Human Resources for Health

RESEARCH

Open Access

Comparison of depressive symptoms among emergency physicians and the general population in China: a cross-sectional study based on national data

Nan Jiang[1], Hongmei Chen[2], Xiaoxv Yin[1], Jing Wang[1], Yafei Wu[1], Mengge Tian[1], Jiali Zhang[1], Zhenyuan Chen[1], Jianxiong Wu[1], Chuanzhu Lv[3,4,5], Fengjie Yang[6*] and Yanhong Gong[1*]

Abstract

Background While physicians are considered to be more susceptible to developing depressive symptoms, empirical data are lacking. The study aims to compare the risk of depressive symptoms between emergency physicians and the general population in China based on national data.

Methods This was a national cross-sectional study. 10 457 emergency physicians and 101 120 participants from the general population were investigated from July 2018 to August 2018 and January 2019 to February 2019, respectively. PHQ-9 was used to measure depressive symptoms, and a score ≥ 10 indicates major depression. Propensity score matching was adopted to balance the characteristics between emergency physicians and the general population. Multinomial logistic regression model was used to examine the association between occupational groups and the severity of depressive symptoms. Binary logistic regression model was performed to explore the risk factors of major depression among emergency physicians.

Results The prevalence of major depression among emergency physicians was 35.7%, whereas among the general population was 13.9%. Emergency physicians had a 3.65 times higher risk of major depression than the general population. And emergency physician was significantly associated with mild (OR: 3.12, 95% CI 2.95–3.30), moderate (OR: 4.94, 95% CI 4.60–5.30), moderately severe (OR: 9.48, 95% CI 8.61–10.44), and severe depressive symptoms (OR: 14.18, 95% CI 12.47–16.13) compared with none depressive symptoms. Even after matching, the results remained consistent. Factors associated with major depression among emergency physicians included bachelor degree or above (OR: 1.22, 95% CI 1.06–1.40), worked long years (OR: 1.26, 95% CI 1.08–1.46 for 1–5 years; OR: 1.56, 95% CI 1.32–1.84 for ≥ 6 years), experienced workplace violence (OR: 2.51, 95% CI 2.16–2.94), worked more night shifts per month (OR: 1.33, 95% CI 1.16–1.51 for 6–10 times; OR: 1.83, 95% CI 1.58–2.11 for ≥ 11 times), smoked (OR: 1.64, 95% CI 1.47–1.84), and effort-reward imbalance (OR: 4.18, 95% CI 3.62–4.85).

Conclusions Emergency physicians had a higher risk of depressive symptoms than the general population. There is a need for greater awareness of the mental health issues faced by emergency physicians.

*Correspondence:
Fengjie Yang
yangfjml@126.com
Yanhong Gong
gongyanhong@hust.edu.cn
Full list of author information is available at the end of the article

Keywords Depressive symptoms, Emergency physician, General population, Propensity score matching

Background

The shortage of health workforce across the world is critical [1]. It is estimated that in 2020, the global shortage of healthcare workers reached as high as 15 million [2, 3], posing a serious threat to the stability of human resources for health, as well as the functioning of health systems. The policy briefs by European Observatory state that safeguarding the mental health of health workers is essential for their retention and for alleviating the shortage of health workforce [4, 5].

Depression is the most common mental health problem, with symptoms of low mood, lack of interest or pleasure in past rewards or enjoyable activities, and even suicide in severe cases [6, 7]. The WHO estimates that approximately 280 million people in the world have depression [8]. The depression among the physician population is particularly concerning, as it not only affects physicians' ability to deliver high-quality healthcare services but also increases the risk of medical errors [9, 10]. Consequently, it is imperative to explore the depressive symptoms among physicians.

A published meta-analysis results showed that the global prevalence of depression among resident physicians was 28.8% [11]. In certain regions of China, studies have been carried out on the prevalence of depressive symptoms among physicians. For example, Wang et al. conducted a survey on 1488 doctors in public hospitals in Liaoning province, revealing a high prevalence of depressive symptoms at 65.3% [12]. After conducting a survey on depressive symptoms among 2641 physicians in Shenzhen city, Gong et al. found that the prevalence of depressive symptoms was 28.1% [13]. Fu et al. conducted a survey on physicians in Shandong province, which revealed a prevalence of depressive symptoms of 42.3% [14]. However, there are few national studies in China that have investigated depressive symptoms of physicians.

China has a large physician population, with the total number of licensed physicians reaching 3.87 million in 2019. However, due to the large population base, the number of doctors per 1000 people is only 2.77 [15], much lower than 8.01 in Italy, 5.82 in the United Kingdom, and 4.89 in Norway [16]. Despite the shortage of doctors, the number of visits to domestic medical institutions continued to grow, rising from 5.49 billion in 2009 [17] to 8.72 billion in 2019 [15]. According to statistics, the number of outbound medical tourists in 2018 was only 500 000 [18, 19]. The mismatch between the supply and demand of emergency physicians is even more serious [20]. Specifically, from 2007 to 2017, emergency department visits more than tripled, escalating from 51.9 million to 166.5 million. The growth rate of emergency physicians has been slow, increasing from 20 058 to 59 409 [21]. Therefore, emergency physicians are subject to higher workloads and are more likely to experience depressive symptoms. To the best of our knowledge, there is a lack of studies comparing the risk of depressive symptoms among Chinese emergency physicians and the general population, let alone based on national data.

Therefore, we aimed to compare the risk of depressive symptoms between emergency physicians and the general population in China based on national data, revealing and quantifying the impact of physicians' occupational characteristics on mental health. Additionally, we sought to identify the risk factors for major depression among emergency physicians to inform the development of targeted interventions and provide insights into healthcare workforce management.

Materials and methods

Ethics approval

This study was approved by the Medical Ethics Committee of Hainan Medical College (HYLL-2018-035) and Medical Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting guideline for cross-sectional studies (Supplementary Table 1).

Study design and sample population

Physician sample

The survey on depressive symptoms among emergency physicians, was a part of Emergency Medical Resources survey, a project led by the Medical Administration Bureau of the National Health Commission of the People's Republic of China. Data were collected from July 2018 to August 2018 through Questionnaire Star (https://www.wjx.cn), an online survey platform. The survey link for the questionnaire was generated by Questionnaire Star and posted on the work platform of emergency physicians with an invitation. The survey link was resent every 7 days until the end of the survey. Physicians participated in the survey by accessing the link. Prior to the answer questionnaire, participants need to read and agree to the electronic informed consent. During the survey period, a total of 15 288 emergency physicians from

31 provinces clicked the link and 10 457 completed the questionnaire. The completion rate was 68.4%. Participants were only able to submit the questionnaire if they answered all questions; hence there were no missing data in this study.

General population sample

The survey on depressive symptoms among the general population, conducted as a part of the 2019 Community Survey, was a collaborative research project undertaken by the Huazhong University of Science and Technology Tongji Medical College and Hainan Medical College. Data were collected from January 2019 to February 2019 through Questionnaire Star. A total of 1955 undergraduate students at Hainan Medical College were recruited as investigators. These investigators came from all over the China, and the survey was conducted in the communities where they were from with the assistance of local community workers. Before the formal survey, all of the investigators underwent unified training. Individuals who were at least 18 years old, had the ability to read and had access to a smartphone were eligible to participate in this survey.

During the survey period, investigators distributed the questionnaire link to respondents via social networks. Upon accessing the link, respondents were required to first tick the informed consent box before answering the questionnaires. All questions had to be answered before submission. A total of 171 335 questionnaire links were distributed, out of which 107 650 respondents submitted their questionnaire, resulting in a response rate of 62.83%. Among the respondents who submitted questionnaires, 6530 were excluded due to quality control issues. Finally, 101 120 participants from the general population were included in the study.

Study measures

Both physicians and the general population were surveyed using structured questionnaires. The questionnaire for physicians included basic characteristics (age, gender, marital status, educational level, habitual residence), work-related factors (qualification title, monthly income, years of service, frequency of night shift, workplace violence), lifestyle factors (smoking, drinking, frequency of physical exercise), and three scales, the Patient Health Questionnaire-9 (PHQ-9), the Effort-Reward Imbalance Scale, and the General Self-Efficacy Scale. The questionnaire for the general population included basic characteristics and the PHQ-9.

Depressive symptoms

The PHQ-9 was adopted to measure depressive symptoms of emergency physicians and the general population. It consists of nine items and each item was assessed on a 4-point Likert scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). Total scores ranged from 0 to 27. This study classified participants as major depression if their aggregate PHQ-9 score was ≥ 10. The cut-off point has been validated to have greater diagnostic validity in previous studies with a sensitivity of 88% and a specificity of 88% for depressive symptoms [22, 23]. The severity of depressive symptoms was further graded according to the following criteria: none (score, 0–4), mild (score, 5–9), moderate (score, 10–14), moderately severe (score, 15–19), and severe (score, 20–27) [23]. The Cronbach's α for this scale were 0.92 and 0.88 in the physicians and the general population, respectively.

Effort-reward imbalance

Effort-reward imbalance (ERI) was identified as non-reciprocity or imbalance between efforts spent and rewards received [24]. It was evaluated by the effort-reward ratio (ERR), which was measured using the effort and reward subscale of the ERI questionnaire developed by Siegrist [24, 25]. Effort is measured by six items, including time pressure, work interruption, responsibility, extra work, physical labor, and workload increase. Reward is measured by 11 items and describes three aspects of work, including esteem, job promotion and job security. Both subscales were rated on a 5-point Likert scale ranging from 1 to 5. The total scores for the effort subscales were from 6 to 30 and for the reward subscales were from 11 to 55, respectively. The higher the score of each subscale, the higher the corresponding effort spent and rewards received. The ERR was calculated by the formula: ERR = effort scores/reward scores * correction factor. The correction factor was the different numbers of items in the nominator and denominator. In this study, the correction factor is 6/11. A value of ERR > 1 indicated that the physician was in ERI, while ERR $\leq$ 1 indicated that the physician was not in ERI. The Cronbach's α in present study was 0.86 and 0.93 for effort subscale and reward subscale, respectively.

Self-efficacy

Self-efficacy concerns the belief in an individual's ability to succeed in specific situations. The General Self-Efficacy Scale (GSE) was adopted to measure self-efficacy [26]. It consists of 10 items that respondents rate on a scale from 1 (not at all true) to 4 (exactly true). The total score is calculated by adding up the scores of all items, ranging from 10 to 40. Higher scores indicated higher perceived self-efficacy. The scale has shown good reliability among Chinese physicians [27]. In present study, the Cronbach's α of the scale was 0.93.

Statistical analysis

Statistical analyses were performed using R 4.0.3. Descriptive statistics were presented as frequencies and percentages for categorical variables and as means and standard deviations for continuous variables. Comparisons between groups were performed using Chi-squared tests for categorical variables and *t* tests for continuous variables. Propensity score matching (PSM) was performed to achieve a balance in characteristics between emergency physicians and the general population. These characteristics included age, gender, marital status, educational level, and habitual residence. Matching was performed using the 1:1 nearest-neighbor algorithm, with a caliper width of 0.02. The balance of characteristics before and after matching was assessed by standardized mean differences. When the absolute value of the standardized difference is less than 0.1, this indicates a negligible difference between emergency physicians and the general population. Binary and multinomial logistic regression were performed to assess occupational groups associated with major depression and with different severity of depressive symptoms, after adjusting for basic characteristics. Additionally, binary logistic regression was also utilized to identify factors associated with emergency physicians' major depression. All tests were two-sided, and $P<0.05$ indicated statistical significance.

Results

Characteristics of participants

Table 1 describes the basic characteristics among emergency physicians and general population before PSM. There were 10 457 emergency physicians and 101 120 participants from the general population were included in analysis. Most physicians were aged 31–40 years, but most participants from the general population were aged ≤ 30 years. Compared with the general population,

Table 1 Characteristics of emergency physicians and the general population before and after propensity score matching

Variables	Unmatched			Matched[a]		
	Physicians (N = 10 457)	General population (N = 101 120)	*P* value	Physicians (N = 9271)	General population (N = 9271)	*P* value
Age (years)			< 0.001			1.000
≤ 30	2600 (24.9%)	63 743 (63.0%)		2442 (26.3%)	2442 (26.3%)	
31–40	4977 (47.6%)	14 681 (14.5%)		3949 (42.6%)	3949 (42.6%)	
≥ 41	2880 (27.5%)	22 696 (22.4%)		2880 (31.1%)	2880 (31.1%)	
Gender			< 0.001			1.000
Male	7632 (73.0%)	42 930 (42.5%)		6446 (69.5%)	6446 (69.5%)	
Female	2825 (27.0%)	58 190 (57.5%)		2825 (30.5%)	2825 (30.5%)	
Marital status			< 0.001			1.000
Unmarried/other	1629 (15.6%)	65 492 (64.8%)		1629 (17.6%)	1629 (17.6%)	
Married	8828 (84.4%)	35 628 (35.2%)		7642 (82.4%)	7642 (82.4%)	
Educational level			< 0.001			1.000
Associate degree or below	1684 (16.1%)	46 756 (46.2%)		1684 (18.2%)	1684 (18.2%)	
Bachelor degree or above	8773 (83.9%)	54 364 (53.8%)		7587 (81.8%)	7587 (81.8%)	
Habitual residence			< 0.001			1.000
Western region	3820 (36.5%)	23 511 (23.3%)		3004 (32.4%)	3004 (32.4%)	
Central region	2830 (27.1%)	21 812 (21.6%)		2460 (26.5%)	2460 (26.5%)	
Eastern region	3807 (36.4%)	55 797 (55.2%)		3807 (41.1%)	3807 (41.1%)	
Major depression			< 0.001			< 0.001
No	6723 (64.3%)	87 086 (86.1%)		6030 (65.0%)	7934 (85.6%)	
Yes	3734 (35.7%)	14 034 (13.9%)		3241 (35.0%)	1337 (14.4%)	
Severity of depressive symptoms			< 0.001			< 0.001
None	2330 (22.3%)	52 149 (51.6%)		2109 (22.7%)	4995 (53.9%)	
Mild	4393 (42.0%)	34 937 (34.6%)		3921 (42.3%)	2939 (31.7%)	
Moderate	2027 (19.4%)	9683 (9.6%)		1765 (19.0%)	879 (10.3%)	
Moderately severe	1097 (10.5%)	2956 (2.9%)		949 (10.2%)	298 (3.2%)	
Severe	610 (5.8%)	1395 (1.4%)		527 (5.7%)	101 (0.9%)	

[a] In the propensity score matching model, age, gender, marital status, educational level, and habitual residence were matched

physicians were more likely to be males, be married, have a bachelor degree or above, and live in the central region of China. In PSM, 9271 participants from the general population were matched with physicians at a ratio of 1:1. After PSM, the demographic characteristics were balanced between physicians and the general population with absolute value of standard mean difference < 0.1 (Supplementary Figure 1). The majority of the physicians and the general population were 31–40 years old, males, married, with a bachelor degree or above, and living in the eastern region.

Prevalence of depressive symptoms

As shown in Table 1, the prevalence of major depression among emergency physicians was 35.7% and 13.9% among the general population before PSM. Mild depressive symptoms were observed in 42.0% of emergency physicians, moderate depressive symptoms in 19.4%, moderately severe depressive symptoms in 10.5%, and severe depressive symptoms in 5.8%. In the general population, mild depressive symptoms were observed in 34.6%, moderate depressive symptoms in 9.6%, moderately severe depressive symptoms in 2.9%, and severe depressive symptoms in 1.4%. After PSM, the prevalence of major depression among emergency physicians and the general population was 35.0% and 14.4%, respectively. In addition, there was a significant difference in the distribution of severity of depressive symptoms among emergency physicians and the general population ($P < 0.001$).

The risk of major depression in emergency physicians was 3.65 times higher than in the general population before PSM. Multinomial logistic regression analysis showed that emergency physician was significantly associated with mild (OR: 3.12, 95% CI 2.95–3.30), moderate (OR: 4.94, 95% CI 4.60–5.30), moderately severe (OR: 9.48, 95% CI 8.61–10.44), and severe depressive symptoms (OR: 14.18, 95% CI 12.47–16.13) compared with none depressive symptoms (Table 2). The analysis with a propensity-scored matching sample displayed similar results (Supplementary Table 2).

Risk factors of physicians' major depression

The baseline characteristics of emergency physicians with or without major depression are shown in Table 3. The results of multivariable analysis, as shown in Table 4, indicated that risk factors associated with major depression among emergency physicians included bachelor degree or above (OR: 1.22, 95% CI 1.06–1.40), worked long years (OR: 1.26, 95% CI 1.08–1.46 for 1–5 years; OR: 1.56, 95% CI 1.32–1.84 for ≥ 6 years), experienced workplace violence (OR: 2.51, 95% CI 2.16–2.94), worked more night shifts per month (OR: 1.33, 95% CI 1.16–1.51 for 6–10 times; OR: 1.83, 95% CI 1.58–2.11 for ≥ 11 times), smoked (OR: 1.64, 95% CI 1.47–1.84), and effort-reward imbalance (OR: 4.18, 95% CI 3.62–4.85).

Discussion

To the best of our knowledge, this study is the first to conduct quantitative comparison of depressive symptoms between Chinese emergency physicians and the general population based on national data. Furthermore, we identified the factors associated with major depression in emergency physicians.

Our findings showed that major depression was common among emergency physicians in China, with a prevalence of 35.7%, which was similar to Netherlands (29.0%) [28], Canada (23.2%) [29], and Europe (28.0%) [30]. The risk of major depression was significantly higher for emergency physicians than for the general population before and after matching. More importantly, compared to the none depressive symptoms, emergency physician was significantly associated with mild, moderate, moderately severe, and severe depressive symptoms.

The higher risk for emergency physicians to develop depressive symptoms than the general population may be related to their professional specificity. Emergency physicians are exposed to more stressors than the general population, such as the burden of high professional expectations, the responsibility for patient's well-being, the maintenance of doctor-patient relationship, and the frequent witnessing of deaths [31]. These stressors have been linked to depressive symptoms in physicians [32]. Moreover, as the stress is cumulative, the constant

Table 2 Multinomial logistic regression of the association between occupational groups and severity of depressive symptoms before propensity score matching

	Mild vs. none depressive symptoms		Moderate vs. none depressive symptoms		Moderately severe vs. none depressive symptoms		Severe vs. none depressive symptoms	
	OR (95% CI)[a]	*P*	OR (95% CI)[a]	*P*	OR (95% CI)[a]	*P*	OR (95% CI)[a]	*P*
General population	1.00	–	1.00	–	1.00	–	1.00	–
Emergency physician	3.12 (2.95–3.30)	< 0.001	4.94 (4.60–5.30)	< 0.001	9.48 (8.61–10.44)	< 0.001	14.18 (12.47–16.13)	< 0.001

OR odds ratio, *CI* confidence interval

[a] Adjusted by age, gender, marital status, educational level, and habitual residence

Table 3 Characteristics of emergency physicians with and without major depression

Variables	Major depression (N = 3734)	Without major depression (N = 6723)	χ^2	*P* value
Basic characteristics				
Age (years)			69.674	< 0.001
≤ 30	868 (23.3%)	1732 (25.8%)		
31–40	1976 (52.9%)	3001 (44.6%)		
≥ 41	890 (23.8%)	1990 (29.6%)		
Gender			25.449	< 0.001
Male	2835 (75.9%)	4797 (71.4%)		
Female	899 (24.1%)	1926 (28.7%)		
Marital status			1.439	0.230
Unmarried/other	603 (16.2%)	1026 (15.3%)		
Married	3131 (83.9%)	5697 (84.7%)		
Educational level			43.899	< 0.001
Associate degree or below	482 (12.9%)	1202 (17.9%)		
Bachelor degree or above	3252 (87.1%)	5521 (82.1%)		
Habitual residence			14.138	0.001
Western region	1444 (38.7%)	2376 (35.3%)		
Central region	945 (25.3%)	1885 (28.0%)		
Eastern region	1345 (36.0%)	2462 (36.6%)		
Work-related factors				
Qualification title			39.140	< 0.001
Junior or below	1721 (46.1%)	3251 (48.4%)		
Moderate	1599 (42.8%)	2513 (37.4%)		
High	414 (11.1%)	959 (14.3%)		
Monthly income (CNY)			23.232	< 0.001
≤ 4000	1460 (39.1%)	2402 (35.7%)		
4001–6000	1294 (34.7%)	2268 (33.7%)		
≥ 6001	980 (26.3%)	2053 (30.5%)		
Years of service			68.226	< 0.001
< 1	390 (10.4%)	1058 (15.7%)		
1–5	1394 (37.3%)	2571 (38.2%)		
≥ 6	1950 (52.2%)	3094 (46.0%)		
Night shift (times/month)			249.630	< 0.001
≤ 5	464 (12.4%)	1569 (23.3%)		
6–10	2017 (54.0%)	3616 (53.8%)		
≥ 11	1253 (33.6%)	1538 (22.9%)		
Experienced workplace violence			505.586	< 0.001
No	241 (6.5%)	1612 (24.0%)		
Yes	3493 (93.6%)	5111 (76.0%)		
Lifestyle factors				
Smoking			109.831	< 0.001
No	2564 (68.7%)	5242 (78.0%)		
Yes	1170 (31.3%)	1481 (22.0%)		
Drinking			8.990	0.003
No	2344 (62.8%)	4417 (65.7%)		
Yes	1390 (37.2%)	2306 (34.3%)		
Physical exercise (times/week)			355.795	< 0.001
Never	2195 (58.8%)	2702 (40.2%)		
Once	751 (20.1%)	1659 (24.7%)		
Twice or more	788 (21.1%)	2362 (35.1%)		

Table 3 (continued)

Variables	Major depression (N = 3734)	Without major depression (N = 6723)	χ^2	*P* value
ERI			743.793	< 0.001
No	257 (6.9%)	2003 (29.8%)		
Yes	3477 (93.1%)	4720 (70.2%)		
Self-efficacy (mean ± SD)	26.8 ± 5.9	23.0 ± 6.4	30.205	< 0.001

CNY Chinese Yuan, *ERI* effort-reward imbalance, *SD* standard deviation

stressors would increase the stress level and exacerbate depressive symptoms for physicians who work in a high-pressure environment for a long time. Siegrist's ERI model proposed that the ERI is an indicator of occupational stress [24]. This study also revealed that physicians with ERI were more likely to experience depressive symptoms, which was consistent with the study by private physicians in Japan [33]. Ge et al. have noted a relatively high level of ERI among Chinese healthcare workers [34]. Existing research indicates that an imbalance of effort and reward can lead to feelings of humiliation and low self-esteem, both of which are important psychological processes in the development of depression [35–37].

In addition, the profession of emergency physician is also characterized by shift work in order to provide medical services to patients around the clock. Shift work includes night work. It has been reported that physicians take on more night shifts than other professions [38]. Prolonged night work disrupts the circadian rhythm on sleep, hormone regulation, and many other biological functions, which induces activation of clinical pathways of depressive symptoms and increases the risk of depressive symptoms [39]. Meta-analysis studies have shown that the risk of depressive symptoms increased by 33%–42% among persons working night shifts [40, 41]. Our findings also demonstrated that emergency physicians who worked more night shifts per month had a higher risk of depressive symptoms.

The higher risk of depressive symptoms among emergency physicians than the general population may also be related to their greater susceptibility to workplace violence. Physicians are a high-risk group for workplace violence because they often deal with a person in stressful and emotional situations [42, 43]. According to Cognitive Trauma Theory [44], workplace violence as a traumatic event not only undermines physicians' positive perceptions of society, but also severely impairs their psychological balance and makes them more susceptible to depressive symptoms. This study also found that the exposure to workplace violence was one of the significant risk factors for physicians to have depressive symptoms, which was consistent with the results conducted in healthcare workers [45, 46]. This might be because workplace violence could lead to feelings of helplessness and despair, which have been reported to be closely linked to the etiology of depression [47]. Another possible explanation is that physicians are prone to doubt their self-worth and professional value due to workplace violence, which increases the risk of depressive symptoms [48].

Of note, this study found that emergency physicians with higher levels of self-efficacy showed a lower risk of depressive symptoms, which is consistent with what was proposed by social cognitive theory [49]. Physicians who exhibit high self-efficacy generally feel confident in their ability to cope with stress and persist in the face of challenges. Positive self-evaluation improves physicians' control over their work tasks, thus contributing to reduce their risk of depressive symptoms. It is of great importance to take measures to improve physicians' self-efficacy.

The study findings highlight the importance of addressing depressive symptoms among emergency physicians for policymakers and hospital administrators. ERI and workplace violence are the two most significant risk factors to the depressive symptoms. As for the ERI, our study emphasizes the importance of the reciprocal experience between effort and reward in reducing the risk of depressive symptoms. To achieve this reciprocal, hospital administrators can implement a variety of incentives, such as increasing salaries and benefits, offering more training opportunities, and expanding promotion pathways.

In terms of workplace violence, given the occupational characteristics of emergency physicians, our study suggests taking relevant measures from the aspects of prevention, emergency response, and handling. First, medical staff should take emergency drills on workplace violence to enhance their ability to prevent and respond to workplace violence. Second, a hospital violence emergency management system should be established to ensure timely warning, monitoring, and handling of workplace violence. In addition, hospitals should have dedicated psychological counselors and develop effective mental health support plans to provide timely psychological intervention for physicians experiencing depression

Table 4 Binary logistic regression of factors related to major depression among emergency physicians (n = 10 457)

Variables	OR	95% CI	*P* value
Basic characteristics			
Age (years)			
≤ 30	Reference		
31–40	1.02	0.89–1.17	0.772
≥ 41	0.84	0.70–1.01	0.057
Gender			
Male	Reference		
Female	1.00	0.89–1.12	0.976
Marital status			
Unmarried/other	Reference		
Married	0.75	0.65–0.86	< 0.001
Educational level			
Associate degree or below	Reference		
Bachelor degree or above	1.22	1.06–1.40	0.006
Habitual residence			
Western region	Reference		
Central region	0.82	0.73–0.92	0.001
Eastern region	0.84	0.75–0.93	0.001
Work-related factors			
Qualification title			
Junior or below	Reference		
Moderate	1.09	0.97–1.23	0.147
High	1.03	0.85–1.24	0.780
Monthly income (CNY)			
≤ 4000	Reference		
4001–6000	0.83	0.74–0.92	0.001
≥ 6001	0.66	0.58–0.74	< 0.001
Years of service			
< 1	Reference		
1–5	1.26	1.08–1.46	0.003
≥ 6	1.56	1.32–1.84	< 0.001
Night shift (times/month)			
≤ 5	Reference		
6–10	1.33	1.16–1.51	< 0.001
≥ 11	1.83	1.58–2.11	< 0.001
Experienced workplace violence			
No	Reference		
Yes	2.51	2.16–2.94	< 0.001
Lifestyle factors			
Smoking			
No	Reference		
Yes	1.64	1.47–1.84	< 0.001
Drinking			
No	Reference		
Yes	0.96	0.87–1.07	0.463
Physical exercise (times/week)			
Never	Reference		
Once	0.69	0.61–0.77	< 0.001
Twice or more	0.59	0.53–0.66	< 0.001
ERI			
No	Reference		
Yes	4.18	3.62–4.85	< 0.001
Self-efficacy	0.91	0.91–0.92	< 0.001

OR odds ratio, *CI* confidence interval, *CNY* Chinese Yuan, *ERI* effort-reward imbalance

and other psychological issues due to workplace violence. The mass media also should use their advantages to objectively report on incidents of violence against physicians, raising public awareness and understanding of such events. Last but not least, establishing a scientific shift system and properly arranging physician handovers in clinical work can help reduce the risk of depressive symptoms among physicians as well.

Limitations

First, the physicians included in this study were emergency physicians. Compared to physicians in other departments, emergency physicians frequently contend with challenging working conditions and significant stress, they are potentially at a higher risk for experiencing depressive symptoms. Caution is warranted when generalizing our conclusion to all physicians. Second, this study used a self-report approach to measure depressive symptoms that may lead to recall bias. Finally, as we collected data via online survey, the majority of the respondents were from younger and middle-aged groups who use the Internet and electronic devices more frequently. This may lead to selection bias. Therefore, we employed PSM to ensure baseline comparability between emergency physicians and the general population and remained cautious when interpreting the results.

Conclusion

The risk of emergency physicians developing depressive symptoms is higher than that of the general population. ERI and workplace violence are the two most significant risk factors for depressive symptoms among emergency physicians, indicating that improving physicians' working conditions is of great significance in reducing their risk of depressive symptoms.

Abbreviations

PHQ-9 Patient Health Questionnaire-9
ERI Effort-reward imbalance
ERR Effort-reward ratio
GSE General Self-Efficacy Scale
PSM Propensity score matching

OR Odds ratio
CI Confidence interval

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12960-024-00952-7.

Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Author contributions

Nan Jiang: methodology, software, writing—original draft preparation. Hongmei Chen: conceptualization, writing—review. Xiaoxv Yin: conceptualization, writing—review. Jing Wang: conceptualization, methodology. Yafei Wu: investigation, validation. Mengge Tian: investigation, validation. Jiali Zhang: investigation, validation. Zhenyuan Chen: investigation, software. Jianxiong Wu: investigation, validation. Chuanzhu Lv: investigation, funding acquisition. Fengjie Yang: supervision, writing—review and editing. Yanhong Gong: data curation, supervision, writing—review and editing.

Funding

This study was funded by Department of Science and Technology of Hainan Province, Major Science and Technology Projects (Grant Number: ZDKJ202004), Key Research and Development Program (Grant Number: ZDYF2020112). The funding resource had no role in study design; data collection, analysis and interpretation of data; writing of the report; or in the decision to submit the article for publication.

Availability of data and materials

The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Medical Ethics Committee of Hainan Medical College (HYLL-2018-035) and Medical Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Department of Social Medicine and Health Management, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, People's Republic of China. [2]School of Nursing, Wuchang University of Technology, Wuhan, People's Republic of China. [3]Department of Emergency Medicine Center, Sichuan Provincial People's Hospital, University of Electronic Science and Technology of China, Chengdu, People's Republic of China. [4]Research Unit of Island Emergency Medicine, Chinese Academy of Medical Sciences, Hainan Medical University, Haikou, Hainan, People's Republic of China. [5]Key Laboratory of Emergency and Trauma of Ministry of Education, Hainan Medical University, Haikou, Hainan, People's Republic of China. [6]Department of Pediatrics, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei 430030, People's Republic of China.

Received: 17 July 2023 Accepted: 24 September 2024
Published online: 25 October 2024

References

1. Health The Lancet Global. Health-care workers must be trained and retained. Lancet Glob Health. 2023;11(5):e629.
2. World Health Organization. Human resources for health: global strategy on human resources for health: workforce 2030: report by the Director-General. https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75_15-ch.pdf.
3. Boniol M, Kunjumen T, Nair TS, Siyam A, Campbell J, Diallo K. The global health workforce stock and distribution in 2020 and 2030: a threat to equity and 'universal' health coverage? BMJ Glob Health. 2022;7(6):e009316.
4. McPake B, Dayal P, Zimmermann J, Williams GA. What steps can improve and promote investment in the health and care workforce? https://iris.who.int/bitstream/handle/10665/366654/Policy-brief-54-1997-8073-eng.pdf?sequence=1.
5. McDaid D, Drummond M, Suhrcke M. How can European health systems support investment in and the implementation of population health strategies? https://iris.who.int/bitstream/handle/10665/107902/Policy-brief-1-1997-8073-eng.pdf?sequence=14.
6. World Health Organization. Depression. https://www.who.int/health-topics/depression#tab=tab_1.
7. Bostwick JM, Pankratz VS. Affective disorders and suicide risk: a reexamination. Am J Psychiatry. 2000;157:1925–32.
8. World Health Organization. Depressive disorder (depression). https://www.who.int/news-room/fact-sheets/detail/depression.
9. Harvey SB, Epstein RM, Glozier N, Petrie K, Strudwick J, Gayed A, et al. Mental illness and suicide among physicians. Lancet. 2021;398(10303):920–30.
10. de Oliveira C, Saka M, Bone L, Jacobs R. The role of mental health on workplace productivity: a critical review of the literature. Appl Health Econ Health Policy. 2023;21(2):167–93.
11. Mata DA, Ramos MA, Bansal N, Khan R, Guille C, Di Angelantonio E, et al. Prevalence of depression and depressive symptoms among resident physicians: a systematic review and meta-analysis. JAMA. 2015;314(22):2373–83.
12. Wang JN, Sun W, Chi TS, Wu H, Wang L. Prevalence and associated factors of depressive symptoms among Chinese doctors: a cross-sectional survey. Int Arch Occup Environ Health. 2010;83(8):905–11.
13. Gong Y, Han T, Chen W, Dib HH, Yang G, Zhuang R, et al. Prevalence of anxiety and depressive symptoms and related risk factors among physicians in China: a cross-sectional study. PLoS ONE. 2014;9(7): e103242.
14. Fu C, Wang G, Shi X, Cao F. Social support and depressive symptoms among physicians in tertiary hospitals in China: a cross-sectional study. BMC Psychiatry. 2021;21(1):217.
15. National Health Commission of the People's Republic of China. China health statistical yearbook. Beijing: Peking Union Medical College Press; 2020.
16. The World Bank. Physicians (per 1,000 people). https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?end=2019&name_desc=true&start=1960&view=chart.
17. National Health Commission of the People's Republic of China. China health statistical yearbook. Beijing: Peking Union Medical College Press; 2010.
18. Chia KW, Liao YM. An exploratory study of factors influencing Chinese outbound medical tourism. J China Tour Res. 2020;17(3):376–94.
19. Global Growth Market. 2018 China outbound medical tourism market intelligence service. http://www.ggmkts.com/r-0111-2018-china-outbound-medical-tourism-post-launch.
20. Shi X, Bao J, Zhang H, Wang H, Wang Y, Li L, et al. Emergency medicine in China: a review of the history of progress and current and future challenges after 40 years of reform. Am J Emerg Med. 2020;38(3):662–9.
21. Pan C, Pang JJ, Cheng K, Xu F, Chen YG. Trends and challenges of emergency and acute care in Chinese mainland: 2005–2017. World J Emerg Med. 2021;12(1):5–11.
22. Alshardi A, Farahat F. Prevalence and predictors of depression among medical residents in western Saudi Arabia. J Clin Psychol Med Settings. 2020;27:746–52.
23. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16:606–13.

24. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R. The measurement of effort-reward imbalance at work: European comparisons. Soc Sci Med. 2004;58:1483–99.
25. Li J, Yang W, Cheng Y, Siegrist J, Cho SI. Effort-reward imbalance at work and job dissatisfaction in Chinese healthcare workers: a validation study. Int Arch Occup Environ Health. 2005;78:198–204.
26. Schwarzer R, Bäßler J, Kwiatek P, Schröder K, Zhang JX. The assessment of optimistic self-beliefs: comparison of the German, Spanish, and Chinese versions of the general self-efficacy scale. Appl Psychol. 1997;46(1):69–88.
27. Yao Y, Wang W, Wang F, Yao W. General self-efficacy and the effect of hospital workplace violence on doctors' stress and job satisfaction in China. Int J Occup Med Environ Health. 2014;27(3):389–99.
28. Ruitenburg MM, Frings-Dresen MH, Sluiter JK. The prevalence of common mental disorders among hospital physicians and their association with self-reported work ability: a cross-sectional study. BMC Health Serv Res. 2012;12:292–8.
29. Compton MT, Frank E. Mental health concerns among Canadian physicians: results from the 2007–2008 Canadian Physician Health Study. Compr Psychiatry. 2011;52:542–7.
30. Alvarez-Galvez J, Rojas-Garcia A. Measuring the impact of multiple discrimination on depression in Europe. BMC Public Health. 2019;19:435.
31. Tanner G, Bamberg E, Kozak A, Kersten M, Nienhaus A. Hospital physicians' work stressors in different medical specialities: a statistical group comparison. J Occup Med Toxicol. 2015;10:7.
32. Buddeberg-Fischer B, Klaghofer R, Stamm M, Siegrist J, Buddeberg C. Work stress and reduced health in young physicians: prospective evidence from Swiss residents. Int Arch Occup Environ Health. 2008;82:31–8.
33. Tsutsumi A, Kawanami S, Horie S. Effort-reward imbalance and depression among private practice physicians. Int Arch Occup Environ Health. 2012;85(2):153–61.
34. Ge J, He J, Liu Y, Zhang J, Pan J, Zhang X, Liu D. Effects of effort-reward imbalance, job satisfaction, and work engagement on self-rated health among healthcare workers. BMC Public Health. 2021;21(1):195.
35. Harris T. Recent developments in understanding the psychosocial aspects of depression. Br Med Bull. 2001;57:17–32.
36. Kendler KS, Hettema JM, Butera F, Gardner CO, Prescott CA. Life event dimensions of loss, humiliation, entrapment, and danger in the prediction of onsets of major depression and generalized anxiety. Arch Gen Psychiatry. 2003;60(8):789–96.
37. Sowislo JF, Orth U. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. Psychol Bull. 2013;139(1):213–40.
38. Smith-Coggins R, Broderick KB, Marco CA. Night shifts in emergency medicine: the American board of emergency medicine longitudinal study of emergency physicians. J Emerg Med. 2014;47:372–8.
39. Angerer P, Schmook R, Elfantel I, Li J. Night work and the risk of depression. Dtsch Arztebl Int. 2017;114:404–11.
40. Lee A, Myung SK, Cho JJ, Jung YJ, Yoon JL, Kim MY. Night shift work and risk of depression: meta-analysis of observational studies. J Korean Med Sci. 2017;32:1091–6.
41. Torquati L, Mielke GI, Brown WJ, Burton NW, Kolbe-Alexander TL. Shift work and poor mental health: a meta-analysis of longitudinal studies. Am J Public Health. 2019;109:e13–20.
42. Kumari A, Kaur T, Ranjan P, Chopra S, Sarkar S, Baitha U. Workplace violence against doctors: characteristics, risk factors, and mitigation strategies. J Postgrad Med. 2020;66:149–54.
43. Wu Q, Zhao L, Ye XC. Shortage of healthcare professionals in China. BMJ. 2016;354: i4860.
44. Janoff-Bulman R. Shattered assumptions: towards a new psychology of trauma. New York: Free Press; 1992.
45. Rudkjoebing LA, Hansen ÅM, Rugulies R, Kolstad H, Bonde JP. Exposure to workplace violence and threats and risk of depression: a prospective study. Scand J Work Environ Health. 2021;47(8):582–90.
46. Owen CP, Djukic M, Whisenant M, Lobiondo-Wood G. Factors of maladaptive coping in emergency healthcare professionals: a systematic review. J Nurs Scholarsh. 2023;55(2):536–48.
47. Beck AT, Alford BA. Depression: causes and treatment. 2nd ed. Philadelphia: University of Pennsylvania Press; 2009.
48. Wang H, Zhang Y, Sun L. The effect of workplace violence on depression among medical staff in China: the mediating role of interpersonal distrust. Int Arch Occup Environ Health. 2021;94(3):557–64.
49. Bandura A. On the functional properties of perceived self-efficacy revisited. J Manag. 2012;38:9–44.

Publisher's Note