | NSTEMI | 0.60 | 0.80 | -0.97 | 21.64 | 0.75 | 0.4554 |
|  | Bundle branch block | -0.04 | 15.47 | -30.72 | 29.90 | -0.03 | 0.9788 |
|  | Undefined | -37.52 | 27.82 | -92.04 | 17.00 | -1.35 | 0.1774 |

1Reference category.: never; 2Ref. Not at all/little; 3Ref.: female; 4Ref.: unmarried; 5Ref.: No; 6Ref.: >50%; 7Ref.: Never; 8Ref.: ST-segment elevation myocardial infarction; LVEF: left ventricular ejection fraction; AMI: AMI: acute myocardial infarction; NSTEMI: Non-ST-segment elevation myocardial infarction