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Job burnout is associated with slow improvement of quality of life in the employees after a first episode of acute coronary syndrome: A hospital-based longitudinal study in China

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ABSTRACT

Objective: This study investigated the association between job burnout and quality of life (QoL) after acute coronary syndrome (ACS) in a Chinese sample.
Methods: This was a one-year longitudinal study. Participants included patients with a first episode of ACS who were still employed. The Copenhagen Burnout Inventory (CBI) assessed job burnout before discharge, and QoL was assessed using the Medical Outcome Study 8-Items Short Form Health Survey (SF-8) and the Seattle Angina Questionnaire (SAQ) before discharge (baseline), at one month, six months and 12 months after discharge. Generalized estimating equations determined the association between job burnout and longitudinal changes of QoL.
Results: All participants were assigned to either a "low job burnout" group ($n = 70$) or a "high job burnout" group ($n = 50$), based on the upper quartile of job burnout scores. Longitudinally over 1-year follow-up period, the scores of the SF-8 and SAQ among patients with a high level of burnout were lower than those in the low job burnout group. Job burnout was significantly associated with lower physical and mental health (SF-8), as well as greater physical limitation and lower treatment satisfaction (SAQ) over time.
Conclusion: Job burnout at baseline predicted slow improvement of QoL after ACS in a Chinese working sample.

1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death, and acute coronary syndrome (ACS) accounts for at least 50% of such deaths [1]. Although the popularity of early revascularization and evidenced-based drug treatments have improved the survival rate of ACS patients [2], the incidence of major adverse cardiovascular events (MACEs) remain high during the period of long-term rehabilitation for ACS [3]. Improving the quality of life (QoL) and prognosis of ACS survivors is a common focus of both the medical field and the wider society.

ACS is the most serious type of coronary heart disease (CHD). Although it is common in the elderly, its prevalence in the young and middle-aged people is rising [4]. It is reported that the prevalence of ACS prior to the age 55 is between 17.4 and 24.2% [2,5,6]. According to an American study, the prevalence of myocardial infarction in young women and men (35–54 y/o) increased from 21% and 30% between 1995 and 1999, to 31% and 33% between 2010 and 2014, respectively [7]. Importantly, young people tend to ignore cardiovascular risk factors, and they therefore miss the best opportunities in terms of prevention and control [8].

CHD is caused by multiple factors, and psychosocial factors are likely to represent independent risk factors for CHD [9,10]. It is reported that the negative effects of marriage, low income, family support, the work environment, or life stresses could lead to adverse outcomes in ACS

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patients [11]. Depression and anxiety are the important psychosocial factors affecting the occurrence and development of CHD. On average in 20% of patients after acute myocardial infarction appeared identified depressive symptoms [12]. Similarly, the prevalence of anxiety in ACS patients was around 25–37% [13]. An early study reported the depression after myocardial infarction predicted a 3–4-fold increase in mortality from cardiac causes [14]. Anxiety was associated with worse long-term cardiac endpoints in myocardial infarction patients [13]. Moreover, both depression and anxiety have a significant negative influence on the quality of life (QoL) during the recovery in ACS patients [15].

In recent years, psychosocial factors in the workplace have been received much attention in association with CVD, particularly CHD. Job stress (or work stress), defined as "the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker" [16], is majorly assessed with theoretical models of job strain and effort-reward imbalance at work [17]. Another relevant concept is job burnout whose harmonized definition is "In a worker, occupational burnout or occupational physical AND emotional exhaustion state is an exhaustion due to prolonged exposure to work-related problems" [18]. Though research evidence suggested both job stress and job burnout are associated with higher risk of incident CHD and recurrent CHD [19–23], the general research consensus about relationships among job stress, job burnout, and CHD is that job burnout mediates the association between job stress and health outcomes including CHD [24,25]. Regarding the potential contribution of work-related stress and burnout experiences to QoL after coronary events, to our best knowledge, a one-year longitudinal study from Germany found that effort-reward imbalance was significantly related with post-infarction QoL [26]. General burnout or exhaustion (not referring to work place) was discovered to predict poor recovery of QoL among ACS patients in Hungary and in China [27,28]. In the working setting, we previously reported that job burnout predicted the decline of health-related QoL among Chinese employees with cardiovascular disease [29], although this study had a couple of limitations. For instance, the study participants were all female nurses, QoL was measured twice (at baseline and at one-year), and prevalent cases included cardiovascular disease as opposed to incident (first episode) cases. Hence, we conducted a new study in order to generate new research evidence. The present study was a hospital-based longitudinal study to observe the effect of job burnout on QoL among employees with a first episode of ACS during one year after their discharge, which provided evidence of job burnout and the follow-up development of ACS among a sample of Chinese employees.

2. Materials and methods

2.1. Study participants

This was a hospital-based prospective study. The participants were patients who were admitted to the First Affiliated Hospital of Kunming Medical University, which is the largest regional hospital with full range of cardiac inpatient and outpatient clinics, because of a first episode of ACS between March 2018 and December 2019. Before they were hospitalized, all of them were employed in the labor market with age no more than 65 years old. ACS refers to a range of acute myocardial ischemic states: ST-segment elevation myocardial infarction (STEMI) [30], non-ST segment elevation myocardial infarction (NSTEMI), and unstable angina (UA) [31]. All of the patients accepted percutaneous coronary intervention during hospitalization. A follow-up was carried out at one month, six months and 12 months after discharge. Data related to QoL were measured repeatedly at follow-up. All patients provided their written informed consent. This project was approved by the Ethics Committee of Kunming Medical University (Kunming, China).

2.2. Study design and the follow-up details

Details of study design and follow-up were shown in Fig. 1. During the hospitalization, the sociodemographic and clinical information were collected. Meanwhile, job burnout, depression, anxiety, and QoL at baseline were assessed before discharge. The follow-up time was 1 month, 6 months and 1 year after discharge. QoL was measured repeatedly at each follow-up.

2.3. Collection of sociodemographic and medical data

Research staff administered a questionnaire to collect participants' demographic and clinical data, such as their age, sex, ACS type (UA, STEMI, NSTEMI), education level, number of family members, monthly family income, medical history (hypertension, diabetes, hyperlipemia, stroke, smoking at present, heavy drinker), serum biochemical(glucose, total cholesterol, triglyceride, HDL-C, LDL-C) from their medical records.

2.4. Assessment of job burnout, anxiety, and depression

Job burnout was assessed using the work burnout subscale from the Copenhagen Burnout Inventory (CBI). Responses were rated according to a five-point Likert-type scale. Potential scores of the CBI ranged from 0 to 100, with higher scores indicating higher levels of job burnout. The Cronbach's alpha coefficient for the 6-item CBI work burnout subscale was 0.723 in our study. We applied the Chinese version of the CBI which has satisfactory reliability and validity [32,33]. Our previous research also proved that the CBI was able to reflect the burnout level in patients with ACS [28,34]. According to the practice of our previous study [28], the upper quartile of job burnout score in this study was used to define high burnout and low burnout, given that fact that there is no empirical cut-off point for CBI. Meanwhile, the median of job burnout score was also used as an alternative threshold, and the subsequent results of data analysis were reported in the supplementary materials. In addition, symptoms of depression and anxiety were assessed with the Chinese version of the Hospital Anxiety and Depression Scale (HADS). The Cronbach's alpha coefficient for the HADS-anxiety and HADS-depression subscale was 0.712 and 0.733, respectively, in this study. Potential scores of the HADS range from 0 to 21 for each subscale with higher scores indicating higher levels of anxiety and depressive symptoms. A score of $\geq$8 was taken to indicate clinically relevant levels of anxiety or depression symptoms [35]. This instrument has successfully applied in Chinese CHD patients [36].

2.5. Evaluation of QoL

To evaluate QoL, two instruments were used: the Medical Outcome Study 8-Items Short Form Health Survey (SF-8), and a disease-specific instrument — the Seattle Angina Questionnaire (SAQ). The SF-8 was derived from the SF-36, a multipurpose, generic questionnaire that is used to assess health-related QoL [37,38]. The SF-8 has eight items and two dimensions, i.e., physical health and mental health; potential score of each dimension ranges from 0 to 100. Higher SF-8 scores indicate better general QoL. The Chinese version of the SF-8 has been widely used in Chinese CHD patients [39]. The Seattle Angina Questionnaire (SAQ) is a 19-item self-administered questionnaire to assess disease-specific QoL. It has five scales which measure the following dimensions of CHD: Physical limitation (PL), angina stability (AS), angina frequency (AF), treatment satisfaction (TS), and disease perception (DP) [40]. The score of each scale ranges from 0 to 100, with high scores indicating a good level of the particular dimension. The Chinese version of the SAQ has been verified as a useful instrument for the assessment of QoL in CHD patients in China because of its good validity, reliability, and responsiveness [41]. In the present study, the Cronbach's alpha coefficient for the physical health dimension and mental health dimension of

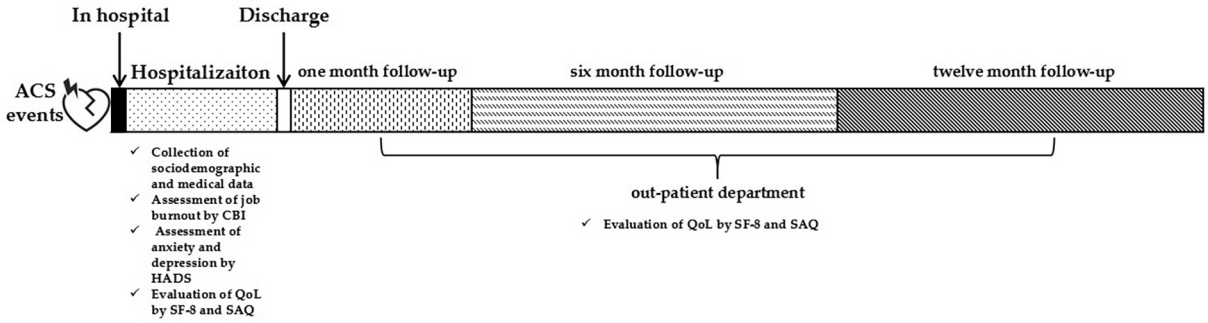

Fig. 1. Study design and the follow-up details.
ACS: Acute coronary syndrome; QoL: Quality of life; HADS: the Hospital Anxiety and Depression Scale (the cut-off point is 8 point); SF-8: the Medical Outcome Study 8-Items Short Form Health Survey; CBI: Copenhagen Burnout Inventory; SAQ: The Seattle Angina Questionnaire.

SF-8 was 0.72 and 0.74, respectively. Meanwhile, the Cronbach's alpha coefficient for PL, AS, AF, TS, and DP of SAQ was 0.75, 0.71, 0.74, 0.76, and 0.70, respectively.

2.6. Recording cardiac events

During the follow-up, the cardiac events were recorded, which were defined as cardiac sudden death, recurrence of ACS events including recurrence of angina, NSTEMI or STEMI, rehospitalization mainly because recurrence of ACS relevant symptoms.

2.7. Statistical analyses

Statistical analyses were carried out using Stata, version 10 (Stata, College Station, TX, USA). Continuous variables were presented as mean values, and discrete variables were presented as frequencies and percentages. The Student's *t*-test (for continuous variables) and chi-square test (for categorical variables) were used to compare the high burnout group and the low burnout group on baseline characteristics. As an extension of generalized linear models, generalized estimating equations (GEEs) could deal with correlations between observations within the same subjects [42,43]. Therefore, we used GEEs to determine the association between job burnout at baseline and development of QoL over time as measured by the SF-8 and SAQ before discharged (baseline), 1 month, 6 months and 12 months during the follow-up. We also controlled for potentially confounding factors including age, sex, ACS type (UA, STEMI, NSTEMI), education level, number of family members, monthly family income, medical history (hypertension, diabetes, hyperlipemia, stroke, smoking at present, heavy drinker), serum biochemical (glucose, total cholesterol, triglyceride, HDL—C, LDL-C) following previous research [28,34]. In addition to the binary measures of job burnout, we also conducted sensitivity analyses with continuous measures of job burnout, and regression coefficients were reported for an increase by 1 standard deviation (SD).

3. Results

3.1. Baseline characteristics of study participants

Between March 2018 and December 2019, there were 150 eligible patients who met the inclusion criteria, and they were all invited to participate in our study. A total of 123 patients agreed at baseline (participation rate = 82%). One subject was allergic to medical electrodes so that this patient was with incomplete clinical data at baseline; another two patients did not attend the entire follow-up examinations. Therefore, a total of 120 patients (101 males and 19 females; mean age: 49.5 ± 7.6; age range: 27–62 years) were included into this study as analytic sample. Range of scores for job burnout was 8.30 to 95.8 (median = 50.00, upper quartile = 58.33). All participants were divided into two groups based on the upper quartile: low job burnout group (score for job burnout < 58.33) and high job burnout group (score for job burnout ≥ 58.33). The anxiety score of high burnout group was significantly higher than that of low burnout group. The baseline physical healthy scores of low burnout group were significantly higher than those of high burnout group. Other demographic and health characteristics were not significantly different between the two groups (Table 1).

3.2. Effect of job burnout at baseline on SF-8 scores during 12 months post-ACS

Both the physical health score and the mental health score of the SF-8 were higher in the low job burnout group than in the high job burnout group, as shown in Fig. 2. Developing three models of GEEs, as shown in Table 2, job burnout scores at baseline were negatively associated with physical health scores (all $p < 0.001$), such that every for a 1-SD increase in job burnout, there was a 2.68-point and 2.58-point (both $p < 0.001$) decrease in the physical health score, after adjustment for anxiety and depression, respectively. Similarly, a negative association was also observed between job burnout scores at baseline and mental health scores during the one-year observation period. For dichotomized job burnout scores based on upper quartile, there was no significant association between job burnout and the mental health score after adjusting for anxiety ($p = 0.053$). However, for continuous job burnout, every 1-SD increase in job burnout scores at baseline corresponded to a significant decrease in mental health scores after adjusting for either anxiety (1.54 points drop, $p = 0.004$) or depression (1.55 points drop, $p = 0.002$).

3.3. Effect of job burnout at baseline on SAQ scores during 12 months post-ACS

As shown in Fig. 3, there was a trend that the SAQ scores of the low job burnout group were generally higher than those observed in the high job burnout group. Job burnout scores at baseline were significantly inversely associated with PL and TS scores. An 1-SD increase in job burnout scores at baseline corresponded to a decline in PL scores of 3.61 points ($p = 0.001$) and 3.16 points ($p = 0.003$) after adjusting for anxiety and depression, respectively. Similarly, an 1-SD increase in job burnout scores at baseline corresponded to a decline in TS scores of 4.07 points ($p = 0.002$) and 4.13 points ($p = 0.001$) after adjusting for anxiety and depression, respectively. In Model I, compared with the low job burnout group, the patients with high job burnout scores had a lower AS score ($p = 0.038$). However, after adjusting for anxiety and depression, this difference was no longer significant. The association between job burnout at baseline and the AF or DP score was not significant (Table 3). Furthermore, multiple regression analyses might have inflated the Type I error rate. Bonferroni correction of the *p*-value for multiple testing

Table 1
Characteristics of study participants at baseline ($n = 120$).

		Low job burnout($n = 70$)	High job burnout($n = 50$)	p
Age (y)		48.53 ± 7.99	50.86 ± 6.74	0.10
Sex (n)	Male	62	39	0.12
	Female	8	11	
ACS type (n)	UA	10	7	0.86
	STEMI	34	22	
	NSTEMI	26	21	
Education level (n)	Junior middle school	16	18	0.08
	High middle school/ technical secondary school	41	21	
	Junior college	7	2	
	College or higher	6	9	
Number of family members (n)		3.97 ± 1.19	4.06 ± 1.48	0.72
Monthly family income (Yuan)		7378.57 ± 2337.96	7082.00 ± 1858.54	0.46
Medical history (%)	Hypertension	20.8	20.8	0.12
	Diabetes	13.3	10.0	0.88
	Hyperlipemia	21.7	15.0	0.90
	Stroke	0.8	4.2	0.08†
	Family history of CVD	20.8	11.7	0.37
	Smoking at present	41.7	25.8	0.28
	Heavy drinker	20.0	12.5	0.62
Serum biochemistry (mmol/L)	Glucose	6.56 ± 2.74	6.26 ± 2.23	0.52
	Total cholesterol	4.53 ± 1.31	4.31 ± 1.22	0.35
	Triglyceride	2.10 ± 1.10	1.75 ± 1.09	0.09
	HDL-C	1.12 ± 0.62	1.17 ± 0.43	0.66
	LDL-C	2.89 ± 1.14	2.84 ± 1.20	0.84
Anxiety score		6.69 ± 3.74	8.90 ± 3.49	0.001*
Depression score		5.63 ± 2.11	6.40 ± 2.22	0.06
SF-8 scores at baseline	Physical health score	47.73 ± 6.18	43.33 ± 5.56	0.014*
	Mental health score	46.88 ± 6.60	43.55 ± 5.60	0.07
SAQ scores at baseline	PL	64.53 ± 10.11	60.80 ± 9.42	0.20
	AS	90.00 ± 20.25	95.59 ± 9.82	0.29
	AF	85.50 ± 17.24	85.88 ± 11.21	0.93
	TS	72.38 ± 14.12	65.16 ± 14.81	0.09
	DP	49.58 ± 15.56	40.69 ± 14.70	0.06

ACS: acute coronary syndrome; UA: unstable angina; STEMI: ST-segment elevated myocardial infarction; NSTEMI: non-ST-segment elevated myocardial infarction; CVD: cardiovascular disease; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; SF-8: Medical Outcome Study 8-Items Short Form Health Survey; SAQ: Seattle Angina Questionnaire; PL: physical limitation; AS: angina stability; AF; angina frequency; TS: treatment satisfaction; DP: disease perception.
The Chinese version of the Hospital Anxiety and Depression Scale (HADS) was used to assess the anxiety and depression level. The cut-off point of anxiety or depression is 8 point.
* $p < 0.05$.
† Fisher's exact test.

(α/number of tests) [44] results in a p-value of 0.007 for an α of 0.05 and seven QoL parameter tests. As showed in Tables 2 and 3, the findings of our study were not obviously affected.

3.4. Cardiac events

By the end of the one-year follow-up, no cardiac events were observed.

3.5. Supplemental findings

When the median of job burnout score was used as the threshold to define high burnout and low burnout, characteristics of participants are shown in Supplemental Table 1. The results of associations between job burnout and QoL were consistent with those using the upper quartile as the threshold; for details, please see Supplemental Table 2 and Supplemental Table 3.

4. Discussion

This study was carried out among working people in China who had experienced a first episode of ACS. It aimed to evaluate the association between job burnout and QoL during the period of one-year follow-up after discharge. To the best of our knowledge, this is the first study in this regard, worldwide. Our findings suggest that job burnout is associated with lower improvement in QoL among ACS patients who employed in the labor market.

In the current study, we found the patients with high job burnout level at baseline showed a lower health status scores assessed by using SF-8 in both physical health and mental health dimensions after they discharged one year. This finding was in line with our previous report that, compared with the low job burnout group, employees with cardiovascular disease in high job burnout group displayed decreased scores in both physical functioning and mental functioning evaluated by using SF-8 as well [29]. As mentioned above, the participants in this previous study were female nurses, suffering from chronic cardiovascular diseases, while the participants in our present study were both men and women without any restriction to specific occupations, and their disease was acute coronary heart disease. These two studies illustrate a similar phenomenon from different angles, i.e., job burnout could exert adverse effects on health-related QoL among patients with cardiac diseases. Also, the results of present study based on a working sample are concordant with our previous findings in a general ACS patients who were older and retired or unemployed when ACS occurred [28]. Lower PL scores reflect that the patients had a worse subjective administration about their physical condition. In younger working group, physical limitation may cause the patients to feel difficult undertaking the workload as they did before ACS onset, or even created a negative influence on their daily life activities. Lower TS scores reflect less treatment satisfaction of patients in high job burnout group. One possible explanation may be recurrent chest pain, which represented a non-cardiac symptom due to social-psychological factors [45]. As our previous study revealed that higher levels of burnout were correlated with greater frequency of angina [28], making patients believe that their treatment has failed; furthermore, lower treatment satisfaction could lead to the poor medication adherence, and an increase in mortality [46].

After adjustment the confounding factors, job burnout at baseline was negatively associated with the physical health and mental health scores of SF-8, as well as the PL and TS scores of SAQ, indicating a less improvement in QoL in working group during the first year after ACS. QoL is a multidimensional concept that can help physicians to examine treatment effectiveness in patients with post-ACS. A growing number of studies have revealed that QoL is an independent indicator to predict the reoccurrence of adverse cardiac events, rehospitalization and mortality [47,48]. Early interventional strategy including thrombolytic therapy, percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), and standardized medication treatment can improve the QoL [49,50], however, it has been shown that numerous, complex and dynamic types of factors have potential influence on QoL, such as age, gender, marital status, behavioral factors, disease-related factors, and psychosocial factors [51]. Burnout characterized by emotional exhaustion, physical fatigue, and cognitive weariness, which is one type of negative response to chronic stress [22]. Like other forms of phycological factors, burnout is also linked to the occurrence of cardiac events

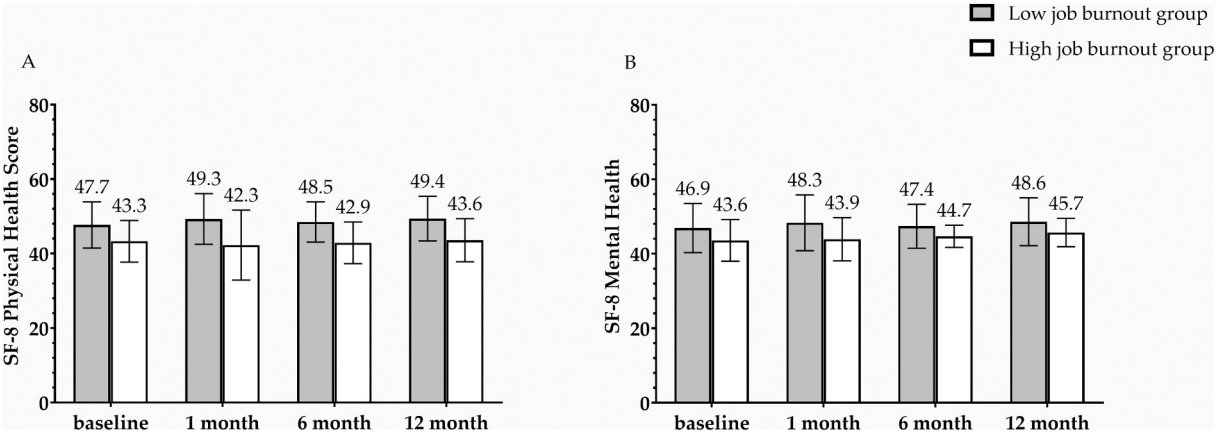

Fig. 2. Changes in SF-8 scores (means ± SD) among patients with ACS over 12-month follow-up: A comparison of the low job burnout group and high job burnout group.
(A) Physical health score and (B) Mental health score.
SF-8: Medical Outcome Study 8-Items Short Form Health Survey.
SD: Standard Deviation.
ACS: Acute Coronary Syndrome.

Table 2
The coefficients and 95% CIs of repeated measures of QoL parameters (SF-8) during follow-up by job burnout at baseline.

		Model I		Model II		Model III	
		Coefficients (95% CIs)	*p* value	Coefficients (95% CIs)	p value	Coefficients (95% CIs)	p value
		SF-8 physical health score					
Job burnout	Low	0.00		0.00		0.00	
	High	−5.04(−7.15, −2.92)	<0.001	−4.65(−6.83, −2.47)	<0.001	−4.63(−6.73, −2.54)	<0.001
	Continuous(increase per SD)	−2.86(−3.93, −1.78)	<0.001	−2.68(−3.82, −1.55)	<0.001	−2.58(−3.68, −1.47)	<0.001
		SF-8 mental health score					
Job burnout	Low	0.00		0.00		0.00	
	High	−2.75(−4.75, −0.74)	0.007	−1.99(−4.01, 0.02)	0.053	−2.22(−4.14, −0.31)	0.023
	Continuous(increase per SD)	−1.96(−2.97, −0.95)	<0.001	−1.54(−2.59, −0.51)	0.004	−1.55(−2.55, −0.55)	0.002

SF-8: Medical Outcome Study 8-Items Short Form Health Survey (SF-8), CIs: Coefficient intervals.
Model I: adjustment for age, sex, ACS type (UA, STEMI, NSTEMI), education level (junior middle school, high middle school/technical secondary school, college, junior college, college or higher), number of family members, monthly family income, medical history (hypertension, diabetes, hyperlipemia, stroke, smoking at present, heavy drinker), serum biochemical(glucose, total cholesterol, triglyceride, HDL—C, LDL-C).
Model II: Model I + additional adjustment for anxiety.
Model III: Model I + additional adjustment for depression.
Table 2 showed that ACS patients with higher baseline job burnout had lower physical and mental health scores during follow-up.

[52]. Vital exhaustion has a significantly high negative linear correlation with subjective feeling of QoL [27]. Thus, we consider there is a vicious circle between job burnout and less improvement of QoL, which probably result in poor outcome after ACS in a long run.

The impact of anxiety and depression on QoL of patients with ACS have been widely studied. Higher level of anxiety and depression at baseline was associated with poorer QoL [53]. Previous research suggested that burnout may share a potential overlap with both anxiety [54] and depression [55], however, they are differentially demonstrated as negative emotional reactions under the chronic stress [54,56]. In our study, the patients in high job burnout group displayed higher scores of both anxiety and depression, especially the average score of anxiety in high job burnout group was over 8 points, which indicated that higher job burnout level was likely linked to anxiety and depression. However, after adjustment the potential confounding effects induced by anxiety and depression, job burnout remained robust negative association with physical health score and mental health score in SF-8, as well as PL and TS scores in SAQ. The results highlighted that, at least in this study, the influence of job burnout on QoL trajectories in ACS patients during the 12-month follow-up was independent of anxiety and depression.

Our previous study showed the elderly ACS patients with high burnout/exhaustion level experienced a slow improvement of physical performance during the first-year follow-up after discharge [28]. Similarly, the younger ACS patients with higher burnout also reported a lower PL scores in the current study. One of the possible reasons to explain the lower PL scores was that emotional distress often expressed by patients as some physical symptoms, for instance, dyspnea, fatigue, palpitations, making them confused whether they did not recovery from the ACS yet or even had a disease recurrence [57]. This finding may have clinical implications, as impairment of physical performance in the aftermath of ACS has been associated with poor prognosis. Physical activity capacity is an important predictor related to outcome in ACS patients. The decline in physical functioning was associated with an increased risk of recurrence of disease and of the cardiac adverse events during long-term follow-up [58]. In contrast, exercise-based rehabilitation exercise treatment revealed a long-term reduction in total mortality by 20% and in cardiac mortality by 26% [59]. Compared with elder patients, physical capability rebuilding is more important for the younger who are still employed in the labor market due to the personal economic and social needs. Regarding the relevance of psychosocial work factors to cardiac practice, it has been suggested that clinicians could use a set of screening questions to identify potential occupational risk factors, in addition to normal psychosocial factors such as depression and anxiety, among economically active cardiac patients [60].

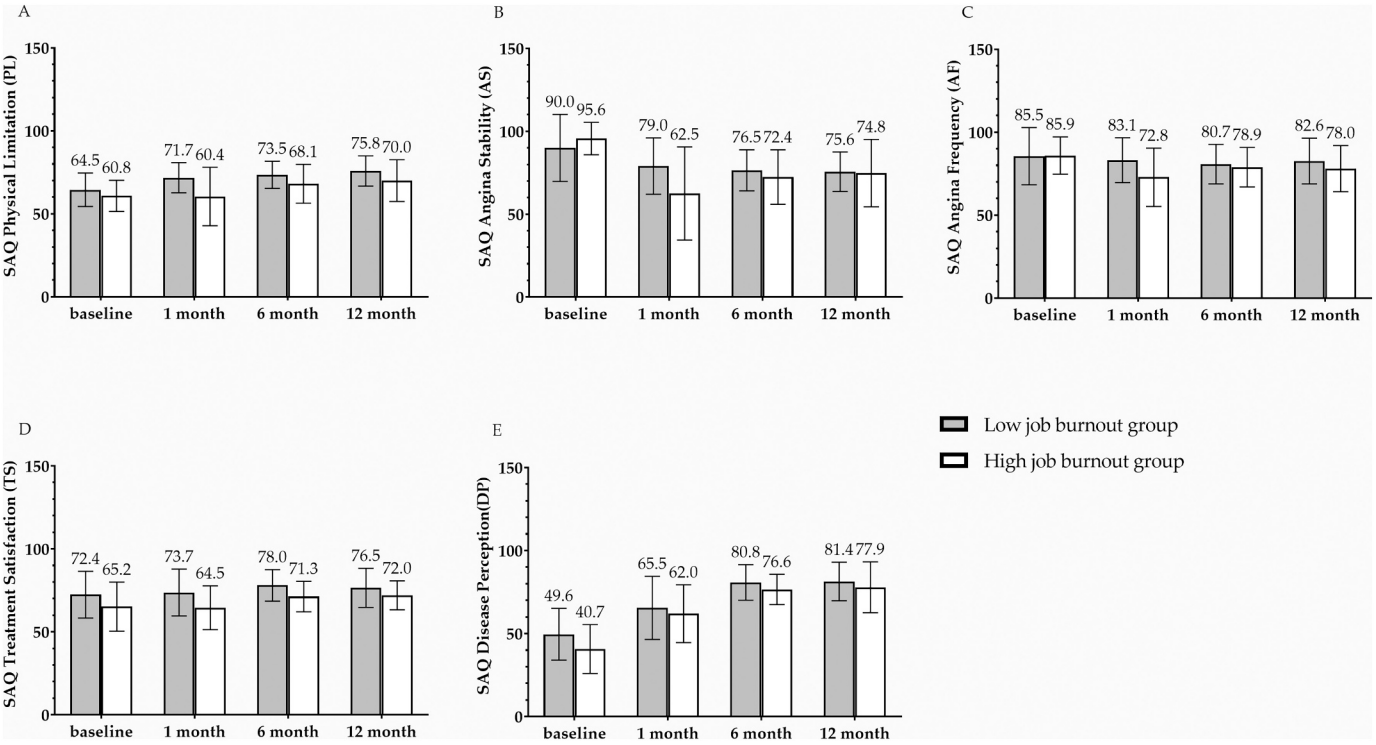

Fig. 3. Changes in the SAQ scores (means ± SD) of patients with ACS over 12-month follow-up: A comparison of the low job burnout group and high job burnout group.
(A) PL, (B) AS, (C) AF, (D) TS and (E) DP.
SAQ: Seattle Angina Questionnaire; PL: physical limitation; AS: angina stability; AF; angina frequency; TS: treatment satisfaction; DP: disease perception.
SD: Standard Deviation.
ACS: Acute Coronary Syndrome.

Table 3
The coefficients and 95% CIs of repeated measures of QoL parameters (SAQ) during follow-up by job burnout at baseline.

		Model I		Model II		Model III	
		Coefficients (95% CIs)	p value	Coefficients (95% CIs)	p value	Coefficients (95% CIs)	p value
		SAQ physical limitation (PL)					
Job burnout	Low	0.00		0.00		0.00	
	High	−7.18(−11.10, −3.27)	<0.001	−7.13(−11.18, −3.08)	0.001	−6.60(−10.50, −2.70)	0.001
	Continuous(increase per SD)	−3.59(−5.61, −1.56)	0.001	−3.61(−5.75, −1.48)	0.001	−3.16(−5.24, −1.08)	0.003
		SAQ angina stability (AS)					
Job burnout	Low	0.00		0.00		0.00	
	High	−6.79(−13.19, −0.38)	0.038	−5.42(−11.97, 1.13)	0.11	−6.33(−12.80, 0.14)	0.06
	Continuous(increase per SD)	−2.24(−5.58, 1.09)	0.19	−1.27(−4.74, 2.20)	0.47	−1.84(−5.29, 1.60)	0.29
		SAQ angina frequency (AF)					
Job burnout	Low	0.00		0.00		0.00	
	High	−3.52(−8.09, 1.04)	0.13	−2.52(−7.18, 2.14)	0.29	−2.54(−6.99, 1.90)	0.26
	Continuous(increase per SD)	−2.33(−4.69, 0.03)	0.053	−1.75(−4.21, 0.71)	0.16	−1.54(−3.90, 0.83)	0.20
		SAQ treatment satisfaction (TS)					
Job burnout	Low	0.00		0.00		0.00	
	High	−8.82(−13.46, −4.18)	<0.001	−8.27(−13.08, −3.46)	0.001	−8.43(−13.11, −3.75)	<0.001
	Continuous(increase per SD)	−4.36(−6.80, −1.93)	<0.001	−4.07(−6.64, −1.49)	0.002	−4.13(−6.64, −1.61)	0.001
		SAQ disease perception (DP)					
Job burnout	Low	0.00		0.00		0.00	
	High	−5.38(−13.55, 2.79)	0.20	−1.23(−10.04, 7.57)	0.78	−5.34(−16.73, 6.04)	0.36
	Continuous(increase per SD)	−0.08(−0.29, 0.12)	0.43	−0.03(−0.23, 0.18)	0.80	−0.01(−0.18, 0.16)	0.89

CIs: Coefficient intervals.
Model I: adjustment for age, sex, ACS type (UA, STEMI, NSTEMI), education level (junior middle school, high middle school/technical secondary school, college, junior college, college or higher), number of family members, monthly family income, medical history (hypertension, diabetes, hyperlipemia, stroke, smoking at present, heavy drinker), serum biochemical(glucose, total cholesterol, triglyceride, HDL—C, LDL-C).
Model II: Model I + additional adjustment for anxiety.
Model III: Model I + additional adjustment for depression.
Table 3 showed that ACS patients with higher baseline job burnout had lower scores of Physical Limitation and lower Treatment Satisfaction during follow-up.

Moreover, in terms of job retention and disease management among employees with CHD, cardiac rehabilitation programs incorporation with return-to-work plans is still poorly developed [61,62]. Collaboration between clinical cardiologists and occupational physicians has called for urgent need [63].

Our study had some limitations. First, the sample size of this study was relatively small and the proportion of female patients was small. Given the inclusion criteria of this study, i.e., patients who were employed at the time that they experienced a first episode of ACS, the characteristics of our study sample seems reasonable. However, this may result in the lack of generalizability to female group. Second, the main independent and dependent variables were assessed using self-administered scales, thus common method variance might bias the associations in this study. Yet, given the longitudinal research design, our findings are supportive to causal interpretation. Third, job characteristics (such as occupational category, length of employment, shift work, job loss or disability retirement) and behavioral modifications after ACS onset were not included in this present study, thus we were not able to rule out potential effects of these factors on QoL. Fourth, job burnout was assessed before discharge, which should refer to burnout experience at work prior to the onset of ACS. However, acute heart events may change participants' perception of job burnout. Finally, we carried out a single-center observational study which enrolled patients who came from one city in China, which limits the generalizability of our findings within and beyond China.

To summarize, in patients from a sample of Chinese employees with a first episode of ACS, high levels of job burnout were associated with low improvement of physical and mental QoL as well as greater physical limitations and poorer treatment satisfaction over an observational period of 12 months. Further research is needed to confirm the findings and their clinical implications.

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Declaration of Competing Interest

The authors have no competing interests to report.

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