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Association between compassion fatigue and depression among emergency medical staff in China: a cross-sectional study

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Abstract

Objectives: Medical staff in emergency departments are at high risk of compassion fatigue and depression. The purpose of this study was to examine the relationship between compassion fatigue and depression among emergency department staff members.

Design: A cross-sectional study.

Setting: This study was conducted in five tertiary hospitals in five different cities across Sichuan province, China, in 2021.

Participants: A total of 342 emergency medical staff participated in the study.

Main outcome measures: Compassion fatigue and depression scores.

Results: Among the 342 emergency medical staff, 100% were found to have depressive symptoms, 27.8% had low compassion satisfaction, 2.3% had high burnout and 3.8% had secondary traumatic stress. In the final multiple linear regression model, marital status ($p=0.008$; 95% confidence interval [CI], -5.205 to -0.789), history of

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4 chronic disease ($p=0.003$; 95% CI, -6.461 to -1.386), compassion satisfaction
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6 ($p<0.001$; 95% CI, 0.593 to 1.274), burnout ($p=0.019$; 95% CI, 0.084 to 0.930) and
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8 secondary traumatic stress ($p<0.001$; 95% CI, -1.527 to -1.053) among the
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10 emergency medical staff were considered to be significant predictors of depression.
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14 **Conclusions:** The prevalence of depression among emergency medical staff is high in
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16 China. Compassion fatigue was significantly and meaningfully associated with
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18 depression among emergency medical staff. Hospital administrations should consider
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20 these findings to prevent depression among Chinese medical staff in emergency
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22 departments.
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27 **Keywords:** compassion fatigue, depression, emergency department
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30 **Strengths and limitations of this study**

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33 •This is a novel study conducted in China, which describes the prevalence of
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35 compassion fatigue and depression and the influencing factors associated with
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37 depression among medical staff in emergency departments.
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40 •The causal association between compassion fatigue and depression could not be
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42 established since this was a cross-sectional study.
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45 •Data on compassion fatigue and depression were collected based on the participants'
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47 self-reports, which may have led to information bias.
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50 **Introduction**

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53 Emergency departments are fast-paced, high-pressure environments in which the
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55 medical staff encounter heavy workloads, violence, interpersonal conflict, high
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57 patient load, mass casualty incidents; moreover, limited resources and poor skill mix
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4 compound the problem.^{1 2} Emergency clinical staff who are at the frontline of a
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6 demanding health care system take significant responsibility for the care of
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8 emergencies, regardless of overstretched and overburdened resources.³ Emergency
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10 medical staff who witness alarming morbidity and mortality on a daily basis, can
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12 experience adverse physical and mental health problems, such as compassion fatigue,
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14 depression and burnout.⁴ It has been reported that compassion fatigue and depression
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16 afflicting emergency medical staff can not only harm individual mental health, but
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18 can also cause a series of fateful consequences, including medical errors, poor-quality
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20 patient care and increased patient mortality during hospital stay.^{5 6}
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28 Compassion fatigue, which is considered as an occupational hazard in healthcare,
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30 is conceptualized as “the natural, consequent behaviors and emotions resulting from
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32 knowing about a traumatizing event experienced by a significant other – the stress
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34 resulting from helping or wanting to help a traumatized or suffering person”.^{7 8}
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36 According to Stamm,²² compassion fatigue is described as the combination of low
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38 compassion, high burnout and secondary traumatic stress. Compassion fatigue can
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40 result in a series of physical, mental and work-related symptoms that seriously affect
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42 quality of patient care and staff-patient relationships.⁹ Chu reported that compassion
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44 fatigue has a significant negative effect on job performance and organisational
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46 citizenship behavior.¹⁰ A study conducted on Chinese dialysis nurses indicated that
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48 compassion fatigue had a significant effect on turnover intention.¹¹ Barnett et al. noted
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50 that compassion fatigue was positively associated with emotional display.¹²
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59 Depression, a common and serious mental illness, is listed by the World Health
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4 Organization (WHO) as one of the most important factors contributing to global
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6 disability and the main contributor to suicide deaths at all ages.¹³ The most common
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8 symptoms associated with depression are persistent sadness, a loss of interest and
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10 energy, insomnia, headache, unexplained pain, gastrointestinal symptoms,
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12 hopelessness and thoughts of self-harm or suicide.¹⁴ Serious depression can lead to
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14 many negative psychosocial outcomes. For example, a recent study on psychiatry
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16 residents in Saudi Arabia showed that there was a significant relationship between
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18 depressive symptoms and burnout.¹⁵ Fisher et al. found that higher levels of
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20 depressive symptoms was significantly associated with higher levels of fatigue and
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22 pain interference.¹⁶ Emergency medical staff are exposed to all kinds of stress every
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24 day.¹⁷ Hence, special attention should be paid to the psychological status of
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26 emergency clinical staff.
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35 Although extensive studies on depression have been conducted, most of the
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37 studies have focused on university students and patients rather than emergency
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39 medical staff.¹⁸⁻²¹ Considering that emergency medical staff have emotionally
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41 demanding tasks and work in high-pressure situations, the aim of this study was to
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43 determine the prevalence of compassion fatigue and depression and explore their
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45 relationship among this highly vulnerable population.
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50 **Methods**

51 **Study design and participants**

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53 A cross-sectional survey was carried out across five different cities of Sichuan
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55 province, China. A convenience sample was used to recruit doctors and registered
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nurses working in the emergency department. The eligibility criteria were as follows: (1) being licensed doctors and registered nurses; (2) with more than one years' work experience; (3) working in emergency department ; (4) consented to participate. The data were collected by five trained research assistants from January to February 2021. A set of questionnaires was distributed to all emergency medical staff by the five tertiary hospitals' administration. All the participants were informed that their participation was voluntary and that their data would be anonymised. A total of 350 emergency medical staff filled in the questionnaires, out of which 342 questionnaires were returned (an effective response rate of 97.7%).

Measurements

The questionnaire comprised three instruments: a demographic survey, the Professional Quality of Life (ProQOLv5) scale and the Center for Epidemiologic Studies Depression (CES-D) scale. Sociodemographic data, including position, age, gender, marital status, education level, professional title, work experience, shifts worked, daily work hours, cigarette use, alcohol use and history of chronic disease, were collected.

Professional quality of life scale

Compassion fatigue levels were assessed using the ProQOLv5. The questionnaire includes 30 items with a Likert scale of 5 points (1=never; 5=always), 10 items for compassion satisfaction, 10 items for burnout and 10 items for secondary traumatic stress.²² The total score range for each subscale is 5–50, with higher scores on burnout and secondary traumatic stress indicating more severe compassion fatigue.

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4 For compassion satisfaction, lower scores represent higher compassion fatigue. The
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6 alpha reliability coefficients for compassion satisfaction, burnout and secondary
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8 traumatic stress were 0.775, 0.775 and 0.807, respectively.
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11 **Depression**

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14 The CES-D is a 20-item questionnaire intended to measure the frequency of
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16 occurrence of symptoms of depression over the past week using a 5-point Likert scale
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18 (each item was scored as follows: 0=rarely or none of the time to 3=most or all of the
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20 time; total score range, 0–60).²³ The CES-D scale has four reverse-scored items (items
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22 4, 8, 12 and 16) and covers four major symptoms of depression, including depressed
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24 affect, somatic symptoms, positive affect and inter-personal relations. Standard
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26 cut-off value ≥ 16 indicates the likely presence of depression. The Cronbach's α in the
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28 current study was 0.916.
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34 **Statistical analysis**

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37 Statistical analysis was conducted using SPSS version 22.0 (SPSS Inc., Chicago,
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39 IL, USA). Continuous variables were summarised as mean with standard deviation
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41 (SD), while categorical variables were presented as frequencies and percentages.
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43 Independent samples t-test, and one-way analysis of variance (ANOVA) were used to
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45 compare participants' depression by demographic characteristics. The association
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47 between compassion fatigue and depression among emergency medical staff was
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49 analysed using Pearson's correlation analysis. A multiple linear regression model was
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51 used to estimate the effect of compassion fatigue and other demographic variables on
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53 depression. A *p* value of less than 0.05 was considered statistically significant
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(two-tailed).

Patient and public involvement

Patients or members of the public were not involved in the design, reporting or dissemination plans of our research.

Results

The participants' baseline characteristics are shown in Table 1. The mean age was 32.59 years (SD, 8.19; age range, 20–58 years). Most participants were female (70.5%), nurses (71.1%), married (68.7.0%), held a bachelor degree (62.9%) and had a primary professional title (57.0%).

The differences in depression scores according to the characteristics of emergency medical staff are also presented in Table 1. There were significant differences in depression scores based on marital status ($p<0.01$), professional title ($p<0.05$), daily work hours ($p<0.05$), alcohol use ($p<0.05$) and history of chronic disease ($p<0.01$).

As depicted in Table 2, compassion satisfaction levels were moderate in approximately 70.8% of the emergency medical staff, low in 27.8% of them and high in 1.4% of them. Of the participants, 2.3% had a high burnout score, 66 (19.3%) had a low burnout score and 3% of the respondents had a high secondary traumatic stress score. The mean scores for depression, compassion satisfaction, burnout and secondary traumatic stress were 37.36 (SD, 10.91), 26.70 (SD, 6.36), 27.74 (SD, 6.19) and 30.19 (SD, 6.59), respectively.

Both compassion satisfaction and burnout were significantly correlated with

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4 three depression metrics: depressed affect, somatic symptoms and inter-personal
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6 relations. Apart from positive affect, there was no relationship between the other
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8 sub-scales of depression and secondary traumatic stress (Table 3).
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12 Depression was computed as outcome variable, and the independent variables
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14 comprised the demographic characteristics and the three dimensions of compassion
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16 fatigue. Table 4 shows that marital status, history of chronic disease, compassion
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18 satisfaction, burnout and secondary traumatic stress collectively accounted for 39.6%
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20 of the variance in depression ($F = 28.952, p < 0.001, R^2 = 0.410, \text{adjusted } R^2 = 0.396$).
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24 25 **Discussion**

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27 The findings of the current study regarding the frequency and distribution of
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29 depression among emergency medical staff show that the following characteristics
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31 were significantly associated with higher levels of depression—marital status:
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33 unmarried; intermediate professional title; consumption of alcohol; daily worktime
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35 between 9 and 12 hours; and a history of chronic disease. Similar to our study, a
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37 statistically significant difference was observed in the levels of depression among
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39 breast cancer patients in Serbia with regard to marital status.²⁴ One reason for this
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41 could be that spousal support is beneficial for maintaining good mental health.²⁵ Our
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43 findings concur with those of Xiao et al. who found that depression levels were
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45 different among different professional titles and that an intermediate title was an
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47 independent influencing factor.²⁶ This could be explained by the fact that compared to
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49 medical staff with an intermediate title, doctors and nurses with a senior title have a
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51 richer work experience, a higher income and a lower family burden.²⁷ The findings of
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4 this study are in accordance with those of two previous studies that reported that
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6 working excessively long hours on a daily basis was significantly associated with the
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8 frequency of depressive symptoms.^{28 29} Emergency medical staff endure a heavy
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10 burden of work imposed on them on a daily basis and most often without a day of
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12 safety rest. Work overload and chronic sleep deprivation can increase the risk for
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14 serious mental illness.³⁰ A study conducted by Luo et al. among 5,294 outpatients in
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16 China noted that drinking alcohol was a risk factor for depressive symptoms; this is in
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18 line with our research.³¹ The possible explanation for this finding is that emergency
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20 medical staff who encounter psychological problems resort to drinking alcohol to
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22 reduce their mental stress and as a means of escape from reality. Thus, consumption
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24 of alcohol and depressive symptoms interact to form a vicious cycle.³² Our results are
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26 also similar to those reported in a study by Ngasa et al. that found that the presence of
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28 a chronic disease was independently associated with depression.³³
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38 Our study found a considerably high prevalence of depressive symptoms among
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40 emergency medical staff, and the prevalence of depressive symptoms reached up to
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42 100%, which is much higher than the incidence of 12.1% reported in caregivers of
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44 children with osteogenesis imperfecta.³⁴ The high level of depression may be
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46 associated with factors, such as excessive workload, overcrowding and resource
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48 shortages in the emergency department.³⁵ Levels of burnout and secondary traumatic
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50 stress were much higher than that reported in previous studies, with emergency
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52 department doctors and nurses in this sample showing significantly lower levels of
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54 compassion satisfaction.^{36 37} Compared to nurse leaders and surgical trainees,
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4 emergency medical staff often take on more work and have higher levels of
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6 psychological stress.³⁸
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9 We found that compassion fatigue had a statistically significant correlation with
10 depression. The current study shows that compassion satisfaction and burnout have a
11 significant positive correlation with depression and secondary traumatic stress has a
12 significant positive correlation with depression and secondary traumatic stress has a
13 significant negative correlation with depression, which is in partial agreement with
14 other recent studies. Jo et al. and Hegney et al. both found an opposite association,
15 that is, compassion satisfaction was negatively associated with depression and
16 secondary traumatic stress was positively correlated with depression.^{39 40} One possible
17 reason for this discrepancy is that the tools for measurement of depression were
18 different.
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33 **Limitations of the current study**

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35 Our study has a few limitations. First, our study sample was drawn from a single
36 Chinese region with predominantly emergency medical staff and adopted the method
37 of convenient sampling, which limits the generalisability of the findings to other
38 professional groups. Second, most of the instruments used in this research were based
39 on the respondents' self-reports, which is prone to information bias. Therefore, more
40 robust methods of assessment and better tools should be used in future studies. Third,
41 the causal association between compassion fatigue and depression is not clear, due to
42 the cross-sectional study nature of our study. Hence, we recommend that future
43 research should examine the interaction between compassion fatigue and depression
44 and evaluate their potential impact rather than focusing on these phenomena
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4 separately. Lastly, compassion fatigue, in our study, merely contributed to (did not
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6 cause) increase in depression. While the findings of our study have the potential to
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8 provide new directions and perspectives for future research, it is crucial to realize that
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10 depression is often multifactorial.
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13 14 **Conclusion**

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17 The prevalence of depression among Chinese emergency medical staff was
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19 shown to be extremely high. Marital status and the presence of a chronic disease
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21 among the staff affected their depression levels. We also examined the relationship
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23 between compassion fatigue and depression among emergency medical staff in China,
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25 and found a significant association between them. Moreover, it was also determined
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27 that independent variables, such as compassion satisfaction, burnout and secondary
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29 traumatic stress strongly predict depression levels among the emergency medical staff.
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31 Consequently, reducing the level of compassion fatigue could be a key factor in
32
33 addressing depression in emergency department doctors and nurses.
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40 **Acknowledgements**

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43 We would like to thank all emergency medical staff who completed
44
45 questionnaires for their unbiased participation; we gratefully acknowledge the
46
47 contributions by the hospital administrators of the five hospitals and thank them for
48
49 their efforts and time.
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51

52 **Contributors**

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55 BW wrote the manuscript and conducted the statistical analysis and
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57 interpretation; HM was responsible for conceptualisation and design of the study; and
58
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4 SQH and YZ were in charge of data acquisition. All authors revised and approved the
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6 final manuscript.
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10
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13

14 **Competing interests**

15
16 None declared.
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18

19 **Patient consent for publication**

20
21 Not required.
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23

24 **Ethics approval**

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26 The study was approved by the Institutional Review Board of of Xiangya
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28 Nursing School, Central South University, China.
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31 **Data availability statement**

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33 Data are available upon reasonable request.
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Table 1. Demographic characteristics of emergency medical staff (N=342).

Variables	N (%)	Depression Mean (SD)
Position		<i>P</i> =0.181
Doctor	99(28.9)	38.60(11.76)
Nurse	243(71.1)	36.86(10.52)
Age (years)		<i>P</i> =0.991
<35	236(69.0)	37.37(10.23)
≥35	106(31.0)	37.35(12.32)
Gender		<i>P</i> =0.162
Male	101(29.5)	38.64(12.22)
Female	241(70.5)	36.83(10.28)
Marital status		<i>P</i> =0.002
Unmarried	107(31.3)	40.01(11.05)
Married	235(68.7)	36.16(10.64)
Education level		<i>P</i> =0.071
Associate degree	102(29.8)	36.16(9.97)
Bachelor degree	215(62.9)	38.33(11.49)
Master degree	25(7.3)	34.00(8.24)
Profession title		<i>P</i> =0.034
Primary	195(57.0)	37.57(10.56)
Intermediate	108(31.6)	38.48(11.51)
Senior	39(11.4)	33.25(10.18)
Work experience (years)		<i>P</i> =0.810
<5	94(27.5)	37.48(10.09)
5-10	95(27.8)	37.88(10.96)
>10	153 (44.7)	36.97(11.39)
Weekly night shifts		<i>P</i> =0.063
0	46(13.5)	33.60(9.35)
1-2	148(43.4)	37.89(11.19)
3-4	106(31.0)	37.46(11.10)
>4	42(12.3)	39.40(10.35)
Daily work hours(h)		<i>P</i> =0.017
<9	161(47.1)	35.60(10.29)
9-12	118(34.5)	39.19(11.13)
>12	163(18.4)	38.44(11.45)
Cigarette use		<i>P</i> =0.244
Yes	38(11.1)	39.31(12.13)
No	304(88.9)	37.12(10.74)
Alcohol use		<i>P</i> =0.019

Yes	50(14.6)	40.70(10.91)
No	292(85.4)	36.79(10.82)
History of chronic disease		$P=0.001$
Yes	58(17.0)	41.79(12.21)
No	284(83.0)	36.46(10.41)

Table 2. Depression and compassion fatigue levels among emergency medical staff (N=342).

Dimensions	N (%)	Mean	SD
Depression		37.36	10.91
Compassion satisfaction		26.70	6.36
Low	95(27.8)	-	-
Medium	242(70.8)	-	-
High	5(1.4)	-	-
Burnout		27.74	6.19
Low	66(19.3)	-	-
Medium	268(78.4)	-	-
High	8(2.3)	-	-
Secondary traumatic stress		30.19	6.59
Low	43(12.6)	-	-
Medium	286(83.6)	-	-
High	13(3.8)	-	-

Table 3. Correlations between dimensions of depression and compassion fatigue (N=342).

	Depression	Depressed Affect	Somatic	Positive Affect	Inter-personal
Compassion satisfaction	0.282**	0.319**	0.317**	0.003	0.311**
Burnout	0.171**	0.214**	0.239**	-0.163**	0.247**
Secondary traumatic stress	-0.178**	-0.092	-0.021	-0.430**	0.001

Note:** $p < 0.01$

Table 4. Multiple linear regression analysis of depression (N=342).

Dependent variables	Independent variables	Unstandardised coefficient		Standardised coefficient	t	P	95% CI	
		B	SE	Beta			Lower bound	Upper bound
Depression	Marital status	-2.997	1.123	-0.128	-2.670	0.008	-5.205	-0.789
	History of chronic disease	-3.924	1.290	-0.135	-3.052	0.003	-6.461	-1.386

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Compassion satisfaction	0.934	0.173	0.545	5.388	<0.001	0.593	1.274
Burnout	0.507	0.215	0.288	2.359	0.019	0.084	0.930
Secondary traumatic stress	-1.290	0.120	-0.779	-10.707	<0.001	-1.527	-1.053

For peer review only

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Part 1 identifies basic requirements for the manuscript submission (mandatory for all submissions)

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Part 3 is a self assessment checklist that is designed to help to ensure that your research or review manuscript meets basic standards and the journal's Guide for Authors. (optional only)

PART 1 Basic requirements	Author response or further detail	Tick
Word count	3962	
Was ethical approval given and by whom? (give any reference number)	the Institutional Review Board of Xiangya Nursing School, Central South University (Approval number E202062)	
Please state any conflicts of interest	None	
Please state sources of funding and the role of funders in the conduct of the research	None	
Please state any study registry number (e.g. ISRCTN)	Not applicable	
Title	The title is in the format 'Topic / question: design/type of paper' and identifies the population / care setting studied. (e.g. <i>The effectiveness of telephone support for adolescents with insulin dependant diabetes: controlled before and after study: the structure is optional for discussion papers, editorials and commentaries</i>)	Page1
Abstract	A structured abstract appropriate to the design (see <i>guidelines for authors</i>). Reports of controlled trials should follow the CONSORT format (does not apply to editorials or commentaries, Abstracts for discussion papers need not be structured)	Page1
Key words	Between four and ten key words have been provided in alphabetical order, which accurately identify the paper's subject, purpose, method and focus. Use the Medical Subject Headings (MeSH®) thesaurus or Cumulative Index to Nursing and Allied Health (CINAHL) headings where possible (see http://www.nlm.nih.gov/mesh/meshhome.html).	Page2
Highlights	Bullet points have been included that identify existing research knowledge relating to the specific research question / topic (what is already known) and a summary of the new knowledge added by this study (what the paper adds) (see <i>Guide for Authors</i> , does not apply to editorials or commentaries)	Page2
References	Citations accord to the journal's format (Author, date) and reference list includes full details of all cited references in the proper format and alphabetical order (see <i>Guide for Authors</i>)	Page12-17
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	The study is referred to by a distinctive name which will be used in any future publications to identify that it as the same study.	
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Authorship	All authors and contributors sufficiently acknowledged as per Guide for Authors.	Page11

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Randomised (and quasi-randomised) controlled trial	CONSORT – Consolidated Standards of Reporting Trials http://www.equator-network.org/index.aspx?o=1032		
Study of Diagnostic accuracy / assessment scale	STARD Standards for the Reporting of Diagnostic Accuracy studies http://www.equator-network.org/index.aspx?o=1032		
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	<i>Qualitative researchers might wish to consult the guideline listed below</i>		
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Section	Descriptor	TICK
a) Primary research only		
Background	A statement of the problem / phenomena of interest, a brief summary of existing research which addresses the topic and an explanation of the purpose of the current study / review in relation to this.	Page2
METHODS	Clear statement of the aims, objectives (hypothesis) and research design	Page4
Settings	The settings and locations where the study took place	Page4
Inclusion Criteria	Eligibility criteria for participants – inclusion and exclusion criteria	Page5
Sampling	Method of sampling and if relevant allocation to groups (e.g. convenience, random) and <i>description</i> of sampling, recruitment and allocation procedures .	Page4
Sample size	How sample size was determined.	Page5
Outcomes and data collection procedures	Clearly defined primary and secondary outcome measures (when applicable), Setting and methods of data collection and methods used to enhance the quality of data collection (e.g., multiple observations, training of assessors).	Page5
Analysis Methods	Statistical methods used / approaches to qualitative analysis including procedures to ensure accuracy / validity / truthfulness of accounts.	Page6
Ethical review*	Details of ethical scrutiny / approvals obtained.	Page12
RESULTS Participant flow	Flow of participants through each stage of selection, allocation, follow up / inclusion in analysis (a diagram is strongly recommended). Describe protocol deviations from study as planned, together with reasons.	N/A
Recruitment	Dates defining the periods of recruitment and follow-up.	N/A
Baseline data	Baseline demographic and clinical characteristics of each group.	N/A
Results	Point estimates, exact p-values and confidence intervals for quantitative studies. Qualitative analyses are supported by appropriate quotations which support the derived themes / categories and which are anonymously attributed to participants (using pseudonyms, numbers or equivalent)	Page6
DISCUSSION	Brief recapitulation / summary of the results taking into account study hypotheses / aims	Page8
Interpretation	Interpretation of the results, taking into account study limitations	Page10
Overall evidence	Assessment of the current state of knowledge in the context of study results and other evidence.	Page10
Implications	Consideration of the implications of the current state of knowledge for further research and or practice	Page11

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Compassion fatigue, burnout, compassion satisfaction and depression among emergency department physicians and nurses: a cross-sectional study

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Abstract

Objectives: Emergency department physicians and nurses are at high risk of compassion fatigue, burnout and depression. The purpose of this study was to examine the interrelationship between compassion fatigue, burnout, compassion satisfaction and depression in emergency department physicians and nurses.

Design: A cross-sectional study.

Setting: This study was conducted in five tertiary hospitals in five different cities across the province of Sichuan, China, in 2021.

Participants: A total of 342 emergency department physicians and nurses participated in the study.

Main outcome measures: Compassion fatigue, burnout, compassion satisfaction and depression scores.

Results: Among the study participants, 100% were found to have depressive

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4 symptoms, 27.8% had low compassion satisfaction, 2.3% had high burnout and 3.8%
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6 had compassion fatigue. In the final multiple linear regression model, marital status
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8 ($p=0.008$; 95% confidence interval [CI], -5.205 to -0.789), history of chronic disease
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10 ($p=0.003$; 95% CI, -6.461 to -1.386), compassion satisfaction ($p<0.001$; 95% CI,
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12 0.593 to 1.274), burnout ($p=0.019$; 95% CI, 0.084 to 0.930) and compassion fatigue
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14 ($p<0.001$; 95% CI, -1.527 to -1.053) among emergency department physicians and
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16 nurses were considered to be significant predictors of depression.
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22 **Conclusions:** The prevalence of depression among emergency department physicians
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24 and nurses is high in the province of Sichuan, China. Compassion fatigue, burnout
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26 and compassion satisfaction were significantly associated with depression in
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28 emergency department physicians and nurses. Hospital administrations should
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30 consider these findings to develop appropriate psychological interventions and
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32 strategies, to prevent, alleviate or treat severe depression among emergency
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34 department physicians and nurses in the province of Sichuan.
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40 **Keywords:** Compassion fatigue, burnout, compassion satisfaction, depression,
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42 emergency department
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45 **Strengths and limitations of this study**

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48 •This is a novel study conducted in the province of Sichuan, China, which describes
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50 the prevalence of compassion fatigue, burnout, compassion satisfaction and
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52 depression and the influencing factors associated with depression among emergency
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54 department physicians and nurses.
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58 •The causal association between compassion fatigue, burnout, compassion satisfaction
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4 and depression could not be established since this was a cross-sectional study.
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6 •Data on compassion fatigue, burnout, compassion satisfaction and depression were
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8 collected based on the participants' self-reports, which may have led to information
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10 bias.
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13 14 **Introduction**

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16 Emergency departments are fast-paced, high-pressure environments in which the
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18 medical staff encounter heavy workloads, violence, interpersonal conflict, high
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20 patient load, mass casualty incidents; moreover, limited resources and poor skill mix
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22 compound the problem.^{1 2} Emergency department physicians and nurses who are at
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24 the frontline of a demanding health care system take significant responsibility for the
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26 care of emergency patients, regardless of overstretched and overburdened resources.³
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28 Emergency physicians and nurses who witness alarming morbidity and mortality on a
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30 daily basis, can experience adverse physical and mental health problems, such as
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32 compassion fatigue, depression and burnout.⁴ It has been reported that compassion
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34 fatigue, burnout and depression afflicting emergency physicians and nurses can not
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36 only harm individual mental health, but can also cause a series of fateful
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38 consequences, including medical errors, poor-quality patient care and increased
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40 patient mortality during hospital stay.⁵⁻⁷
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51 Compassion fatigue, which is considered as an occupational hazard in healthcare,
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53 is conceptualized as “the natural, consequent behaviors and emotions resulting from
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55 knowing about a traumatizing event experienced by a significant other – the stress
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57 resulting from helping or wanting to help a traumatized or suffering person”.^{8 9}
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4 Compassion fatigue can result in a series of physical, mental and work-related
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6 symptoms that seriously affect quality of patient care and staff-patient relationships.¹⁰
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9 Chu reported that compassion fatigue has a significant adverse effect on job
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11 performance and organizational citizenship behavior.¹¹ A study conducted in the U.S.
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13 indicated that about 80% of emergency nurses had moderate to high levels of
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15 compassion fatigue.¹² Barnett et al. noted that compassion fatigue was positively
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17 associated with emotional display.¹³ Burnout is a work-related syndrome and
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19 predominantly defined as “high emotional exhaustion, depersonalization and a low
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21 level of personal accomplishment”.¹⁴ The prevalence of burnout among emergency
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23 medical staff was very high and burnout can cause serious consequences.¹⁵⁻¹⁷
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25 Moukarzel et al. noted that 34.6% emergency medical staff had severe burnout and
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27 Soltanifar et al. found that 84.5% emergency physicians had experienced high
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29 emotional exhaustion.^{15 18} Jyothindran’s findings indicated that severe burnout was
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31 highly correlated with medical error and turnover.¹⁹ Compassion satisfaction is
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33 defined as the emotions generated and the sense of achievement derived from helping
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35 and caring for patients, whether related to direct assistance or support in improvement
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37 of patients’ condition.²⁰

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48 Depression, a common and serious mental illness, is listed by the World Health
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50 Organization (WHO) as one of the most important factors contributing to global
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52 disability and the main contributor to suicide deaths at all ages.²¹ The most common
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54 symptoms associated with depression are persistent sadness, a loss of interest and
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56 energy, insomnia, headache, unexplained pain, gastrointestinal symptoms,
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4 hopelessness and thoughts of self-harm or suicide.²² Severe depression can lead to
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6 many negative outcomes. For example, a recent study on emergency department
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8 nurses during the COVID-19 pandemic in China showed that depression had an
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10 adverse effect on quality of patient care and nurses' quality of life.²³ Vasconcelos et al.
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12 found that depressive symptoms were significantly associated with burnout.²⁴
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17 Emergency medical staff are exposed to all kinds of stress every day.²⁵ Hence, special
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19 attention should be paid to the psychological status of emergency physicians and
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Although extensive studies on depression have been conducted, most of the
studies have only focused on nurses.^{23 24} Moreover, few studies have been carried out
to explore the factors that influence the development of depression in emergency
physicians and nurses.^{5 25} Considering that emergency physicians and nurses have
emotionally demanding tasks and work in high-pressure situations, the aim of this
study was to determine the prevalence of compassion fatigue, burnout, compassion
satisfaction and depression and explore the interrelationship of these among this
highly vulnerable population.

Methods

Study design and participants

A cross-sectional survey was conducted among emergency physicians and nurses
across five different cities of Sichuan province, China. A convenience sample was
used to recruit physicians and registered nurses working in the emergency department.

The eligibility criteria were as follows: (1) being licensed physicians and registered

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4 nurses; (2) with more than one year's work experience; (3) working in emergency
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6 department; (4) provided consent to participate. The data were collected by five
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8 trained research assistants from January to February 2021. A set of questionnaires was
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10 distributed to all emergency medical staff by the five tertiary hospitals' administration.
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12 All the participants were informed that their participation was voluntary and that their
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14 data would be anonymised. A total of 350 emergency physicians and nurses filled in
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16 the questionnaires, out of which 342 questionnaires were returned (an effective
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18 response rate of 97.7%).
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24 25 **Measurements**

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27 The questionnaire comprised three instruments: a demographic survey, the
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29 Professional Quality of Life (ProQOLv5) scale and the Center for Epidemiologic
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31 Studies Depression (CES-D) scale. Sociodemographic data were collected with a
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33 self-designed questionnaire, including position (physician, nurse), age (less than 35
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35 years, 35 years or older), gender (male, female), marital status (married, unmarried),
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37 education level (diploma, associate degree, bachelor's degree, master's degree or
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39 higher), professional title (primary, intermediate, senior), work experience (less than 5
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41 years, 5–10 years, over 10 years), weekly night shifts (none, 1–2, 3–4, more than 4),
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43 daily work hours (less than 9 h, 9–12 h, over 12 h), cigarette use (yes, no), alcohol use
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45 (yes, no) and history of chronic disease (yes, no).
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52 53 **Professional quality of life scale**

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55 Compassion fatigue, burnout and compassion satisfaction levels were assessed using
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57 the ProQOLv5. The questionnaire includes 30 items with a Likert scale of 5 points
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4 (1=never; 5=always), 10 items for compassion satisfaction, 10 items for burnout and
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6 10 items for compassion fatigue.²⁰ The level of compassion satisfaction was divided
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8 into less than 22 (low), 23–41 (middle) and more than 42 (high). For compassion
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10 fatigue and burnout, a score of 22 or less represents low levels, 23–41 represents
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12 middle levels, and a score of more than 42 high levels. The alpha reliability
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14 coefficients for compassion satisfaction, burnout and compassion fatigue were 0.775,
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16 0.775 and 0.807, respectively.
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22 **Depression**

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24 The CES-D is a 20-item questionnaire intended to measure the frequency of
25
26 occurrence of symptoms of depression over the past week using a 5-point Likert scale
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28 (each item was scored as follows: 0=rarely or none of the time to 3=most or all of the
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30 time; total score range, 0–60).²⁶ The CES-D scale has four reverse-scored items (items
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32 4, 8, 12 and 16) and covers four major symptoms of depression, including (1)
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34 depressed affect (e.g. sadness, crying); (2) absence of positive affect (e.g. hope,
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36 enjoyment); (3) somatic symptoms (e.g., appetite problems, problems “getting
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38 going”); and (4) interpersonal relations (e.g. perceiving others as unfriendly).
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40 Standard cut-off value ≥ 16 indicates the likely presence of depression. The
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42 Cronbach’s α in the current study was 0.916.
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50 **Statistical analysis**

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52 Statistical analysis was conducted using SPSS version 22.0 (SPSS Inc., Chicago, IL,
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54 USA). Continuous variables were summarized as mean with standard deviation (SD),
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56 while categorical variables were presented as frequencies and percentages.
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4 Independent samples t-test, and one-way analysis of variance (ANOVA) were used to
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6 compare participants' depression by demographic characteristics. Associations
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8 between compassion satisfaction, burnout, compassion fatigue and depression among
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10 emergency physicians and nurses were analysed using Pearson's correlation analysis.
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12 A multiple linear regression model was used to estimate the effect of compassion
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14 satisfaction, burnout, compassion fatigue and other demographic variables on
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16 depression. A *p* value of less than 0.05 was considered statistically significant
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18 (two-tailed).
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24 **Patient and public involvement**

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26 Patients or members of the public were not involved in the design, reporting or
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28 dissemination plans of our research.
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33 **Results**

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35 The participants' baseline characteristics are shown in Table 1. The mean age was
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37 32.59 years (SD, 8.19; age range, 20–58 years). Most participants were female
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39 (70.5%), nurses (71.1%), married (68.7.0%), held a bachelor degree (62.9%) and had
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41 a primary professional title (57.0%).
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47 The differences in depression scores according to the characteristics of
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49 emergency physicians and nurses are also presented in Table 1. There were significant
50
51 differences in depression scores based on marital status ($p<0.01$), professional title
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53 ($p<0.05$), daily work hours ($p<0.05$), alcohol use ($p<0.05$) and history of chronic
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55 disease ($p<0.01$).
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59 **Table 1. Demographic characteristics of emergency department physicians and**

nurses (N=342).

Variables	N (%)	Depression Mean (SD)
Position		<i>P</i> =0.181
Physician	99 (28.9)	38.60 (11.76)
Nurse	243 (71.1)	36.86 (10.52)
Age (years)		<i>P</i> =0.991
<35	236 (69.0)	37.37 (10.23)
≥35	106 (31.0)	37.35 (12.32)
Gender		<i>P</i> =0.162
Male	101 (29.5)	38.64 (12.22)
Female	241 (70.5)	36.83 (10.28)
Marital status		<i>P</i> =0.002
Unmarried	107 (31.3)	40.01(11.05)
Married	235 (68.7)	36.16(10.64)
Education level		<i>P</i> =0.071
Associate degree	102 (29.8)	36.16 (9.97)
Bachelor degree	215 (62.9)	38.33 (11.49)
Master degree	25 (7.3)	34.00 (8.24)
Profession title		<i>P</i> =0.034
Primary	195 (57.0)	37.57 (10.56)
Intermediate	108 (31.6)	38.48 (11.51)
Senior	39 (11.4)	33.25 (10.18)
Work experience (years)		<i>P</i> =0.810
<5	94 (27.5)	37.48 (10.09)
5-10	95 (27.8)	37.88 (10.96)
>10	153 (44.7)	36.97 (11.39)
Weekly night shifts		<i>P</i> =0.063
0	46 (13.5)	33.60 (9.35)
1-2	148 (43.4)	37.89 (11.19)
3-4	106 (31.0)	37.46 (11.10)
>4	42 (12.3)	39.40 (10.35)
Daily work hours(h)		<i>P</i> =0.017
<9	161 (47.1)	35.60 (10.29)
9-12	118 (34.5)	39.19 (11.13)
>12	163 (48.4)	38.44 (11.45)
Cigarette use		<i>P</i> =0.244
Yes	38 (11.1)	39.31 (12.13)
No	304 (88.9)	37.12 (10.74)
Alcohol use		<i>P</i> =0.019
Yes	50 (14.6)	40.70 (10.91)
No	292 (85.4)	36.79 (10.82)
History of chronic disease		<i>P</i> =0.001
Yes	58 (17.0)	41.79 (12.21)

No	284 (83.0)	36.46 (10.41)
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As depicted in Table 2, compassion satisfaction levels were moderate in approximately 70.8% of emergency physicians and nurses, low in 27.8% of them and high in 1.4%. Of the participants, 2.3% had a high burnout score, 66 (19.3%) had a low burnout score and 3% of the respondents had a high compassion fatigue score. The mean scores for depression, compassion satisfaction, burnout and compassion fatigue were 37.36 (SD, 10.91), 26.70 (SD, 6.36), 27.74 (SD, 6.19) and 30.19 (SD, 6.59), respectively.

Table 2. Compassion satisfaction, burnout, compassion fatigue and depression levels among emergency physicians and nurses (N=342).

Dimensions	N (%)	Mean	SD
Depression		37.36	10.91
Compassion satisfaction		26.70	6.36
Low	95 (27.8)	-	-
Medium	242 (70.8)	-	-
High	5 (1.4)	-	-
Burnout		27.74	6.19
Low	66 (19.3)	-	-
Medium	268 (78.4)	-	-
High	8 (2.3)	-	-
Compassion fatigue		30.19	6.59
Low	43 (12.6)	-	-
Medium	286 (83.6)	-	-
High	13 (3.8)	-	-

Both compassion satisfaction and burnout were significantly correlated with three depression metrics: depressed affect, somatic symptoms and inter-personal relations. Apart from positive affect, there was no relationship between the other sub-scales of depression and compassion fatigue (Table 3).

Table 3. Correlation between dimensions of compassion satisfaction, burnout, compassion fatigue and depression (N=342).

	Depression	Depressed Affect	Somatic	Positive Affect	Inter-personal
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Compassion satisfaction	0.282**	0.319**	0.317**	0.003	0.311**
Burnout	0.171**	0.214**	0.239**	-0.163**	0.247**
Compassion fatigue	-0.178**	-0.092	-0.021	-0.430**	0.001

Note:** $p < 0.01$

Depression was computed as outcome variable, and the independent variables comprised the demographic characteristics and the three dimensions of compassion fatigue. Table 4 shows that marital status, history of chronic disease, compassion satisfaction, burnout and compassion fatigue collectively accounted for 39.6% of the variance in depression ($F = 28.952$, $p < 0.001$, $R^2 = 0.410$, adjusted $R^2 = 0.396$).

Table 4. Multiple linear regression analysis of depression (N=342).

Dependent variables	Independent variables	Unstandardised coefficient		Standardised coefficient	<i>t</i>	<i>P</i>	95% CI	
		B	SE	Beta			Lower bound	Upper bound
Depression	Marital status	-2.997	1.123	-0.128	-2.670	0.008	-5.205	-0.789
	History of chronic disease	-3.924	1.290	-0.135	-3.052	0.003	-6.461	-1.386
	Compassion satisfaction	0.934	0.173	0.545	5.388	<0.001	0.593	1.274
	Burnout	0.507	0.215	0.288	2.359	0.019	0.084	0.930
	Compassion fatigue	-1.290	0.120	-0.779	-10.707	<0.001	-1.527	-1.053

Discussion

The findings of the current study regarding the frequency and distribution of depression among emergency physicians and nurses show that the following characteristics were significantly associated with higher levels of depression—marital status: unmarried; intermediate professional title; consumption of alcohol; daily

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4 worktime between 9 and 12 h; and a history of chronic disease. Similar to our study, a
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6 statistically significant difference was observed in the levels of depression among
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9 frontline doctors combating the COVID-19 pandemic in India with regard to marital
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11 status.²⁷ One reason for this could be that spousal support is beneficial for maintaining
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13 good mental health.²⁸ Our findings concur with those of Xiao et al. who found that
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15 depression levels were different among different professional titles and that an
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17 intermediate title was an independent influencing factor.²⁹ This could be explained by
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19 the fact that compared to medical staff with an intermediate title, physicians and
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21 nurses with a senior title have a richer work experience, a higher income and a lower
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23 family burden.³⁰ The findings of this study are in accordance with those of two
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25 previous studies that reported that working excessively long hours on a daily basis
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27 was significantly associated with the frequency of depressive symptoms.^{31 32}
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30 Emergency physicians and nurses endure a heavy burden of work imposed on them
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32 on a daily basis and most often without a day of safety rest. Work overload and
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34 chronic sleep deprivation can increase the risk for depression.³³ A study conducted by
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36 Sørensen et al. among 1,943 Danish physicians noted that the emergency department
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38 had the highest proportion of risky alcohol use.³⁴ Besides, the study of Silva et al.
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40 reported that the prevalence of depressive symptoms among emergency nurses in
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42 Brazil is 95.24%.³⁵ Emergency physicians and nurses who had severe depressive
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44 symptoms were more likely to be drinking alcohol to regulate these emotional
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46 states.³⁶ Our results are also similar to those reported in a study by Ngasa et al. that
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48 found that the presence of a chronic disease was independently associated with
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4 depression.³⁷
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8 Our study found a considerably high prevalence of depressive symptoms among
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10 emergency physicians and nurses, and the prevalence of depressive symptoms
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12 reached up to 100%, which is much higher than the previous study.³⁸ The high level of
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14 depression may be associated with factors, such as excessive workload, overcrowding
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16 and resource shortages in the emergency department.^{39 40} The COVID-19 pandemic
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18 has added to the heavy workload and the life-threatening emergencies that medical
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20 staff, especially physicians and nurses, were facing, thereby aggravating the
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22 psychological pressure; this is one of the neglected important reasons causing the high
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24 levels of depression.⁴¹ The prevalence rates of burnout, compassion satisfaction and
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26 compassion fatigue in our study were much lower than those in nurses in a study
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28 conducted in an adult emergency and urgent care department.⁸ However, these
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30 differences may be due to the small sample size (87 nurses), which consisted of
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32 emergency nurses only in the Portuguese study. However, in this study, the results
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34 indicated an average to high level of compassion fatigue and burnout among
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36 emergency nurses, which was much higher than that of a previous study.⁴²
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48 We found that compassion satisfaction, burnout and compassion fatigue had a
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50 statistically significant correlation with depression. The current study shows that
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52 compassion satisfaction has a significant positive correlation with depression and
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54 compassion fatigue has a significant negative correlation with depression, which is
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56 not consistent with other recent studies. Jo et al. and Hegney et al. both found an
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4 opposite association, that is, compassion satisfaction was negatively associated with
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6 depression and compassion fatigue was positively correlated with depression.^{43 44} The
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8 reason for this may include differences in measurement tools. Interestingly, an
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10 association analysis showed that burnout was significantly related to depression, a
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12 finding similar to that of a survey of emergency physicians.⁴⁵
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17 **Limitations of the current study**

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19 Our study has a few limitations. First, our study sample was drawn from a single
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21 Chinese region with predominantly emergency physicians and nurses and adopted the
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23 method of convenient sampling, which may have caused the uncommonly high scores
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25 of depression and limits the generalisability of the findings to other professional
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27 groups. Second, most of the instruments used in this research were based on the
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29 respondents' self-reports, which is prone to information bias. Therefore, more robust
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31 methods of assessment and better tools should be used in future studies. Third, the
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33 causal association between compassion satisfaction, burnout, compassion fatigue and
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35 depression is not clear, due to the cross-sectional study nature of our study. Hence, we
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37 recommend that future research should examine the interaction between compassion
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39 fatigue, burnout, compassion satisfaction and depression and evaluate their potential
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41 impact rather than focusing on these phenomena separately. Lastly, compassion
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43 fatigue, in our study, merely contributed to (did not cause) increase in depression.
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52 **Conclusion**

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54 The prevalence of depression among emergency physicians and nurses in the province
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56 of Sichuan was shown to be extremely high. Marital status and the presence of a
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4 chronic disease among the staff affected their depression levels. We also examined
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6 the relationship between compassion satisfaction, burnout, compassion fatigue and
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8 depression among emergency physicians and nurses in Sichuan province and found a
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10 significant association between these. Moreover, it was also determined that
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12 independent variables, such as compassion satisfaction, burnout and compassion
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14 fatigue strongly predict depression levels among emergency physicians and nurses.
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16 Consequently, reducing the level of burnout and compassion fatigue and increasing
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18 compassion satisfaction could be a key factor in addressing depression in emergency
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20 department physicians and nurses. The findings of our study have the potential to
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22 provide new directions and perspectives for future research. However, further studies
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24 are needed to derive more specific details through in-depth interviews with physicians
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26 and nurses to more accurately evaluate the prevalence of depression among
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28 emergency physicians and nurses.
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38
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40
41 completed questionnaires for their unbiased participation; we gratefully acknowledge
42
43 the contributions by the hospital administrators of the five hospitals and thank them
44
45 for their efforts and time.
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50 **Contributors**

51
52 HM wrote the manuscript and conducted the statistical analysis and interpretation;
53
54 BW was in charge of the study concept and design; and SQH and YZ were in charge
55
56 of data acquisition. All authors revised and approved the final manuscript.
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Competing interests

None declared.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Institutional Review Board of Xiangya Nursing School (Approval number E202062), Central South University, China.

Data availability statement

Data are available upon reasonable request.

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Word count	3962	
Was ethical approval given and by whom? (give any reference number)	the Institutional Review Board of Xiangya Nursing School, Central South University (Approval number E202062)	
Please state any conflicts of interest	None	
Please state sources of funding and the role of funders in the conduct of the research	None	
Please state any study registry number (e.g. ISRCTN)	Not applicable	
Title	The title is in the format 'Topic / question: design/type of paper' and identifies the population / care setting studied. (e.g. <i>The effectiveness of telephone support for adolescents with insulin dependant diabetes: controlled before and after study: the structure is optional for discussion papers, editorials and commentaries</i>)	Page1
Abstract	A structured abstract appropriate to the design (see <i>guidelines for authors</i>). Reports of controlled trials should follow the CONSORT format (does not apply to editorials or commentaries, Abstracts for discussion papers need not be structured)	Page1
Key words	Between four and ten key words have been provided in alphabetical order, which accurately identify the paper's subject, purpose, method and focus. Use the Medical Subject Headings (MeSH®) thesaurus or Cumulative Index to Nursing and Allied Health (CINAHL) headings where possible (see http://www.nlm.nih.gov/mesh/meshhome.html).	Page2
Highlights	Bullet points have been included that identify existing research knowledge relating to the specific research question / topic (what is already known) and a summary of the new knowledge added by this study (what the paper adds) (see <i>Guide for Authors</i> , does not apply to editorials or commentaries)	Page2
References	Citations accord to the journal's format (Author, date) and reference list includes full details of all cited references in the proper format and alphabetical order (see <i>Guide for Authors</i>)	Page12-17
Other Published accounts	All published and in press accounts of the study from which data in this paper originate are referred to in the paper and the relationship between this and other publications from the same study is made clear (see <i>Guide for Authors</i>)	
	The study is referred to by a distinctive name which will be used in any future publications to identify that it as the same study.	
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Authorship	All authors and contributors sufficiently acknowledged as per Guide for Authors.	Page11

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Randomised (and quasi-randomised) controlled trial	CONSORT – Consolidated Standards of Reporting Trials http://www.equator-network.org/index.aspx?o=1032		
Study of Diagnostic accuracy / assessment scale	STARD Standards for the Reporting of Diagnostic Accuracy studies http://www.equator-network.org/index.aspx?o=1032		
Systematic Review of Controlled Trials	PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses http://www.equator-network.org/index.aspx?o=1032		
Systematic Review of Observational Studies	MOOSE Meta-analysis of Observational Studies in Epidemiology http://www.equator-network.org/index.aspx?o=1032		
	<i>Qualitative researchers might wish to consult the guideline listed below</i>		
Qualitative studies	COREQ: Consolidated criteria for reporting qualitative research Tong, A., Sainsbury, P., Craig, J., 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. <i>International Journal for Quality in Health Care</i> 19 (6), 349-357. (http://dx.doi.org/10.1093/intqhc/mzm042)		
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Section	Descriptor	TICK
a) Primary research only		
Background	A statement of the problem / phenomena of interest, a brief summary of existing research which addresses the topic and an explanation of the purpose of the current study / review in relation to this.	Page2
METHODS	Clear statement of the aims, objectives (hypothesis) and research design	Page4
Settings	The settings and locations where the study took place	Page4
Inclusion Criteria	Eligibility criteria for participants – inclusion and exclusion criteria	Page5
Sampling	Method of sampling and if relevant allocation to groups (e.g. convenience, random) and <i>description</i> of sampling, recruitment and allocation procedures .	Page4
Sample size	How sample size was determined.	Page5
Outcomes and data collection procedures	Clearly defined primary and secondary outcome measures (when applicable), Setting and methods of data collection and methods used to enhance the quality of data collection (e.g., multiple observations, training of assessors).	Page5
Analysis Methods	Statistical methods used / approaches to qualitative analysis including procedures to ensure accuracy / validity / truthfulness of accounts.	Page6
Ethical review*	Details of ethical scrutiny / approvals obtained.	Page12
RESULTS Participant flow	Flow of participants through each stage of selection, allocation, follow up / inclusion in analysis (a diagram is strongly recommended). Describe protocol deviations from study as planned, together with reasons.	N/A
Recruitment	Dates defining the periods of recruitment and follow-up.	N/A
Baseline data	Baseline demographic and clinical characteristics of each group.	N/A
Results	Point estimates, exact p-values and confidence intervals for quantitative studies. Qualitative analyses are supported by appropriate quotations which support the derived themes / categories and which are anonymously attributed to participants (using pseudonyms, numbers or equivalent)	Page6
DISCUSSION	Brief recapitulation / summary of the results taking into account study hypotheses / aims	Page8
Interpretation	Interpretation of the results, taking into account study limitations	Page10
Overall evidence	Assessment of the current state of knowledge in the context of study results and other evidence.	Page10
Implications	Consideration of the implications of the current state of knowledge for further research and or practice	Page11

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Compassion fatigue, burnout, compassion satisfaction and depression among emergency department physicians and nurses: a cross-sectional study

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Compassion fatigue, burnout, compassion satisfaction and depression among emergency department physicians and nurses: a cross-sectional study

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Abstract

Objectives: Emergency department physicians and nurses are at high risk of compassion fatigue, burnout and depression. The purpose of this study was to examine the interrelationship between compassion fatigue, burnout, compassion satisfaction and depression in emergency department physicians and nurses.

Design: A cross-sectional study.

Setting: This study was conducted in five tertiary hospitals in five different cities across the province of Sichuan, China, in 2021.

Participants: A total of 342 emergency department physicians and nurses participated in the study.

Main outcome measures: Compassion fatigue, burnout, compassion satisfaction and depression scores.

Results: Among the study participants, 100% were found to have depressive

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4 symptoms, 27.8% had low compassion satisfaction, 2.3% had high burnout and 3.8%
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6 had compassion fatigue. In the final multiple linear regression model, marital status
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8 ($p=0.008$; 95% confidence interval [CI], -5.205 to -0.789), history of chronic disease
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10 ($p=0.003$; 95% CI, -6.461 to -1.386), compassion satisfaction ($p<0.001$; 95% CI,
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12 0.593 to 1.274), burnout ($p=0.019$; 95% CI, 0.084 to 0.930) and compassion fatigue
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14 ($p<0.001$; 95% CI, -1.527 to -1.053) among emergency department physicians and
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16 nurses were considered to be significant predictors of depression.
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22 **Conclusions:** The prevalence of depression among emergency department physicians
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24 and nurses is high in the province of Sichuan, China. Compassion fatigue, burnout
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26 and compassion satisfaction were significantly associated with depression in
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28 emergency department physicians and nurses. Hospital administrations should
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30 consider these findings to develop appropriate psychological interventions and
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32 strategies, to prevent, alleviate or treat severe depression among emergency
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34 department physicians and nurses in the province of Sichuan.
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40 **Keywords:** Compassion fatigue, burnout, compassion satisfaction, depression,
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42 emergency department
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45 **Strengths and limitations of this study**

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48 •This is a novel study conducted in the province of Sichuan, China, which describes
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50 the prevalence of compassion fatigue, burnout, compassion satisfaction and
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52 depression and the influencing factors associated with depression among emergency
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54 department physicians and nurses.
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58 •The causal association between compassion fatigue, burnout, compassion satisfaction
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4 and depression could not be established since this was a cross-sectional study.
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6 •Data on compassion fatigue, burnout, compassion satisfaction and depression were
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8 collected based on the participants' self-reports, which may have led to information
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10 bias.
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13 14 **Introduction**

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16 Emergency departments are fast-paced, high-pressure environments in which the
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18 medical staff encounter heavy workloads, violence, interpersonal conflict, high
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20 patient load, mass casualty incidents; moreover, limited resources and poor skill mix
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22 compound the problem.^{1 2} Emergency department physicians and nurses who are at
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24 the frontline of a demanding health care system take significant responsibility for the
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26 care of emergency patients, regardless of overstretched and overburdened resources.³
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28 Emergency physicians and nurses who witness alarming morbidity and mortality on a
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30 daily basis, can experience adverse physical and mental health problems, such as
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32 compassion fatigue, depression and burnout.⁴ It has been reported that compassion
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34 fatigue, burnout and depression afflicting emergency physicians and nurses can not
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36 only harm individual mental health, but can also cause a series of fateful
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38 consequences, including medical errors, poor-quality patient care and increased
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40 patient mortality during hospital stay.⁵⁻⁷
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51 Compassion fatigue, which is considered as an occupational hazard in healthcare,
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53 is conceptualized as “the natural, consequent behaviors and emotions resulting from
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55 knowing about a traumatizing event experienced by a significant other – the stress
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57 resulting from helping or wanting to help a traumatized or suffering person”.^{8 9}
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4 Compassion fatigue can result in a series of physical, mental and work-related
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6 symptoms that seriously affect quality of patient care and staff-patient relationships.¹⁰
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9 Chu reported that compassion fatigue has a significant adverse effect on job
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11 performance and organizational citizenship behavior.¹¹ A study conducted in the U.S.
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13 indicated that about 80% of emergency nurses had moderate to high levels of
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15 compassion fatigue.¹² Barnett et al. noted that compassion fatigue was positively
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17 associated with emotional display.¹³ Burnout is a work-related syndrome and
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19 predominantly defined as “high emotional exhaustion, depersonalization and a low
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21 level of personal accomplishment”.¹⁴ The prevalence of burnout among emergency
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23 medical staff was very high and burnout can cause serious consequences.¹⁵⁻¹⁷
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25 Moukarzel et al. noted that 34.6% emergency medical staff had severe burnout and
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27 Soltanifar et al. found that 84.5% emergency physicians had experienced high
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29 emotional exhaustion.^{15 18} Jyothindran’s findings indicated that severe burnout was
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31 highly correlated with medical error and turnover.¹⁹ Compassion satisfaction is
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33 defined as the emotions generated and the sense of achievement derived from helping
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35 and caring for patients, whether related to direct assistance or support in improvement
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37 of patients’ condition.²⁰

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48 Depression, a common and serious mental illness, is listed by the World Health
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50 Organization (WHO) as one of the most important factors contributing to global
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52 disability and the main contributor to suicide deaths at all ages.²¹ The most common
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54 symptoms associated with depression are persistent sadness, a loss of interest and
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56 energy, insomnia, headache, unexplained pain, gastrointestinal symptoms,
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4 hopelessness and thoughts of self-harm or suicide.²² Severe depression can lead to
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6 many negative outcomes. For example, a recent study on emergency department
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8 nurses during the COVID-19 pandemic in China showed that depression had an
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10 adverse effect on quality of patient care and nurses' quality of life.²³ Vasconcelos et al.
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12 found that depressive symptoms were significantly associated with burnout.²⁴
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Emergency medical staff are exposed to all kinds of stress every day.²⁵ Hence, special attention should be paid to the psychological status of emergency physicians and nurses.

Although extensive studies on depression have been conducted, most of the studies have only focused on nurses.^{23 24} Moreover, few studies have been carried out to explore the factors that influence the development of depression in emergency physicians and nurses.^{5 25} Considering that emergency physicians and nurses have emotionally demanding tasks and work in high-pressure situations, the aim of this study was to determine the prevalence of compassion fatigue, burnout, compassion satisfaction and depression and explore the interrelationship of these among this highly vulnerable population.

Methods

Study design and participants

A cross-sectional survey was conducted among emergency physicians and nurses across five different cities of Sichuan province, China. A convenience sample was used to recruit physicians and registered nurses working in the emergency department.

The eligibility criteria were as follows: (1) being licensed physicians and registered

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4 nurses; (2) with more than one year's work experience; (3) working in emergency
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6 department; (4) provided consent to participate. The data were collected by five
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8 trained research assistants from January to February 2021. A set of questionnaires was
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10 distributed to all emergency medical staff by the five tertiary hospitals' administration.
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12 All the participants were informed that their participation was voluntary and that their
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14 data would be anonymised. A total of 350 emergency physicians and nurses filled in
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16 the questionnaires, out of which 342 questionnaires were returned (an effective
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18 response rate of 97.7%).
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24 25 **Measurements**

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27 The questionnaire comprised three instruments: a demographic survey, the
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29 Professional Quality of Life (ProQOLv5) scale and the Center for Epidemiologic
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31 Studies Depression (CES-D) scale. Sociodemographic data were collected with a
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33 self-designed questionnaire, including position (physician, nurse), age (less than 35
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35 years, 35 years or older), gender (male, female), marital status (married, unmarried),
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37 education level (diploma, associate degree, bachelor's degree, master's degree or
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39 higher), professional title (primary, intermediate, senior), work experience (less than 5
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41 years, 5–10 years, over 10 years), weekly night shifts (none, 1–2, 3–4, more than 4),
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43 daily work hours (less than 9 h, 9–12 h, over 12 h), cigarette use (yes, no), alcohol use
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45 (yes, no) and history of chronic disease (yes, no). According to the level of experience
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47 of the professionals, physicians and nurses' professional ranks in China were divided
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49 into three categories, including primary titles, intermediate titles and senior titles.
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58 **Professional quality of life scale**

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4 Compassion fatigue, burnout and compassion satisfaction levels were assessed using
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6 the ProQOLv5. The questionnaire includes 30 items with a Likert scale of 5 points
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8 (1=never; 5=always), 10 items for compassion satisfaction, 10 items for burnout and
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10 10 items for compassion fatigue.²⁰ The level of compassion satisfaction was divided
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12 into less than 22 (low), 23–41 (middle) and more than 42 (high). For compassion
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14 fatigue and burnout, a score of 22 or less represents low levels, 23–41 represents
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16 middle levels, and a score of more than 42 high levels. The alpha reliability
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18 coefficients for compassion satisfaction, burnout and compassion fatigue were 0.775,
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20 0.775 and 0.807, respectively.
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27 **Depression**

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29 The CES-D is a 20-item questionnaire intended to measure the frequency of
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31 occurrence of symptoms of depression over the past week using a 5-point Likert scale
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33 (each item was scored as follows: 0=rarely or none of the time to 3=most or all of the
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35 time; total score range, 0–60).²⁶ The CES-D scale has four reverse-scored items (items
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37 4, 8, 12 and 16) and covers four major symptoms of depression, including (1)
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39 depressed affect (e.g. sadness, crying); (2) absence of positive affect (e.g. hope,
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41 enjoyment); (3) somatic symptoms (e.g., appetite problems, problems “getting
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43 going”); and (4) interpersonal relations (e.g. perceiving others as unfriendly).
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45 Standard cut-off value ≥ 16 indicates the likely presence of depression. The
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47 Cronbach’s α in the current study was 0.916.
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55 **Statistical analysis**

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57 Statistical analysis was conducted using SPSS version 22.0 (SPSS Inc., Chicago, IL,
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4 USA). Continuous variables were summarized as mean with standard deviation (SD),
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6 while categorical variables were presented as frequencies and percentages.
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9 Independent samples t-test, and one-way analysis of variance (ANOVA) were used to
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11 compare participants' depression by demographic characteristics. Associations
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13 between compassion satisfaction, burnout, compassion fatigue and depression among
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15 emergency physicians and nurses were analysed using Pearson's correlation analysis.
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18 A multiple linear regression model was used to estimate the effect of compassion
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20 satisfaction, burnout, compassion fatigue and other demographic variables on
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22 depression. A *p* value of less than 0.05 was considered statistically significant
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27 (two-tailed).
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29 30 **Patient and public involvement**

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32 Patients or members of the public were not involved in the design, reporting or
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34 dissemination plans of our research.
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37 38 39 **Results**

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41 The participants' baseline characteristics are shown in Table 1. The mean age was
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43 32.59 years (SD, 8.19; age range, 20–58 years). Most participants were female
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45 (70.5%), nurses (71.1%), married (68.7.0%), held a bachelor degree (62.9%) and had
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47 a primary professional title (57.0%).
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52 The differences in depression scores according to the characteristics of
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54 emergency physicians and nurses are also presented in Table 1. There were significant
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56 differences in depression scores based on marital status ($p<0.01$), professional title
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58 ($p<0.05$), daily work hours ($p<0.05$), alcohol use ($p<0.05$) and history of chronic
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disease ($p < 0.01$).

Table 1. Demographic characteristics of emergency department physicians and nurses (N=342).

Variables	N (%)	Depression Mean (SD)
Position		$P=0.181$
Physician	99 (28.9)	38.60 (11.76)
Nurse	243 (71.1)	36.86 (10.52)
Age (years)		$P=0.991$
<35	236 (69.0)	37.37 (10.23)
≥35	106 (31.0)	37.35 (12.32)
Gender		$P=0.162$
Male	101 (29.5)	38.64 (12.22)
Female	241 (70.5)	36.83 (10.28)
Marital status		$P=0.002$
Unmarried	107 (31.3)	40.01(11.05)
Married	235 (68.7)	36.16(10.64)
Education level		$P=0.071$
Associate degree	102 (29.8)	36.16 (9.97)
Bachelor degree	215 (62.9)	38.33 (11.49)
Master degree	25 (7.3)	34.00 (8.24)
Profession title		$P=0.034$
Primary	195 (57.0)	37.57 (10.56)
Intermediate	108 (31.6)	38.48 (11.51)
Senior	39 (11.4)	33.25 (10.18)
Work experience (years)		$P=0.810$
<5	94 (27.5)	37.48 (10.09)
5-10	95 (27.8)	37.88 (10.96)
>10	153 (44.7)	36.97 (11.39)
Weekly night shifts		$P=0.063$
0	46 (13.5)	33.60 (9.35)
1-2	148 (43.4)	37.89 (11.19)
3-4	106 (31.0)	37.46 (11.10)
>4	42 (12.3)	39.40 (10.35)
Daily work hours(h)		$P=0.017$
<9	161 (47.1)	35.60 (10.29)
9-12	118 (34.5)	39.19 (11.13)
>12	163 (18.4)	38.44 (11.45)
Cigarette use		$P=0.244$
Yes	38 (11.1)	39.31 (12.13)
No	304 (88.9)	37.12 (10.74)
Alcohol use		$P=0.019$
Yes	50 (14.6)	40.70 (10.91)

No	292 (85.4)	36.79 (10.82)
History of chronic disease		<i>P</i> =0.001
Yes	58 (17.0)	41.79 (12.21)
No	284 (83.0)	36.46 (10.41)

As depicted in Table 2, compassion satisfaction levels were moderate in approximately 70.8% of emergency physicians and nurses, low in 27.8% of them and high in 1.4%. Of the participants, 2.3% had a high burnout score, 66 (19.3%) had a low burnout score and 3% of the respondents had a high compassion fatigue score. The mean scores for depression, compassion satisfaction, burnout and compassion fatigue were 37.36 (SD, 10.91), 26.70 (SD, 6.36), 27.74 (SD, 6.19) and 30.19 (SD, 6.59), respectively.

Table 2. Compassion satisfaction, burnout, compassion fatigue and depression levels among emergency physicians and nurses (N=342).

Dimensions	N (%)	Mean	SD
Depression		37.36	10.91
Compassion satisfaction		26.70	6.36
Low	95 (27.8)	-	-
Medium	242 (70.8)	-	-
High	5 (1.4)	-	-
Burnout		27.74	6.19
Low	66 (19.3)	-	-
Medium	268 (78.4)	-	-
High	8 (2.3)	-	-
Compassion fatigue		30.19	6.59
Low	43 (12.6)	-	-
Medium	286 (83.6)	-	-
High	13 (3.8)	-	-

Both compassion satisfaction and burnout were significantly correlated with three depression metrics: depressed affect, somatic symptoms and inter-personal relations. Apart from positive affect, there was no relationship between the other sub-scales of depression and compassion fatigue (Table 3).

Table 3. Correlation between dimensions of compassion satisfaction, burnout, compassion fatigue and depression (N=342).

	Depression	Depressed Affect	Somatic	Positive Affect	Inter-personal
Compassion satisfaction	0.282**	0.319**	0.317**	0.003	0.311**
Burnout	0.171**	0.214**	0.239**	-0.163**	0.247**
Compassion fatigue	-0.178**	-0.092	-0.021	-0.430**	0.001

Note:** $p < 0.01$

Depression was computed as outcome variable, and the independent variables comprised the demographic characteristics and the three dimensions of compassion fatigue. Table 4 shows that marital status, history of chronic disease, compassion satisfaction, burnout and compassion fatigue collectively accounted for 39.6% of the variance in depression ($F = 28.952$, $p < 0.001$, $R^2 = 0.410$, adjusted $R^2 = 0.396$).

Table 4. Multiple linear regression analysis of depression (N=342).

Dependent variables	Independent variables	Unstandardised coefficient		Standardised coefficient		95% CI		
		B	SE	Beta	<i>t</i>	<i>P</i>	Lower bound	Upper bound
Depression	Marital status	-2.997	1.123	-0.128	-2.670	0.008	-5.205	-0.789
	History of chronic disease	-3.924	1.290	-0.135	-3.052	0.003	-6.461	-1.386
	Compassion satisfaction	0.934	0.173	0.545	5.388	<0.001	0.593	1.274
	Burnout	0.507	0.215	0.288	2.359	0.019	0.084	0.930
	Compassion fatigue	-1.290	0.120	-0.779	-10.707	<0.001	-1.527	-1.053

Discussion

The findings of the current study regarding the frequency and distribution of depression among emergency physicians and nurses show that the following characteristics were significantly associated with higher levels of depression—marital

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4 status: unmarried; intermediate professional title; consumption of alcohol; daily
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7 worktime between 9 and 12 h; and a history of chronic disease. Similar to our study, a
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9 statistically significant difference was observed in the levels of depression among
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12 frontline doctors combating the COVID-19 pandemic in India with regard to marital
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14 status.²⁷ One reason for this could be that spousal support is beneficial for maintaining
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17 good mental health.²⁸ Our findings concur with those of Xiao et al. who found that
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19 depression levels were different among different professional titles and that an
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21 intermediate title was an independent influencing factor.²⁹ This could be explained by
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23 the fact that compared to medical staff with an intermediate title, physicians and
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25 nurses with a senior title have a richer work experience, a higher income and a lower
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27 family burden.³⁰ The findings of this study are in accordance with those of two
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29 previous studies that reported that working excessively long hours on a daily basis
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31 was significantly associated with the frequency of depressive symptoms.³¹ 32
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Emergency physicians and nurses endure a heavy burden of work imposed on them
on a daily basis and most often without a day of safety rest. Work overload and
chronic sleep deprivation can increase the risk for depression.³³ A study conducted by
Sørensen et al. among 1,943 Danish physicians noted that the emergency department
had the highest proportion of risky alcohol use.³⁴ Besides, the study of Silva et al.
reported that the prevalence of depressive symptoms among emergency nurses in
Brazil is 95.24%.³⁵ Emergency physicians and nurses who had severe depressive
symptoms were more likely to be drinking alcohol to regulate these emotional
states.³⁶ Our results are also similar to those reported in a study by Ngasa et al. that

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4 found that the presence of a chronic disease was independently associated with
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6 depression.³⁷
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10 Our study found a considerably high prevalence of depressive symptoms among
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12 emergency physicians and nurses, and the prevalence of depressive symptoms
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14 reached up to 100%, which is much higher than the previous study.³⁸ The high level of
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16 depression may be associated with factors, such as excessive workload, overcrowding
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18 and resource shortages in the emergency department.^{39 40} The COVID-19 pandemic
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20 has added to the heavy workload and the life-threatening emergencies that medical
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22 staff, especially physicians and nurses, were facing, thereby aggravating the
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24 psychological pressure; this is one of the neglected important reasons causing the high
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26 levels of depression.⁴¹ The prevalence rates of burnout, compassion satisfaction and
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28 compassion fatigue in our study were much lower than those in nurses in a study
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30 conducted in an adult emergency and urgent care department.⁸ However, these
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32 differences may be due to the small sample size (87 nurses), which consisted of
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34 emergency nurses only in the Portuguese study. However, in this study, the results
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36 indicated an average to high level of compassion fatigue and burnout among
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38 emergency nurses, which was much higher than that of a previous study.⁴²
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50 We found that compassion satisfaction, burnout and compassion fatigue had a
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52 statistically significant correlation with depression. The current study shows that
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54 compassion satisfaction has a significant positive correlation with depression and
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56 compassion fatigue has a significant negative correlation with depression, which is
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4 not consistent with other recent studies. Jo et al. and Hegney et al. both found an
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6 opposite association, that is, compassion satisfaction was negatively associated with
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8 depression and compassion fatigue was positively correlated with depression.^{43 44} The
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10 reason for this may include differences in measurement tools. Interestingly, an
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12 association analysis showed that burnout was significantly related to depression, a
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14 finding similar to that of a survey of emergency physicians.⁴⁵
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20 **Limitations of the current study**

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22 Our study has a few limitations. First, our study sample was drawn from a single
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24 Chinese region with predominantly emergency physicians and nurses and adopted the
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26 method of convenient sampling, which may have caused the uncommonly high scores
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28 of depression and limits the generalisability of the findings to other professional
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30 groups. Second, most of the instruments used in this research were based on the
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32 respondents' self-reports, which is prone to information bias. Therefore, more robust
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34 methods of assessment and better tools should be used in future studies. Third, the
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36 causal association between compassion satisfaction, burnout, compassion fatigue and
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38 depression is not clear, due to the cross-sectional study nature of our study. Hence, we
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40 recommend that future research should examine the interaction between compassion
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42 fatigue, burnout, compassion satisfaction and depression and evaluate their potential
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44 impact rather than focusing on these phenomena separately. Lastly, compassion
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46 fatigue, in our study, merely contributed to (did not cause) increase in depression.
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55 **Conclusion**

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58 The prevalence of depression among emergency physicians and nurses in the province
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4 of Sichuan was shown to be extremely high. Marital status and the presence of a
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6 chronic disease among the staff affected their depression levels. We also examined
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8 the relationship between compassion satisfaction, burnout, compassion fatigue and
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10 depression among emergency physicians and nurses in Sichuan province and found a
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12 significant association between these. Moreover, it was also determined that
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14 independent variables, such as compassion satisfaction, burnout and compassion
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16 fatigue strongly predict depression levels among emergency physicians and nurses.
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18 Consequently, reducing the level of burnout and compassion fatigue and increasing
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20 compassion satisfaction could be a key factor in addressing depression in emergency
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22 department physicians and nurses. The findings of our study have the potential to
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24 provide new directions and perspectives for future research. However, further studies
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26 are needed to derive more specific details through in-depth interviews with physicians
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28 and nurses to clarify the underlying causes of the high prevalence of depression
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30 among emergency physicians and nurses.
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39 40 **Acknowledgements**

41
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44 completed questionnaires for their unbiased participation; we gratefully acknowledge
45
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47
48 for their efforts and time.
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52 53 **Contributors**

54
55 HM wrote the manuscript and conducted the statistical analysis and interpretation;
56
57
58 BW was in charge of the study concept and design; and SQH and YZ were in charge
59
60

of data acquisition. All authors revised and approved the final manuscript.

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Competing interests

None declared.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Institutional Review Board of Xiangya Nursing School (Approval number E202062), Central South University, China.

Data availability statement

Data are available upon reasonable request.

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IJNS AUTHOR CHECKLIST *Authors of all papers should submit this checklist together with their manuscript. The checklist will be made available during the submission process online to all authors and full step-by-step guidance given.*

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Part 2 identifies recognized guidelines for scientific reporting, which you should use to prepare your manuscript (required for systematic reviews and original research)

Part 3 is a self assessment checklist that is designed to help to ensure that your research or review manuscript meets basic standards and the journal's Guide for Authors. (optional only)

PART 1 Basic requirements	Author response or further detail	Tick
Word count	4713	
Was ethical approval given and by whom? (give any reference number)	the Institutional Review Board of Xiangya Nursing School, Central South University (Approval number E202062)	
Please state any conflicts of interest	None	
Please state sources of funding and the role of funders in the conduct of the research	None	
Please state any study registry number (e.g. ISRCTN)	Not applicable	
Title	The title is in the format 'Topic / question: design/type of paper' and identifies the population / care setting studied. (e.g. <i>The effectiveness of telephone support for adolescents with insulin dependant diabetes: controlled before and after study: the structure is optional for discussion papers, editorials and commentaries</i>)	Page1
Abstract	A structured abstract appropriate to the design (see <i>guidelines for authors</i>). Reports of controlled trials should follow the CONSORT format (does not apply to editorials or commentaries, Abstracts for discussion papers need not be structured)	Page1
Key words	Between four and ten key words have been provided in alphabetical order, which accurately identify the paper's subject, purpose, method and focus. Use the Medical Subject Headings (MeSH®) thesaurus or Cumulative Index to Nursing and Allied Health (CINAHL) headings where possible (see http://www.nlm.nih.gov/mesh/meshhome.html).	Page2
Highlights	Bullet points have been included that identify existing research knowledge relating to the specific research question / topic (what is already known) and a summary of the new knowledge added by this study (what the paper adds) (see <i>Guide for Authors</i> , does not apply to editorials or commentaries)	Page2- page3
References	Citations accord to the journal's format (Author, date) and reference list includes full details of all cited references in the proper format and alphabetical order (see <i>Guide for Authors</i>)	Page16- page22
Other Published accounts	All published and in press accounts of the study from which data in this paper originate are referred to in the paper and the relationship between this and other publications from the same study is made clear (see <i>Guide for Authors</i>)	Not applicable
	The study is referred to by a distinctive name which will be used in any future publications to identify that it as the same study.	Not applicable
	Please upload copies of all previous, current and under review publications from this study and / or give full details below	Not applicable
Authorship	All authors and contributors sufficiently acknowledged as per Guide for Authors.	Page15

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Observational cohort, case control and cross sectional studies	STROBE Strengthening the Reporting of Observational Studies in Epidemiology http://www.equator-network.org/index.aspx?o=1032	√	
Quasi experimental / non-randomized evaluations	TREND - Transparent Reporting of Evaluations with Non-randomized Designs http://www.equator-network.org/index.aspx?o=1032		
Randomised (and quasi-randomised) controlled trial	CONSORT – Consolidated Standards of Reporting Trials http://www.equator-network.org/index.aspx?o=1032		
Study of Diagnostic accuracy / assessment scale	STARD Standards for the Reporting of Diagnostic Accuracy studies http://www.equator-network.org/index.aspx?o=1032		
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Systematic Review of Observational Studies	MOOSE Meta-analysis of Observational Studies in Epidemiology http://www.equator-network.org/index.aspx?o=1032		
	<i>Qualitative researchers might wish to consult the guideline listed below</i>		
Qualitative studies	COREQ: Consolidated criteria for reporting qualitative research Tong, A., Sainsbury, P., Craig, J., 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. <i>International Journal for Quality in Health Care</i> 19 (6), 349-357. (http://dx.doi.org/10.1093/intqhc/mzm042)		
Other (please give source)			
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Section	Descriptor	TICK
a) Primary research only		
Background	A statement of the problem / phenomena of interest, a brief summary of existing research which addresses the topic and an explanation of the purpose of the current study / review in relation to this.	Page3
METHODS	Clear statement of the aims, objectives (hypothesis) and research design	Page5
Settings	The settings and locations where the study took place	Page5
Inclusion Criteria	Eligibility criteria for participants – inclusion and exclusion criteria	Page5
Sampling	Method of sampling and if relevant allocation to groups (e.g. convenience, random) and <i>description</i> of sampling, recruitment and allocation procedures .	Page5
Sample size	How sample size was determined.	Page6
Outcomes and data collection procedures	Clearly defined primary and secondary outcome measures (when applicable), Setting and methods of data collection and methods used to enhance the quality of data collection (e.g., multiple observations, training of assessors).	Page6
Analysis Methods	Statistical methods used / approaches to qualitative analysis including procedures to ensure accuracy / validity / truthfulness of accounts.	Page7
Ethical review*	Details of ethical scrutiny / approvals obtained.	Page16
RESULTS Participant flow	Flow of participants through each stage of selection, allocation, follow up / inclusion in analysis (a diagram is strongly recommended). Describe protocol deviations from study as planned, together with reasons.	N/A
Recruitment	Dates defining the periods of recruitment and follow-up.	N/A
Baseline data	Baseline demographic and clinical characteristics of each group.	N/A
Results	Point estimates, exact p-values and confidence intervals for quantitative studies. Qualitative analyses are supported by appropriate quotations which support the derived themes / categories and which are anonymously attributed to participants (using pseudonyms, numbers or equivalent)	Page8
DISCUSSION	Brief recapitulation / summary of the results taking into account study hypotheses / aims	Page11
Interpretation	Interpretation of the results, taking into account study limitations	Page14
Overall evidence	Assessment of the current state of knowledge in the context of study results and other evidence.	Page14
Implications	Consideration of the implications of the current state of knowledge for further research and or practice	Page15

BMJ Open

Compassion fatigue, burnout, compassion satisfaction and depression among emergency department physicians and nurses: a cross-sectional study

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Secondary Subject Heading:	Mental health, Emergency medicine, Public health
Keywords:	Adult psychiatry < PSYCHIATRY, PUBLIC HEALTH, MENTAL HEALTH, Depression & mood disorders < PSYCHIATRY

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Compassion fatigue, burnout, compassion satisfaction and depression among emergency department physicians and nurses: a cross-sectional study

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Abstract

Objectives: Emergency department physicians and nurses are at high risk of compassion fatigue, burnout and depression. The purpose of this study was to examine the interrelationship between compassion fatigue, burnout, compassion satisfaction and depression in emergency department physicians and nurses.

Design: A cross-sectional study.

Setting: This study was conducted in five tertiary hospitals in five different cities across the province of Sichuan, China, in 2021.

Participants: A total of 342 emergency department physicians and nurses participated in the study.

Main outcome measures: Compassion fatigue, burnout, compassion satisfaction and depression scores.

Results: Among the study participants, 100% were found to have depressive

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4 symptoms, 27.8% had low compassion satisfaction, 2.3% had high burnout and 3.8%
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6 had compassion fatigue. In the final multiple linear regression model, marital status
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8 ($p=0.008$; 95% confidence interval [CI], -5.205 to -0.789), history of chronic disease
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10 ($p=0.003$; 95% CI, -6.461 to -1.386), compassion satisfaction ($p<0.001$; 95% CI,
11
12 0.593 to 1.274), burnout ($p=0.019$; 95% CI, 0.084 to 0.930) and compassion fatigue
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14 ($p<0.001$; 95% CI, -1.527 to -1.053) among emergency department physicians and
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16 nurses were considered to be significant predictors of depression.
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22 **Conclusions:** The prevalence of depression among emergency department physicians
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24 and nurses is high in the province of Sichuan, China. Compassion fatigue, burnout
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26 and compassion satisfaction were significantly associated with depression in
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28 emergency department physicians and nurses. Hospital administrations should
29
30 consider these findings to develop appropriate psychological interventions and
31
32 strategies, to prevent, alleviate or treat severe depression among emergency
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34 department physicians and nurses in the province of Sichuan.
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40 **Keywords:** Compassion fatigue, burnout, compassion satisfaction, depression,
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42 emergency department
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45 **Strengths and limitations of this study**

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48 •This is a novel study conducted in the province of Sichuan, China, which describes
49
50 the prevalence of compassion fatigue, burnout, compassion satisfaction and
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52 depression and the influencing factors associated with depression among emergency
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54 department physicians and nurses.
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58 •The causal association between compassion fatigue, burnout, compassion satisfaction
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4 and depression could not be established since this was a cross-sectional study.
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6 •Data on compassion fatigue, burnout, compassion satisfaction and depression were
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8 collected based on the participants' self-reports, which may have led to information
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10 bias.
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13 14 **Introduction**

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16 Emergency departments are fast-paced, high-pressure environments in which the
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18 medical staff encounter heavy workloads, violence, interpersonal conflict, high
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20 patient load, mass casualty incidents; moreover, limited resources and poor skill mix
21
22 compound the problem.^{1 2} Emergency department physicians and nurses who are at
23
24 the frontline of a demanding health care system take significant responsibility for the
25
26 care of emergency patients, regardless of overstretched and overburdened resources.³
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28 Emergency physicians and nurses who witness alarming morbidity and mortality on a
29
30 daily basis, can experience adverse physical and mental health problems, such as
31
32 compassion fatigue, depression and burnout.⁴ It has been reported that compassion
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34 fatigue, burnout and depression afflicting emergency physicians and nurses can not
35
36 only harm individual mental health, but can also cause a series of fateful
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38 consequences, including medical errors, poor-quality patient care and increased
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40 patient mortality during hospital stay.⁵⁻⁷
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51 Compassion fatigue, which is considered as an occupational hazard in healthcare,
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53 is conceptualized as “the natural, consequent behaviors and emotions resulting from
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55 knowing about a traumatizing event experienced by a significant other – the stress
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57 resulting from helping or wanting to help a traumatized or suffering person”.^{8 9}
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4 Compassion fatigue can result in a series of physical, mental and work-related
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6 symptoms that seriously affect quality of patient care and staff-patient relationships.¹⁰
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9 Chu reported that compassion fatigue has a significant adverse effect on job
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11 performance and organizational citizenship behavior.¹¹ A study conducted in the U.S.
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13 indicated that about 80% of emergency nurses had moderate to high levels of
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15 compassion fatigue.¹² Barnett et al. noted that compassion fatigue was positively
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17 associated with emotional display.¹³ Burnout is a work-related syndrome and
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19 predominantly defined as “high emotional exhaustion, depersonalization and a low
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21 level of personal accomplishment”.¹⁴ The prevalence of burnout among emergency
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23 medical staff was very high and burnout can cause serious consequences.¹⁵⁻¹⁷
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25 Moukarzel et al. noted that 34.6% emergency medical staff had severe burnout and
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27 Soltanifar et al. found that 84.5% emergency physicians had experienced high
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29 emotional exhaustion.^{15 18} Jyothindran’s findings indicated that severe burnout was
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31 highly correlated with medical error and turnover.¹⁹ Compassion satisfaction is
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33 defined as the emotions generated and the sense of achievement derived from helping
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35 and caring for patients, whether related to direct assistance or support in improvement
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37 of patients’ condition.²⁰

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48 Depression, a common and serious mental illness, is listed by the World Health
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50 Organization (WHO) as one of the most important factors contributing to global
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52 disability and the main contributor to suicide deaths at all ages.²¹ The most common
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54 symptoms associated with depression are persistent sadness, a loss of interest and
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56 energy, insomnia, headache, unexplained pain, gastrointestinal symptoms,
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4 hopelessness and thoughts of self-harm or suicide.²² Severe depression can lead to
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6 many negative outcomes. For example, a recent study on emergency department
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8 nurses during the COVID-19 pandemic in China showed that depression had an
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10 adverse effect on quality of patient care and nurses' quality of life.²³ Vasconcelos et al.
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12 found that depressive symptoms were significantly associated with burnout.²⁴
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17 Emergency medical staff are exposed to all kinds of stress every day.²⁵ Hence, special
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19 attention should be paid to the psychological status of emergency physicians and
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nurses.

Although extensive studies on depression have been conducted, most of the
studies have only focused on nurses.^{23 24} Moreover, few studies have been carried out
to explore the factors that influence the development of depression in emergency
physicians and nurses.^{5 25} Considering that emergency physicians and nurses have
emotionally demanding tasks and work in high-pressure situations, the aim of this
study was to determine the prevalence of compassion fatigue, burnout, compassion
satisfaction and depression and explore the interrelationship of these among this
highly vulnerable population.

Methods

Study design and participants

A cross-sectional survey was conducted among emergency physicians and nurses
across five different cities of Sichuan province, China. A convenience sample was
used to recruit physicians and registered nurses working in the emergency department.

The eligibility criteria were as follows: (1) being licensed physicians and registered

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4 nurses; (2) with more than one year's work experience; (3) working in emergency
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6 department; (4) provided consent to participate. The data were collected by five
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8 trained research assistants from January to February 2021. A set of questionnaires was
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10 distributed to all emergency medical staff by the five tertiary hospitals' administration.
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12 All the participants were informed that their participation was voluntary and that their
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14 data would be anonymised. A total of 350 emergency physicians and nurses filled in
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16 the questionnaires, out of which 342 questionnaires were returned (an effective
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18 response rate of 97.7%).
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24 25 **Measurements**

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27 The questionnaire comprised three instruments: a demographic survey, the
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29 Professional Quality of Life (ProQOLv5) scale and the Center for Epidemiologic
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31 Studies Depression (CES-D) scale. Sociodemographic data were collected with a
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33 self-designed questionnaire, including position (physician, nurse), age (less than 35
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35 years, 35 years or older), gender (male, female), marital status (married, unmarried),
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37 education level (diploma, associate degree, bachelor's degree, master's degree or
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39 higher), professional title (primary, intermediate, senior), work experience (less than 5
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41 years, 5–10 years, over 10 years), weekly night shifts (none, 1–2, 3–4, more than 4),
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43 daily work hours (less than 9 h, 9–12 h, over 12 h), cigarette use (yes, no), alcohol use
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45 (yes, no) and history of chronic disease (yes, no). According to the level of experience
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47 of the professionals, physicians and nurses' professional ranks in China were divided
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49 into three categories, including primary titles (physicians, nurses, nurse practitioners),
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51 intermediate titles (physicians in charge of a case, nurses-in-charge) and senior titles
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4 (assistant director physicians, director physicians, assistant director nurses, director
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7 nurses).

9 **Professional quality of life scale**

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12 Compassion fatigue, burnout and compassion satisfaction levels were assessed using
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14 the ProQOLv5. The questionnaire includes 30 items with a Likert scale of 5 points
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16 (1=never; 5=always), 10 items for compassion satisfaction, 10 items for burnout and
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18 10 items for compassion fatigue.²⁰ The level of compassion satisfaction was divided
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20 into less than 22 (low), 23–41 (middle) and more than 42 (high). For compassion
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22 fatigue and burnout, a score of 22 or less represents low levels, 23–41 represents
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24 middle levels, and a score of more than 42 high levels. The alpha reliability
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26 coefficients for compassion satisfaction, burnout and compassion fatigue were 0.775,
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28 0.775 and 0.807, respectively.
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35 **Depression**

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38 The CES-D is a 20-item questionnaire intended to measure the frequency of
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40 occurrence of symptoms of depression over the past week using a 5-point Likert scale
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42 (each item was scored as follows: 0=rarely or none of the time to 3=most or all of the
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44 time; total score range, 0–60).²⁶ The CES-D scale has four reverse-scored items (items
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46 4, 8, 12 and 16) and covers four major symptoms of depression, including (1)
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48 depressed affect (e.g. sadness, crying); (2) absence of positive affect (e.g. hope,
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50 enjoyment); (3) somatic symptoms (e.g., appetite problems, problems “getting
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52 going”); and (4) interpersonal relations (e.g. perceiving others as unfriendly).
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58 Standard cut-off value ≥ 16 indicates the likely presence of depression. The
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4 Cronbach's α in the current study was 0.916.
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6 **Statistical analysis**

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9 Statistical analysis was conducted using SPSS version 22.0 (SPSS Inc., Chicago, IL,
10 USA). Continuous variables were summarized as mean with standard deviation (SD),
11 while categorical variables were presented as frequencies and percentages.
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14 Independent samples t-test, and one-way analysis of variance (ANOVA) were used to
15 compare participants' depression by demographic characteristics. Associations
16 between compassion satisfaction, burnout, compassion fatigue and depression among
17 emergency physicians and nurses were analysed using Pearson's correlation analysis.
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19 A multiple linear regression model was used to estimate the effect of compassion
20 satisfaction, burnout, compassion fatigue and other demographic variables on
21 depression. A *p* value of less than 0.05 was considered statistically significant
22 (two-tailed).
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38 **Patient and public involvement**

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40 Patients or members of the public were not involved in the design, reporting or
41 dissemination plans of our research.
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47 **Results**

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49 The participants' baseline characteristics are shown in Table 1. The mean age was
50 32.59 years (SD, 8.19; age range, 20–58 years). Most participants were female
51 (70.5%), nurses (71.1%), married (68.7.0%), held a bachelor degree (62.9%) and had
52 a primary professional title (57.0%).
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60 The differences in depression scores according to the characteristics of

emergency physicians and nurses are also presented in Table 1. There were significant differences in depression scores based on marital status ($p<0.01$), professional title ($p<0.05$), daily work hours ($p<0.05$), alcohol use ($p<0.05$) and history of chronic disease ($p<0.01$).

Table 1. Demographic characteristics of emergency department physicians and nurses (N=342).

Variables	N (%)	Depression Mean (SD)
Position		$P=0.181$
Physician	99 (28.9)	38.60 (11.76)
Nurse	243 (71.1)	36.86 (10.52)
Age (years)		$P=0.991$
<35	236 (69.0)	37.37 (10.23)
≥ 35	106 (31.0)	37.35 (12.32)
Gender		$P=0.162$
Male	101 (29.5)	38.64 (12.22)
Female	241 (70.5)	36.83 (10.28)
Marital status		$P=0.002$
Unmarried	107 (31.3)	40.01(11.05)
Married	235 (68.7)	36.16(10.64)
Education level		$P=0.071$
Associate degree	102 (29.8)	36.16 (9.97)
Bachelor degree	215 (62.9)	38.33 (11.49)
Master degree	25 (7.3)	34.00 (8.24)
Profession title		$P=0.034$
Primary	195 (57.0)	37.57 (10.56)
Intermediate	108 (31.6)	38.48 (11.51)
Senior	39 (11.4)	33.25 (10.18)
Work experience (years)		$P=0.810$
<5	94 (27.5)	37.48 (10.09)
5-10	95 (27.8)	37.88 (10.96)
>10	153 (44.7)	36.97 (11.39)
Weekly night shifts		$P=0.063$
0	46 (13.5)	33.60 (9.35)
1-2	148 (43.4)	37.89 (11.19)
3-4	106 (31.0)	37.46 (11.10)
>4	42 (12.3)	39.40 (10.35)
Daily work hours(h)		$P=0.017$
<9	161 (47.1)	35.60 (10.29)
9-12	118 (34.5)	39.19 (11.13)

>12	163 (18.4)	38.44 (11.45)
Cigarette use		<i>P</i> =0.244
Yes	38 (11.1)	39.31 (12.13)
No	304 (88.9)	37.12 (10.74)
Alcohol use		<i>P</i> =0.019
Yes	50 (14.6)	40.70 (10.91)
No	292 (85.4)	36.79 (10.82)
History of chronic disease		<i>P</i> =0.001
Yes	58 (17.0)	41.79 (12.21)
No	284 (83.0)	36.46 (10.41)

As depicted in Table 2, compassion satisfaction levels were moderate in approximately 70.8% of emergency physicians and nurses, low in 27.8% of them and high in 1.4%. Of the participants, 2.3% had a high burnout score, 66 (19.3%) had a low burnout score and 3% of the respondents had a high compassion fatigue score. The mean scores for depression, compassion satisfaction, burnout and compassion fatigue were 37.36 (SD, 10.91), 26.70 (SD, 6.36), 27.74 (SD, 6.19) and 30.19 (SD, 6.59), respectively.

Table 2. Compassion satisfaction, burnout, compassion fatigue and depression levels among emergency physicians and nurses (N=342).

Dimensions	N (%)	Mean	SD
Depression		37.36	10.91
Compassion satisfaction		26.70	6.36
Low	95 (27.8)	-	-
Medium	242 (70.8)	-	-
High	5 (1.4)	-	-
Burnout		27.74	6.19
Low	66 (19.3)	-	-
Medium	268 (78.4)	-	-
High	8 (2.3)	-	-
Compassion fatigue		30.19	6.59
Low	43 (12.6)	-	-
Medium	286 (83.6)	-	-
High	13 (3.8)	-	-

Both compassion satisfaction and burnout were significantly correlated with three depression metrics: depressed affect, somatic symptoms and inter-personal

relations. Apart from positive affect, there was no relationship between the other sub-scales of depression and compassion fatigue (Table 3).

Table 3. Correlation between dimensions of compassion satisfaction, burnout, compassion fatigue and depression (N=342).

	Depression	Depressed Affect	Somatic	Positive Affect	Inter-personal
Compassion satisfaction	0.282**	0.319**	0.317**	0.003	0.311**
Burnout	0.171**	0.214**	0.239**	-0.163**	0.247**
Compassion fatigue	-0.178**	-0.092	-0.021	-0.430**	0.001

Note:** $p < 0.01$

Depression was computed as outcome variable, and the independent variables comprised the demographic characteristics and the three dimensions of compassion fatigue. Table 4 shows that marital status, history of chronic disease, compassion satisfaction, burnout and compassion fatigue collectively accounted for 39.6% of the variance in depression ($F = 28.952$, $p < 0.001$, $R^2 = 0.410$, adjusted $R^2 = 0.396$).

Table 4. Multiple linear regression analysis of depression (N=342).

Dependent variables	Independent variables	Unstandardised coefficient		Standardised coefficient		<i>P</i>	95% CI	
		B	SE	Beta	<i>t</i>		Lower bound	Upper bound
Depression	Marital status	-2.997	1.123	-0.128	-2.670	0.008	-5.205	-0.789
	History of chronic disease	-3.924	1.290	-0.135	-3.052	0.003	-6.461	-1.386
	Compassion satisfaction	0.934	0.173	0.545	5.388	<0.001	0.593	1.274
	Burnout	0.507	0.215	0.288	2.359	0.019	0.084	0.930
	Compassion fatigue	-1.290	0.120	-0.779	-10.707	<0.001	-1.527	-1.053

Discussion

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4 The findings of the current study regarding the frequency and distribution of
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6 depression among emergency physicians and nurses show that the following
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8 characteristics were significantly associated with higher levels of depression—marital
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10 status: unmarried; intermediate professional title; consumption of alcohol; daily
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12 worktime between 9 and 12 h; and a history of chronic disease. Similar to our study, a
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14 statistically significant difference was observed in the levels of depression among
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16 frontline doctors combating the COVID-19 pandemic in India with regard to marital
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18 status.²⁷ One reason for this could be that spousal support is beneficial for maintaining
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20 good mental health.²⁸ Our findings concur with those of Xiao et al. who found that
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22 depression levels were different among different professional titles and that an
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24 intermediate title was an independent influencing factor.²⁹ This could be explained by
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26 the fact that compared to medical staff with an intermediate title, physicians and
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28 nurses with a senior title have a richer work experience, a higher income and a lower
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30 family burden.³⁰ The findings of this study are in accordance with those of two
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32 previous studies that reported that working excessively long hours on a daily basis
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34 was significantly associated with the frequency of depressive symptoms.^{31 32}
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36 Emergency physicians and nurses endure a heavy burden of work imposed on them
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38 on a daily basis and most often without a day of safety rest. Work overload and
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40 chronic sleep deprivation can increase the risk for depression.³³ A study conducted by
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42 Sørensen et al. among 1,943 Danish physicians noted that the emergency department
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44 had the highest proportion of risky alcohol use.³⁴ Besides, the study of Silva et al.
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46 reported that the prevalence of depressive symptoms among emergency nurses in
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4 Brazil is 95.24%.³⁵ Emergency physicians and nurses who had severe depressive
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6 symptoms were more likely to be drinking alcohol to regulate these emotional
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8 states.³⁶ Our results are also similar to those reported in a study by Ngasa et al. that
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10 found that the presence of a chronic disease was independently associated with
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12 depression.³⁷
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18 Our study found a considerably high prevalence of depressive symptoms among
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20 emergency physicians and nurses, and the prevalence of depressive symptoms
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22 reached up to 100%, which is much higher than the previous study.³⁸ The high level of
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24 depression may be associated with factors, such as excessive workload, overcrowding
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26 and resource shortages in the emergency department.^{39 40} The COVID-19 pandemic
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28 has added to the heavy workload and the life-threatening emergencies that medical
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30 staff, especially physicians and nurses, were facing, thereby aggravating the
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32 psychological pressure; this is one of the neglected important reasons causing the high
33
34 levels of depression.⁴¹ The prevalence rates of burnout, compassion satisfaction and
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36 compassion fatigue in our study were much lower than those in nurses in a study
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38 conducted in an adult emergency and urgent care department.⁸ However, these
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40 differences may be due to the small sample size (87 nurses), which consisted of
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42 emergency nurses only in the Portuguese study. However, in this study, the results
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44 indicated an average to high level of compassion fatigue and burnout among
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46 emergency nurses, which was much higher than that of a previous study.⁴²
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58 We found that compassion satisfaction, burnout and compassion fatigue had a
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4 statistically significant correlation with depression. The current study shows that
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6 compassion satisfaction has a significant positive correlation with depression and
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9 compassion fatigue has a significant negative correlation with depression, which is
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11 not consistent with other recent studies. Jo et al. and Hegney et al. both found an
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13 opposite association, that is, compassion satisfaction was negatively associated with
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15 depression and compassion fatigue was positively correlated with depression.^{43 44} The
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17 reason for this may include differences in measurement tools. Interestingly, an
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19 association analysis showed that burnout was significantly related to depression, a
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21 finding similar to that of a survey of emergency physicians.⁴⁵
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28 **Limitations of the current study**

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30 Our study has a few limitations. First, our study sample was drawn from a single
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32 Chinese region with predominantly emergency physicians and nurses and adopted the
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34 method of convenient sampling, which may have caused the uncommonly high scores
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36 of depression and limits the generalisability of the findings to other professional
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38 groups. Second, most of the instruments used in this research were based on the
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40 respondents' self-reports, which is prone to information bias. Therefore, more robust
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42 methods of assessment and better tools should be used in future studies. Third, the
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44 causal association between compassion satisfaction, burnout, compassion fatigue and
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46 depression is not clear, due to the cross-sectional study nature of our study. Hence, we
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48 recommend that future research should examine the interaction between compassion
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50 fatigue, burnout, compassion satisfaction and depression and evaluate their potential
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52 impact rather than focusing on these phenomena separately. Lastly, compassion
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4 fatigue, in our study, merely contributed to (did not cause) increase in depression.
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6 **Conclusion**

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9 The prevalence of depression among emergency physicians and nurses in the province
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11 of Sichuan was shown to be extremely high. Marital status and the presence of a
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13 chronic disease among the staff affected their depression levels. We also examined
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15 the relationship between compassion satisfaction, burnout, compassion fatigue and
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17 depression among emergency physicians and nurses in Sichuan province and found a
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19 significant association between these. Moreover, it was also determined that
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21 independent variables, such as compassion satisfaction, burnout and compassion
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23 fatigue strongly predict depression levels among emergency physicians and nurses.
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25 Consequently, reducing the level of burnout and compassion fatigue and increasing
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27 compassion satisfaction could be a key factor in addressing depression in emergency
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29 department physicians and nurses. The findings of our study have the potential to
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31 provide new directions and perspectives for future research. However, further studies
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33 are needed to derive more specific details through in-depth interviews with physicians
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35 and nurses to clarify the underlying causes of the high prevalence of depression
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37 among emergency physicians and nurses.
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47 **Acknowledgements**

48
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51 completed questionnaires for their unbiased participation; we gratefully acknowledge
52
53 the contributions by the hospital administrators of the five hospitals and thank them
54
55 for their efforts and time.
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Contributors

HM wrote the manuscript and conducted the statistical analysis and interpretation; BW was in charge of the study concept and design; and SQH and YZ were in charge of data acquisition. All authors revised and approved the final manuscript.

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Competing interests

None declared.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Institutional Review Board of Xiangya Nursing School (Approval number E202062), Central South University, China.

Data availability statement

Data are available upon reasonable request.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	14
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	N/A
		(c) Explain how missing data were addressed	N/A
		(d) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	10-12

1			
2	Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
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6			(b) Report category boundaries when continuous variables were categorized
7			
8			(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
9			
10			
11	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
12			
13			
14	Discussion		
15	Key results	18	Summarise key results with reference to study objectives
16			
17			
18	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
19			
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21	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
22			
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25	Generalisability	21	Discuss the generalisability (external validity) of the study results
26			
27	Other information		
28	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.