

Prevalence of Depression in General Practitioners during the COVID-19 Pandemic in Lorestan province, Iran, in 2020-2021

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ABSTRACT

Background: The Coronavirus disease 2019 (COVID-19) pandemic has imposed negative effects on the mental well-being of society and in particular healthcare workers. General practitioners (GPs), as frontline health workers, are continually exposed to mood problems that might endanger their ability to provide patients with proper care. To investigate the prevalence of depression in GPs during the COVID-19 pandemic. **Material and Methods:** This was a cross-sectional study conducted in Khorramabad city Lorestan province, Iran, from 2020 to 2021. A total of 151 GPs working in primary health centers and hospitals were studied. Demographic information including age, sex, and marital status was collected. Beck Depression Inventory-II was used to evaluate the symptoms of depression. The collected data were analyzed by SPSS software version 22. **Results:** In this study, 151 subjects were included, 75 of whom (49.7%) were male. The mean age of the studied population was 38.6 ± 11.4 years. Ninety-seven subjects (64.2%) had moderate depression, 41 (27.2%) had severe depression, and 13 (8.6%) had very severe depression. The frequency of severe depression was significantly higher in divorced and widowed individuals ($p = 0.025$), and those with less than 5 years of work experience ($p=0.043$), compared with other groups. **Conclusion:** In this study, an extreme rate of depression was observed among GPs during the COVID-19 pandemic. Integrated policies should be adopted to empower healthcare workers to maintain their mental well-being during health crises.

Keywords: COVID-19, Depression, General practitioners.

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INTRODUCTION

Depression is a mood disorder and a major cause of disability around the world (1). The impacts of depression on patients could be categorized into psychological, emotional, and physical impairments (2). Some clinical manifestations of depression are declined communication and lack of ability to cooperate, which impair patients' social interactions (1). Depression is also known as a risk factor for many diseases such as heart failure, Alzheimer's, and dementia (3-5). Some groups have been reported to be at a higher risk for depression compared with the general population. Several studies have indicated the high rate of depression in medical students and medical professionals (6-8). Meanwhile, the global

outbreak of the Coronavirus disease 2019 (COVID-19), which was first reported in China in 2019, has affected almost all regions with Iran being one of the most affected countries (9, 10). This pandemic has influenced the lives of all people, leading to various physical disorders (11). Furthermore, many researchers have observed an increased rate of psychological disorders, including clinically-significant depression, during the COVID-19 pandemic (12, 13). Any global crisis can impose a major stressful burden on societies. However, individuals might respond to crises in a different way, depending on their personality, psychological endurance, as well as environmental characteristics such as job (14, 15). In respect to occupation, healthcare workers are exposed to

the highest emotional distress during pandemics, because of the risk of being affected by the disease, concern about infecting their relatives, and extended hours of work (16). In a previous study in Iran, 37.7% of the medical staff had symptoms of stress disorders during the COVID-19 pandemic (17). Another study reported similar findings indicating remarkably higher depression and anxiety scales among clinical laboratory staff compared with nonmedical workers (15). General practitioners (GPs) have been the frontline health providers during the COVID-19 pandemic, which exposed them to a higher risk of psychological disorders. As GPs are the first contact with COVID-19 patients, their poor mental health can exert downstream effects on patients through deteriorated attention span and clinical decision-making (18). We hypothesize that several factors such as work sector, employment type, and work experience might affect the risk of psychological disorders among healthcare workers, which necessitates the investigation of psychological disorders in medical staff working in different health systems. Hence, we decided to evaluate the frequency of depression among Iranian GPs given the potential impact of depression on their personal and professional life activities.

MATERIAL AND METHODS

Study design

This was a cross-sectional study performed on GPs who worked in different health centers including primary health centers and hospitals of Khorramabad city, Lorestan province, Iran, from march 2020 to march 2021. The inclusion criteria were no prior history of answering the Beck depression inventory, negative psychotropic medications history, no history of severe stress like the death of a loved one, and no psychological concerns within the preceding six months. Subjects with documented psychiatric disorders were excluded. The sampling method was census and all the subjects who met the criteria were studied.

Demographic variables scale

Demographic data including age, sex, and marital status as well as years of experience, type of employment, and working sector were collected.

Depression scale

Beck Depression Inventory-II was used to assess the symptoms of depression among the studied population. Beck Depression Inventory was introduced by Aaron Temkin Beck in 1961. This questionnaire consists of 21 items assessing cognitive (7 items), emotional (5 items), and physical components (9 items). Components assessed by this questionnaire were sadness, pessimism, past failure, not enjoying, feeling guilty, feeling punished, not liking oneself, self-criticism, suicidal thoughts or suicidal ideation, crying, restlessness, loss of interest, indecision, loss of energy, sleep patterns changes, mobility, appetite changes, difficulty concentrating, fatigue or boredom, and loss of sexual desire. The components scoring was based on a four-point Likert scale from strongly agree to strongly disagree (0 points). The overall questionnaire score was 63. Based on the achieved score, the prevalence and severity of depression could be detected. A score of 0-9 is known as non-depressed, 10-20 as mild, 21-30 as moderate, 31-40 as se-

vere, and 41-63 as very severe depression (19). The validity and reliability of the questionnaire have been evaluated previously. The mean correlation coefficients between clinical scales and the Beck Depression Inventory were 0.72 and 0.60 for psychiatric and non-psychiatric individuals, respectively (20). A high 1-week test-retest reliability has also been reported ($r = 0.93$) (21). In this study, we used a validated Persian version of the Beck Depression Inventory-II that had shown an internal consistency of 0.87 and acceptable test-retest reliability of 0.74 (22).

Statistical analysis

The collected data were analyzed by Statistical Package for the Social Sciences, version 22.0, SPSS Inc, Chicago, Illinois, USA (SPSS). Descriptive statistics tools including frequency and percentage, or mean and standard deviation (SD) were used to describe the categorical and nominal variables, respectively. The Chi-square test was used to assess independence across categorical variables. Also, ANOVA and T-tests were utilized to compare the mean of quantitative variables in different groups. The significance level was set at 0.05 for all statistical tests.

RESULTS

In the present study, a total of 151 GPs were included, 76 of whom (50.3%) were female and 75 (49.7%) were male. The mean age was 38.6 ± 11.4 years, with a minimum of 25 and a maximum of 85 years old. Further demographic characteristics of the studied population are listed in Table 1.

Table 1. Demographic information of the studied population.

Variable		Frequency (%)
Age groups	≤ 30	45 (29.8)
	31-40	56 (37.1)
	40<	50 (33.1)
Sex	Female	76 (50.3)
	Male	75 (49.7)
Marital status	Single	40 (26.5)
	Married	88 (58.3)
	Widowed	23 (15.2)
Work experience (years)	<5	66 (43.7)
	5-15	51 (33.8)
	15<	34 (22.5)
Work experience (years)	Compulsory medical service program	31 (20.6)
	Under a contract	36 (23.8)
	Permanent contract	22 (14.6)
	Contractual	21 (13.9)
Work sector	Other types	41 (27.1)
	Public sectors	79 (52.3)
	Private sectors	72 (47.7)
Working service	Hospitals	134 (88.7)
	Primary healthcare centers	17 (11.3)

Table 2. Mean and standard deviation of scores of different dimensions of depression along with the range of scores

Depression dimen-sions	Depression di-men-sions score*	Minimum score	Maximum score
Physical	13.4±4.3	9	27
Emotional	7.4±2.03	5	15
cognitive	9.62±2.72	7	21

*Data presented as Mean ± SD.

Based on the results, 97 subjects (64.2%) had moderate, 41 (27.2%) had severe, and 13 (8.6%) had very severe depression (Table 2).

There was no significant association between depression severity and age groups ($p = 0.173$) or gender ($p = 0.553$). However, a significant relationship was found between the severity of depression and marital status, as the rate of severe depression in divorced and widowed GPs was remarkably higher than in others ($p = 0.025$). We found no significant relationship between the severity of depression and type of employment ($p = 0.115$), work sector ($p = 0.067$), or working service ($p = 0.327$). Nevertheless, the association between the severity of depression and work experience was statistically significant ($p = 0.043$). Detailed information is shown in Table 3.

The difference in the mean score of physical dimension in physicians was not statistically significant by age ($p = 0.741$) and sex ($p = 0.492$). However, the difference in the mean score of physical dimension based on marital status was significant. The score of divorced or widowed people was significantly higher than single and married people ($p = 0.037$). The difference in the score of emotional dimension was not significant by gender ($p = 0.792$) but it was statistically significant by age groups ($p = 0.017$), and marital status ($p < 0.001$). Also, using the ANOVA, the difference in the cognitive dimension score in physicians by age group was not statistically significant ($p = 0.64$) but it was statistically significant by marital status ($p = 0.001$). Divorced and widowed individuals had worse cognitive dimension scores than the other subjects. Based on the independent t-test, the difference in the cognitive dimension score according to gender was not statistically significant ($p = 0.669$). Detailed information showed in Table 4.

DISCUSSION

The effects of the COVID-19 pandemic on the mental well-being of societies have been immeasurable. Even a paper in The Lancet called for data on the mental health status of the general population and in particular high-risk individuals, including healthcare providers (23). The present study showed an extreme rate of depression among Iranian GPs working during the COVID-19 pandemic. We found no statistically significant relationship between depression and age, gender, type of employment, work sector, and working service. However, the rate of severe depression was significantly higher in divorced and widowed individuals and those with <5 years of work experience.

Medical professionals are classically considered among high-risk groups for the development of psychological disorders such as depression and anxiety (8). For instance, Kerrien and colleagues re-

ported a 27% rate of depression, as well as a 28.7% rate of anxiety among junior doctors (24). The COVID-19 pandemic exerted an excessive deal of psychological distress on healthcare providers

Table 3. Frequency distribution of depression severity in physicians by demographic characteristics and work experience

Characteristics	Depression severity*				P-value **
	Moder-ate	Severe	Very severe	overall	
Age groups	23 (51.1)	18 (40)	4 (8.9)	45 (100)	0.173
30≥					
31-40	38 (67.9)	12 (21.4)	6 (10.7)	56 (100)	
40<	36 (72)	11(22)	3 (6)	50 (100)	0.553
Sex					
Male	45 (60)	23 (30.7)	7 (9.3)	75 (100)	
Female	52 (68.4)	18 (23.7)	6 (7.9)	76 (100)	0.025
Marital status					
Single	26 (65)	11 (27.5)	3 (7.5)	40 (100)	
Married	58 (65.9)	26 (29.5)	4 (4.5)	88 (100)	0.043
Widowed	13 (56.5)	4 (17.4)	6 (26.1)	23 (100)	
Work experience (years)					0.115
5>	34 (51.1)	25 (37.9)	7 (10.6)	66 (100)	
5-15	36 (70.6)	10 (19.6)	5 (9.8)	51 (100)	
15<	27 (79.4)	6 (17.6)	1 (2.9)	34 (100)	0.067
Employment type					
Compulsory medical service program	19 (61.3)	12 (38.7)	0 (0)	31 (100)	0.327
Under a contract	20 (55.6)	10 (27.8)	6 (16.7)	36 (100)	
Permanent contract	13 (59.1)	6 (27.3)	3 (13.6)	22 (100)	
Contractual	13 (61.9)	5 (23.8)	3 (14.3)	21 (100)	0.327
Other types	32 (78)	8 (19.5)	1 (2.4)	41 (100)	
Work sector					
Public sectors	44 (55.7)	26 (32.9)	9 (11.4)	79 (100)	0.327
Private sectors	53 (73.6)	15 (20.8)	4 (5.6)	72 (100)	
Working service Hospitals	88 (65.7)	36 (26.9)	10 (7.5)	134 (100)	
Primary health-care centers	9 (52.9)	5 (29.4)	3 (17.6)	17 (100)	

*Data presented as numbers (Percent).

**Chi-square test

Table 4. Comparison of the mean scores of different dimensions of depression in GPs according to their demographic characteristics

Characteristics		Physical*	P-value	Emotional*	P-value	Cognitive*	P-value
Age groups	30≥	13.84±4.24	0.741	8.08±2.17	0.017	9.91±2.9	0.64 **
	31-40	13.42±4.3		7.16±1.79		9.62±2.68	
	40<	13.16±4.39		6.98±2.02		9.38±2.62	
Sex	Male	13.7±4.25	0.492	7.33±1.85	0.729	9.53±2.48	0.669 ***
	Female	13.22±4.35		7.42±2.2		9.72±2.95	
Marital status	Single	13±4.18	0.037	7.95±1.89	<0.001	9.5±2.51	0.001 **
	Married	13.12±3.69		6.81±1.71		9.18±2.04	
	Widowed	15.56±5.93		6.52±2.62		11.47±4.29	

*Data presented as Mean ± SD
 **ANOVA
 ***T-test

(25). Medical professionals who fought against COVID-19 were more commonly affected by sleep disorders, stress, and psychiatric conditions (26). Similar to the present work, several studies have reported a high rate of psychological disorders such as depression, anxiety, and sleep disorders among medical staff working during the pandemic (25, 27, 28). This can be justified by the increased concern about being affected in the work environment, concern about infecting relatives, involvement in the allocation of life-saving resources, and extended hours of work (16).

Several studies have evaluated the epidemiology of depression and proposed different inducing factors. Similar to the findings of the present study, Liu et al. observed that divorced and widowed medical professionals were at an increased risk of mental health problems (29). The higher rate of depression among divorced and widowed individuals is justifiable by the loneliness and lack of familial support which would be helpful for tolerating the increased work burden. It is widely accepted that depression and marital status have a mutual effect on each other. Being depressed can damage the marital relationship and increase the chance of separation. Conversely, the stressful nature of divorce can lead to mood disorders including depression (30).

In respect to the higher rate of severe depression among GPs with less than 5 years of work experience, similar findings have been reported. Song and co-workers reported that medical staff working <10 years and those working > 12 hours per day were more frequently affected by depression during the pandemic (31). It should be noted that newly graduated physicians might not be totally free to choose their work sector and shifts, which can cause mental tension. Also, we suppose that those with higher experience might have more stabilized personal and occupational status, which can improve their psychological well-being.

LIMITATIONS

The results of this study should be interpreted in light of some limitations; first, the exact depression scale of the studied population before the pandemic was unknown which might affect the final results. Also, given the rigorous shifts of medical staff during

the pandemic, we encountered difficulties to contact physicians.

FUTURE DIRECTIONS

The findings of the present study suggest that in times of pandemic crises, institutional support for medical workers, in particular GPs, is crucial for improving their mental health.

CONCLUSION

In conclusion, the prevalence of depression was extremely high in GPs during the pandemic and we suppose that some risk factors that originate from medical school and continued by the time even after graduation could contribute to this predicament. Identifying and preventing all of these risk factors could take time, but it is necessary to adopt certain policies to empower healthcare providers to maintain their mental well-being, in particular during health crises.

ETHICAL CONSIDERATION

The ethical research committee of Lorestan University of Medical Sciences, Khorramabad, Lorestan, Iran approved this study (ethical code: IR.LUMS.REC.1399.371). The participants' personal information remained confidential, and all the participants agreed to attend the study by signing the written informed consent.

CONFLICT OF INTERESTS:

None.

ABBREVIATIONS

COVID-19; Coronavirus disease 2019, GPs; General practitioners, SD; standard deviation.

REFERENCES

- Kupferberg A, Bicks L, Hasler G. Social functioning in major depressive disorder. *Neuroscience and biobehavioral reviews*. 2016;69:313-32.
- Kessler RC, Bromet EJ. The epidemiology of depression across cultures. *Annual review of public health*. 2013;34:119-38.
- Cantón-Habas V, Rich-Ruiz M, Romero-Saldaña M, Carrera-González MDP. Depression as a Risk Factor for Dementia and Alzheimer's Disease. *Biomedicines*. 2020;8(11).
- Cao L, Sheng C, Luo G, Ou J. Depression as a Risk Factor for Developing Heart Failure: A Meta-Analysis of Prospective Cohort Studies. *The Journal of cardiovascular nursing*. 2020.
- Sáiz-Vázquez O, Gracia-García P, Ubillos-Landa S, Puente-Martínez

- A, Casado-Yusta S, Olaya B, et al. Depression as a Risk Factor for Alzheimer's Disease: A Systematic Review of Longitudinal Meta-Analyses. *Journal of clinical medicine*. 2021;10(9).
6. Jin T, Sun Y, Wang H, Qiu F, Wang X. Prevalence of depression among Chinese medical students: A systematic review and meta-analysis. *Psychology, health & medicine*. 2021;1-17.
7. Sarokhani D, Delpisheh A, Veisani Y, Sarokhani MT, Manesh RE, Sayehmiri K. Prevalence of Depression among University Students: A Systematic Review and Meta-Analysis Study. *Depression research and treatment*. 2013;2013:373857.
8. Onyishi M, Talukdar D, Sanchez R, Olaleye AO, Medavarapu S. Prevalence of clinical depression among medical students and medical professionals: a systematic review study. *Archives of medicine*. 2016;8(6):0-.
9. Rouzbahani AK, Kheirandish F, Hosseini SZ. Design of a multi-epitope-based peptide vaccine against the S and N proteins of SARS-COV-2 using immunoinformatics approach. *Egyptian Journal of Medical Human Genetics*. 2022;23(1):16.
10. Joulaei H, Fatemi M, Hooshyar D, Karimi Rouzbahani A, Joulaei R, Forooznanfar Z. Analyzing delay in referral of pregnant women and children under five years old during the COVID-19 pandemic: Fars Province, Iran. *Health Care for Women International*. 2022;1-17.
11. Otaghvar HA, Rouzbahani AK, Mahmoudvand G, Moghaddam S, Afkham SA, Razavi ZS. A Brief Report on the Effect of Covid 19 Pandemic on Patients Undergoing Skin Graft Surgery in a Burns Hospital from March 2019 to March 2020. *J Case Rep Med Hist*. 2022;2(8).
12. Mazza MG, De Lorenzo R, Conte C, Poletti S, Vai B, Bollettini I, et al. Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. *Brain, behavior, and immunity*. 2020;89:594-600.
13. Renaud-Charest O, Lui LM, Eskander S, Ceban F, Ho R, Di Vincenzo JD, et al. Onset and frequency of depression in post-COVID-19 syndrome: A systematic review. *Journal of psychiatric research*. 2021;144:129-37.
14. Eslamzadeh M, Fayyazi Bordbar MR, Moodi Ghalibaf A, Modaresi F, Emadzadeh M, Farhoudi F. The role of personality traits in following quarantine orders during the COVID-19 pandemic. *Int Clin Psychopharmacol*. 2022;37(4):173-8.
15. Cheng C, Rao Y-B, Lu Y-R. Psychological Status of Clinical Laboratory Staff During the COVID-19 Outbreak. *Psychiatry and Clinical Psychopharmacology*. 2021;206-12.
16. Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. *New England Journal of Medicine*. 2020;383(6):510-2.
17. Dadgarmoghaddam M, Najafi MN, Ebrahimi A, Talei A, Najafnajaifi N, Ghalibaf AM. Social Mental Health during COVID-19 Pandemic in Iran: A Cross-sectional Study among the General Population of Razavi Khorasan Province, Iran. *Iranian Red Crescent Medical Journal*. 2021;23(11).
18. Quintana-Domeque C, Lee I, Zhang A, Proto E, Battisti M, Ho A. Anxiety and depression among medical doctors in Catalonia, Italy, and the UK during the COVID-19 pandemic. *PloS one*. 2021;16(11):e0259213.
19. Stefanova M, Atanassov D, Krastev T, Fuchs S, Kutsche K. Zimmermann-Laband syndrome associated with a balanced reciprocal translocation t(3;8)(p21.2;q24.3) in mother and daughter: molecular cytogenetic characterization of the breakpoint regions. *American journal of medical genetics Part A*. 2003;117a(3):289-94.
20. Beck AT, Steer RA, Carbin MG. Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical psychology review*. 1988;8(1):77-100.
21. Beck AT, Steer RA, Brown GK. BDI-II: Beck depression inventory: Pearson; 1996.
22. Ghassemzadeh H, Mojtabai R, Karamghadiri N, Ebrahimkhani N. Psychometric properties of a Persian-language version of the Beck Depression Inventory-Second edition: BDI-II-PERSIAN. *Depression and anxiety*. 2005;21(4):185-92.
23. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry*. 2020;7(6):547-60.
24. Kerrien M, Pougnet R, Garlantézec R, Pougnet L, Le Galudec M, Loddé B, et al. Prevalence of anxiety disorders and depression among junior doctors and their links with their work. *Presse Medicale (Paris, France)*. 2015;44(4 Pt 1):e84-91.
25. Hassannia L, Taghizadeh F, Moosazadeh M, Zarghami M, Taghizadeh H, Dooki AF, et al. Anxiety and Depression in Health Workers and General Population During COVID-19 Epidemic in IRAN: A Web-Based Cross-Sectional Study. *medRxiv*. 2020:2020.05.05.20089292.
26. da Silva FCT, Neto MLR. Psychiatric symptomatology associated with depression, anxiety, distress, and insomnia in health professionals working in patients affected by COVID-19: A systematic review with meta-analysis. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2021;104:110057.
27. da Silva Neto RM, Benjamim CJR, de Medeiros Carvalho PM, Neto MLR. Psychological effects caused by the COVID-19 pandemic in health professionals: A systematic review with meta-analysis. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2021;104:110062.
28. Zhang W, Wang K, Yin L, Zhao W, Xue Q, Peng M, et al. Mental Health and Psychosocial Problems of Medical Health Workers during the COVID-19 Epidemic in China. *Psychotherapy and Psychosomatics*. 2020;89(4):242-50.
29. Liu Z, Han B, Jiang R, Huang Y, Ma C, Wen J, et al. Mental health status of doctors and nurses during COVID-19 epidemic in China. Available at SSRN 3551329. 2020.
30. Yan XY, Huang S, Huang C-Q, Wu W-H, Qin Y. Marital status and risk for late life depression: a meta-analysis of the published literature. *Journal of International Medical Research*. 2011;39(4):1142-54.
31. Song X, Fu W, Liu X, Luo Z, Wang R, Zhou N, et al. Mental health status of medical staff in emergency departments during the Coronavirus disease 2019 epidemic in China. *Brain, Behavior, and Immunity*. 2020;88:60-5.

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