



The Prevalence of Depression among the Global Public in the Context of the COVID-19 Epidemic: A Systematic Review and Meta-Analysis

#Jiaxian Shao ¹, #Yuncong Yu ¹, Cheng Cheng ², Min Gao ¹, Xiaona Li ¹, Dongping Ma ¹,
*Wenqiang Yin ¹, *Zhongming Chen ¹

1. School of Management, Shandong Second Medical University, Weifang, Shandong, China

2. WeiFang Mental Health Center, Weifang, Shandong, China

*Corresponding Authors: Email: czm3306196@163.com, yinwq1969@126.com

#These authors contributed equally to this work

(Received 20 Sep 2023; accepted 14 Nov 2023)

Abstract

Background: We aimed to analyze the prevalence of depression among the global public during COVID-19, identify its influencing factors in order to provide reference, and help safeguard public mental health.

Methods: A comprehensive literature on global public depression in various countries during the COVID-19 pandemic was obtained through electronic searches of PubMed, Web of Science, and other databases, combined with literature tracing from Dec 2019 to Mar 2023. Then a meta-analysis was conducted using the random effects model by Stata 16.0. The heterogeneity was evaluated by I^2 . Subgroup analysis, sensitivity analysis, and meta-regression analysis were used to explore the sources of heterogeneity and the factors influencing public depression. Egger's test was used to test publication bias.

Results: Overall, 68 articles with 234,678 samples were included in the study. Analysis revealed that the overall prevalence of depression among the population during COVID-19 was 32.0% (95% CI: 29.0%-35.0%). Of these, marital status (OR=0.65, 95% CI: 0.47-0.87), presence of infected cases (OR=2.45, 95% CI: 1.82-3.30), and fear of being infected by the virus (OR=9.31, 95% CI: 6.03-14.37) were the main factors influencing people's depression and the main source of heterogeneity.

Conclusion: The prevalence of depression among the global public is at a high level during COVID-19. The prevalence of depression among people unmarried, divorced, or widowed, surrounded by infected cases, contact infection cases, and worried about being were higher than others.

Keywords: COVID-19; Epidemic; Global public; Depression; Meta-analysis

Introduction

On 11 March 2020, WHO declared a global pandemic of the novel coronavirus (COVID-19). By 2023, more than 761 million infected cases and

more than 6.8 million deaths have been reported worldwide (1). The COVID-19 pandemic has had a huge impact on the physiological health of



Copyright © 2024 Shao et al. Published by Tehran University of Medical Sciences.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license.

(<https://creativecommons.org/licenses/by-nc/4.0/>). Non-commercial uses of the work are permitted, provided the original work is properly cited

the global public, as well as on public mental health. The impact is not only for infected patients but also for the general public (2-4).

In order to control the spread of the epidemic on time, various countries have adopted a variety of measures to prevent and control the epidemic (5,6). While these measures inevitably have a negative impact on public mental health (7). As Brooks et al (8) showed in their study of isolation measures early in the epidemic, the longer the social isolation period, the greater the negative psychological stress response of those isolated.

Depression is a common and diffuse emotional state with no clear goal and a declining mental state, and is ranked by WHO as the single largest contributor to global disability (10). Depression has become one of the major factors affecting people's physical and mental health in this century (12).

Currently, some scholars have conducted studies on the prevalence of depression in different populations in different countries during the COVID-19 pandemic. For example, Xie X et al (13) surveyed 1784 participants in Chinese schools and found that 22.6% of the students had depressive symptoms. Students in Wuhan with a greater risk of depressive symptoms. Suryavanshi et al (14) surveyed the mental health and quality of life of 197 healthcare professionals in India and reported the prevalence of depression was 47%. The work environment was an influential factor in increasing the risk of depression and anxiety. Due to the influence of sample size, survey area, survey method, and study design, the results of existing studies are somewhat variable and do not reflect the overall psychological depression of the global public during the pandemic.

We used meta-analysis to analyze comprehensively the prevalence of depression of the global public in the context of the COVID-19 epidemic, in order to provide a reference for safeguarding the health of the population.

Materials and Methods

Literature Search Strategy

This article was searched regarding the PRISMA (15) literature search strategy for PubMed, Web of Science, Embase, and EBSCO. The search terms include (“novel coronavirus pneumonia” OR “coronavirus disease 2019” OR “COVID-19” OR “the COVID-19 pandemic”, and “depression” OR “depressive symptoms” OR “mental health”). The search period was from December 2019 to March 2023.

Inclusion and Exclusion Criteria

Inclusion criteria: 1) Original cross-sectional studies (e.g., field or online survey studies) 2) Studies of depression among the global public published since COVID-19. 3) Studies of the public in the world. 4) Literature that can accurately extract or indirectly convert the prevalence of depression.

Exclusion criteria: 1) Studies with non-primary data, such as reviews, commentaries, or conference abstracts. 2) Repeated publications or data from the same study for which the public prevalence of depression could not be extracted or could not be calculated. 3) Subjects including infected and suspected cases of COVID-19, as well as patients with cancer, prisoners in prison, perinatal pregnant women, or other special populations.

Quality assessment

The quality assessment criteria for cross-sectional studies recommended by the Agency for Healthcare Research and Quality (AHRQ) (15) were used to assess the quality of the included literature. The literature with an overall score of 0 to 3 is of low quality, 4 to 7 is of medium quality, and 8 to 11 is of high quality (17). The evaluation was completed by 2 researchers independently, and any disagreement was settled through consultation.

Data extraction

In order to ensure the integrity and authenticity of the data information and minimize bias, data were extracted by two researchers independently,

and any dispute was resolved through discussion with the third researcher. The prevalence of depression detection (which = the number of people with depression detected/sample size \times 100%) was used as the outcome index. The extracted data included the first author of the literature, survey time, survey area, scale, age, total sample size, number of people with depression, the prevalence of depression detection, etc.

Statistical Analysis

Meta-analysis was conducted using Stata 16.0 software. The prevalence of depression detection was used as the statistical effect size and a 95% confidence interval (CI) was provided. I^2 was used as the index of heterogeneity to reflect the proportion of heterogeneity in the total variance of the effect size. Subgroup analysis and meta-regression analysis were used to explore the

sources of heterogeneity and the factors influencing public depression. Publication bias was assessed by Egger's test. Sensitivity analysis was used to evaluate the stability and reliability of the analysis results.

Results

Selection of Studies

The initial search detected 12,686 items of literature that matched the study topic. According to the literature inclusion and exclusion criteria, 4407 duplicate titles were excluded; 7536 titles were excluded based on title; and 675 titles were excluded through full-text reading, resulting in the inclusion of 68 cross-sectional studies. The specific literature screening flow chart is shown in Fig.1.

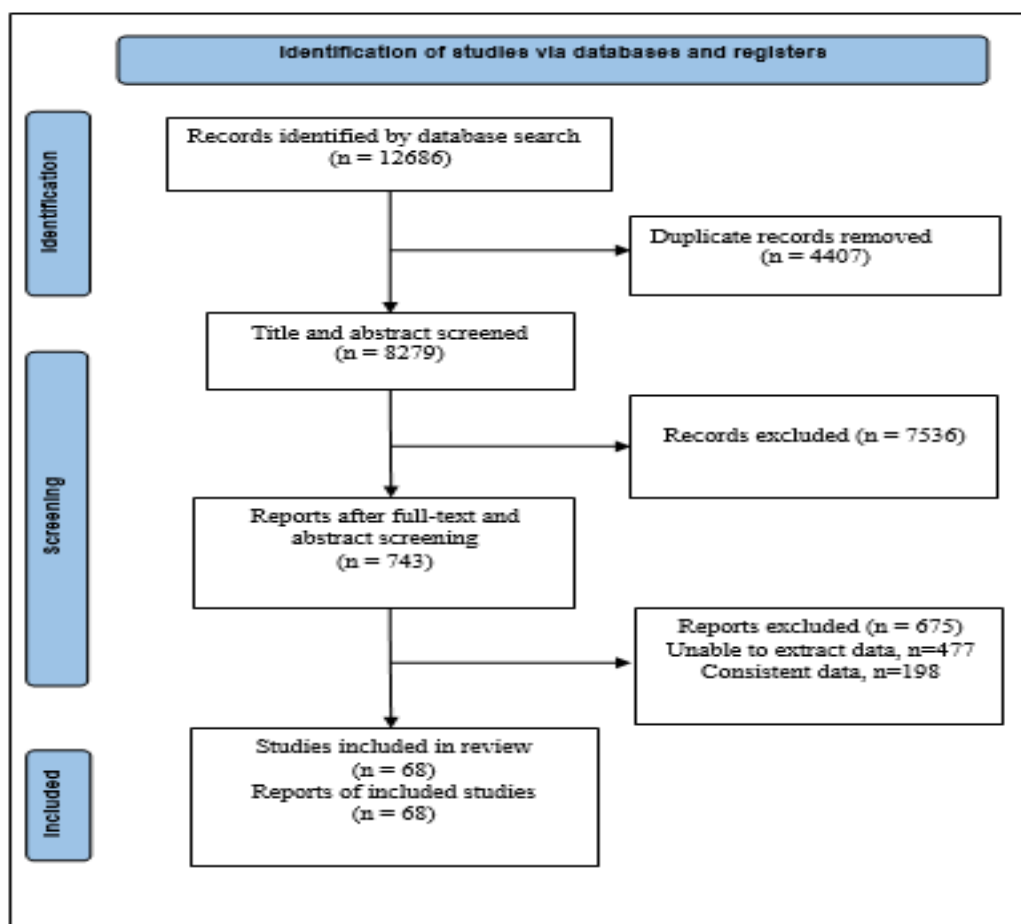


Fig. 1: Flow chart for literature screening

Study Characteristics and Quality Assessment

Finally, 68 cross-sectional studies were included in this meta-analysis, with a total sample size of 234,678. Characteristics of all studies are presented in Table 1.

The included studies were all cross-sectional studies published between 2020 and 2022, and

the prevalence of depression among survey respondents was reported in all studies. Sixty-one studies were investigated in 2020, 6 studies were investigated in 2021 and only one study was investigated in 2022. The quality of the literature included in the studies was all on a scale of 6-11.

Table 1: Basic characteristics of the included literature and results of quality assessment

Reference number	Survey time	Survey area	Survey Scale	Sampling method	Sample size	influencing variables on depression	The prevalence of depression (%)	Quality Assessment Score
18	2020.03	Saudi Arabia	DASS-21	Random sampling	1597	Gender/age/Smoking/Health care workers/	28.9	7
19	2020.03-04	Hong Kong, China	PHQ-9	Random sampling	500	SARS experiment/worried about being infected/lack of surgical mask et al	19.0	9
20	2020.03	the United States	PHQ-9	Random sampling	1005	Racist/National/Living in a larger home/History of hospitalization et al	46.3	8
21	2020.03-04	Italy	PHQ-9	Random sampling	24050	Gender/Frontline et al	27.6	9
22	2020.03-04	Italy	PHQ-9	Random sampling	18147	Having a loved one deceased by COVID-19	17.0	8
23	2020.02	China	PHQ-9	Non-Random sampling	845	More time spent thinking about COVID-19/Being parents/Longer average working time per week et al	33.8	9
24	2020.02	China	CES-D	Random sampling	7236	Age/ More time spent thinking about COVID-19 et al	20.1	7
25	2020.02	China	PHQ-9	Non-Random sampling	1242	Monthly income/Physical exercise	29.3	9
26	2020.03	the United Kingdom	PHQ-9	Non-Random sampling	2025	Age/Presence of children in the home/high estimates of personal risk	22.1	9
27	2020.04	Hong Kong, China	PHQ-2	Random sampling	1051	Age/Privileged people	21.0	7
28	2020.01-02	China	SDS	Non-Random sampling	608	Age/Gender/Knowledge about COVID-19 et al	27.1	7
29	2020.02-03	China	DASS-21	Non-Random sampling	1738	Knowledge about COVID-19/Age et al	16.5	9
30	2020.04	China	DSRS-C	Random sampling	1109	Gender/Physical exercise/Companion on weekdays et al	10.1	8
31	2020.03	Spain	PHQ-2	Non-Random sampling	3480	Age	18.7	7
32	2020.03	Mexico	DASS-21	Non-Random sampling	613	Gender/Academic degree/Systemic diseases et al	41.3	9
33	2020.03	Jordan	BDI-II	Non-Random sampling	511	Gender/Educated/Having family history of chronic physical problems et al	65.0	8
34	2020.07	Japan	PHQ-9	Random sampling	2708	In order of magnitude/having an underlying disease et al	18.4	9
35	2020.05-06	New Zealand	PHQ-9	Random sampling	681	Frequent exercise/reduce loneli-	64.0	9

Table 1: Continued ...

36	2020.03-04	Mexico	HADS	Random sampling	1011	ness/unhealthy behaviours people with a prior psychiatric disease/Educated et al	50.5	7
37	2020.05-07	Brazil	DSM-5	Non-Random sam- pling	1996	Age/Income/gender/Educated/s ocial distancing et al	68.0	9
38	2020.06	Indonesia	PROMIS	Random sampling	335	Age/Educated/ under effective quarantine	10.1	8
39	2020.06-07	Japan	DASS-21	Random sampling	497	Age/Educated/Work experience	54.3	8
40	2020.03-04	Irish	PHQ-9	Random sampling	2025	NA	22.1	9
41	2020.03	South Korea	PHQ-9	Random sampling	1014	COVID-19 related fear/Restrictions level/Economic support	17.5	9
42	2020.10	Poland	HADS-M	Non-Random sam- pling	452	NA	32.1	7
43	2020.04	Iran	DASS-21	Non-Random sam- pling	1498	Having a vulnerable person in the family/Risk of disease/Following COVID-19	47.9	9
44	2020.08	Korea	PHQ-4	Non-Random sam- pling	2288	Sleep pattern/Restrictions in out- side activities/Family conflicts	30.7	8
45	2020.03	Israeli	POAMS-TV	Random sampling	509	Economics fears/Individual func- tion/Age/Employment et al	40.5	8
46	2020.03	China	SDS	Random sampling	3303	The self-rated health/The negli- gence or overindulgence toward the epidemic information	30.4	8
47	2020.04-05	Ecuador	DASS-21	Non-Random sam- pling	626	Gender/Age/Educated/Having a relative diagnosed with COVID- 19	31.3	9
48	2020.05-08	Iran	CES-D	Random sampling	140	Having a history of being quaran- tined due to COVID-19	57.9	7
49	2020.03-06	French	ASR	Not available	729	Gender/ COVID-19 infection	26.7	8
50	2021.02	China	PHQ-9	Random sampling	1171	The level of insomnia/ a negative attitude towards the pandemic	22.6	8
51	2020.03-04	Sweden	PHQ-9	Non-Random sam- pling	1503	Age/Educated/Social stimulation et al	33.1	9
52	2020.03	China	PHQ-9	Non-Random sam- pling	6588	Direct contact with confirmed COVID-19 patients/Working in the COVID-19 isolation unit et al	57.6	9
53	2020.03	China	PHQ-9	Non-Random sam- pling	11133	Gender/Educated/With personal COVID-19 exposure et al	37.0	8
54	2020.04	China	PHQ-9	Non-Random sam- pling	867	Gender/Age/Educated/Work experience	37.3	6
55	2020.01-02	China	PHQ-9	Non-Random sam- pling	1563	Gender/Insomnia et al	50.7	7
56	2020.03	China	CES-D	Random sampling	1681	Fear of COVID-19/Influence on social interaction/Higher grade	56.8	9
57	2020.02-03	China	PHQ-9	Non-Random sam- pling	7413	Age/Divorcees/Physical health et al	27.7	9
58	2020.04	Bangladesh	PHQ-9	Non-Random sam- pling	3388	seriousness of the disease/Fear of being infected/information gaps et al	27.9	8
59	2020.03	Iran	PHQ-9	Not available	8591	Gender/Being mar- ried/Healthcare worker	15.1	8
60	2020.02	China	HADS	Non-Random sam- pling	2651	Without political party member- ship/With contact history of COVID-19/Going out or gather- ing et al	17.4	8
61	2020.05-12	Cameroon	PHQ-9	Not available	7381	a history of quarantine/flu-like symptoms during the past 14 d et al	8.4	7
62	2020.04	Peru	PHQ-9	Non-Random sam- pling	830	post-traumatic stress/Healthcare worker	18.0	9
63	2020.03-04	Serbia	DASS-21	Non-Random sam-	1057	Uneasiness related to COVID-19	29.0	8

Table 1: Continued ...

64	2020.03	Iran	DASS-21	Non-Random sampling	461	news/The feeling of helplessness et al	41.9	9
65	2020.02	China	PHQ-9	Not available	834	Marital status/Medical staff/Educated et al	45.7	9
66	2020.04	the United States	CES-D	Random sampling	1010	Gender/Implementing measures/worried about being infected et al	32.0	8
67	2020.07-11	Ireland	CES-D	Random sampling	3000	Age	19.8	9
68	2020.02-04	China	CES-D	Non-Random sampling	13440	Gender/concerns about entering a higher grade et al	42.5	8
69	2020.06-07	the United Kingdom	PHQ-9	Not available	709	Medical staff/PTSD	40.5	9
70	2020.10-11	South Korea	PHQ-9	Not available	919	Gender	56.5	9
71	2020.09-12	the United States	PHQ-9	Non-Random sampling	15765	COVID-19 concern/Financial distress/Infection	20.4	8
72	2020.09-10	the United States	PHQ-2	Non-Random sampling	810	high risk of developing COVID-19	11.7	9
73	2020.05-10	Spain	HADS	Random sampling	9515	household interpersonal conflicts/Living alone/Financial instability	27.3	8
74	2022.04	Austria	PHQ-9	Non-Random sampling	1031	Age/Income/Gender	28.0	9
75	2020.08-2021.03	Canada	CES-D	Not available	508	Gender/Quality of sleep/Family conflicts/Changes in daily routine	22.1	9
76	2020.11	Korea	PHQ-9	Random sampling	549	Marital status	18.8	9
77	2020.06-08	Europe	EURO-D	Not available	37475	Gender	25.2	7
78	2021.07	Pakistan	DASS-21	Non-Random sampling	2069	Personal contacts/Household/becoming unemployed et al	60.9	8
79	2020.04	Turkey	HADS	Not available	300	Age/Gender/Having comorbidity	68.3	9
80	2020.09-2021.07	Sri Lanka	DASS-21	Random sampling	324	Age/Being quarantined/Having a SARS-CoV-2-infected family member et al	15.4	8
81	2020.05-07	Pakistan	HADS	Non-Random sampling	1047	increased number of deceased patients/lower family support	39.9	8
82	2021.07	Slovak	PHQ-9	Random sampling	1501	Age	24.7	9
83	2021.03-04	Saudi Arabia	RSES	Non-Random sampling	151	low self-esteem	37.7	8
84	2020.05-06	Japan	PHQ-9	Not available	1269	self-report questions/Gender/knowledge of mental health management et al	14.3	7
85	2020.09-11	the United States	PHQ-2	Not available	605	higher health fear/job stressors/perceived social avoidance et al	14.2	9

Meta-analysis

The heterogeneity test of the 68 articles included in the study showed that $I^2=99.6\%$. Therefore, the random-effects model was used for meta-

analysis. The prevalence of depression was 32.0% [95%CI: 30.0%-36.0%] among the global public during the COVID-19 epidemic (Fig. 2).

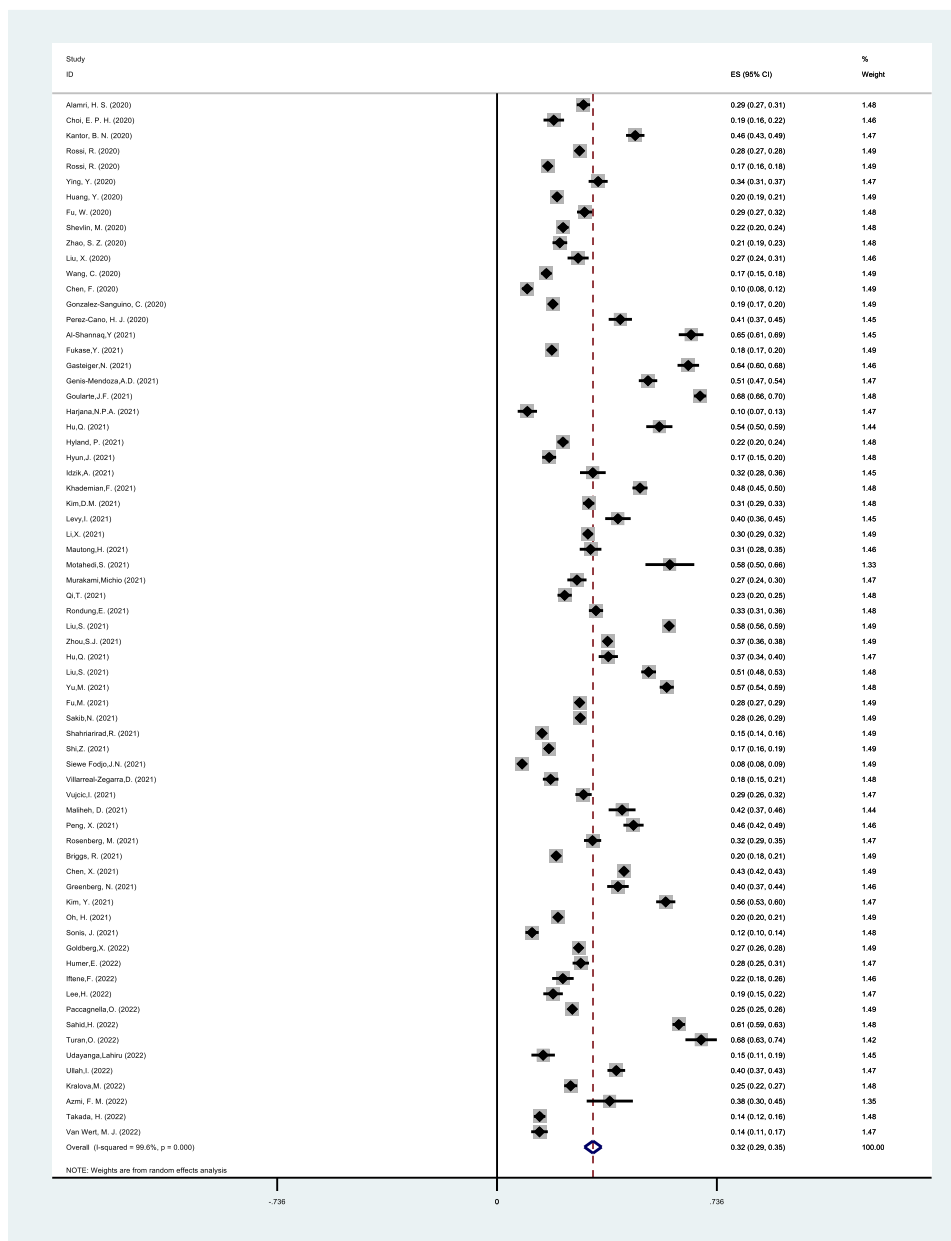


Fig. 2: The prevalence of depression of the global public under COVID-19

Subgroup analysis and meta-regression

Marital status, presence of infected cases around, exposure to infected cases, and fear of being infected were statistically significant on the prevalence of depression in the population, as shown in Table 2.

In terms of the public demographic characteristics, the prevalence of depression detection differed between people with different marital sta-

tuses ($P < 0.05$) and was a significant factor influencing the prevalence of depression, explaining 13.89% of the source of heterogeneity.

In terms of the factors related to the COVID-19 epidemic, the prevalence of depression was significantly higher in those with surrounding cases of infection (43.7%) than in those without (21.9%), ($P < 0.001$), people exposure to infected cases (50.3%) higher than those who were not

(29.2%), ($P < 0.05$), and people concerned about being infected (42.3%) higher than those who were not (7.3%), ($P < 0.05$). These factors explained 98.46%, 41.66%, and 74.48% of the het-

erogeneity, respectively, and were the main source of heterogeneity in the prevalence of depression among the global public.

Table 2: Subgroup analysis and Meta-regression results

<i>Subgroup</i>	<i>Number of included literatures</i>	<i>The prevalence of depression (95% CI)</i>	<i>I²(%)</i>	<i>P for heterogeneity</i>	<i>P value*</i>
Marital status					
Married	13	26.8(20.4-33.3)	98.7	<0.001	0.043*
Unmarried, divorced, or widowed	13	36.2(29.4-43.0)	98.6	<0.001	
Surround by infected cases					
Yes	5	43.7(37.5-49.9)	0.0	<0.001	<0.001**
None	5	21.9(17.1-26.8)	53.0	<0.001	
Exposure to infected persons					
Yes	6	50.3(37.4-63.2)	97.3	<0.001	0.033*
No	4	29.2(26.0-32.4)	61.4	0.051	
Worried about being infected					
Yes	4	42.3(17.3-67.3)	99.7	<0.001	0.010*
No	3	7.3(3.3-11.3)	91.2	<0.001	

P-value* for Meta-regression; * indicates statistically significant at the $P=0.05$ level; ** indicates statistically significant at the $P=0.001$ level; Abbreviation: OR odds ratio;

Sensitivity analysis

Sensitivity analysis was conducted by the method of excluding individual studies one by one. Overall prevalence of depression of the global public obtained before and after literature, exclusion ranged from 31.6% to 32.5%, and did not exceed 1.5 percentage points, indicating that the stability of the results was good.

Risk of bias

The results of Egger’s test showed that $t=-1.45$, $P=0.153$, and no significant publication bias was found.

Discussion

This study analyzed the publicly available overall prevalence of depression among the global public during the COVID-19 pandemic and analyzed

the factors that may have influenced them. The estimated global public prevalence of depression detection of 32% during the COVID-19 pandemic is higher than that reported by Morin, CM et al (86) for residents of 13 countries (23.1%) and closer to that reported by Georgieva, I. et al (87) for residents of 11 countries (30.3%). The marital status of the population, the presence of infected cases in the vicinity, exposure to infected persons, and fear of being infected had an impact on the depression of the population and were the main sources of heterogeneity.

Marital status was one of the important influencing factors in the prevalence of depression in the global public during the COVID-19 pandemic. Unmarried, divorced, or widowed people had a higher prevalence of depression than married people did, which is consistent with the findings (88). Possible reasons for this are that married

people have a higher quality of life than unmarried people do have and have access to more emotional and family support. More family members could be a positive factor against depression (64). People married have access to more financial support than those who are unmarried or divorced (76). A partner can share some of the stress of life and act as a mood regulator, thus reducing their risk of depression due to loneliness or high levels of stress (89). Therefore, in major public health incidents, we should pay attention to the unmarried or divorced and give them more moral support and financial assistance.

People's panic in the face of an epidemic may come from uncertain information in society, or from a lack of their own conditions, such as a shortage of mask supplies, insufficient spare food, etc., or from a fear of the impact on their lives of being separated or quarantined from their families. The presence of infected cases in the neighborhood, exposure to infected people, and fear of being infected reflect people's perceived risk of COVID-19 (90). The results showed a higher prevalence of depression among those surrounded by infected cases, exposed to infected cases, and were worried about being infected. This is in line with the findings reported already (91). The possible reason for this is that there is a general effect of risk perception on mood and psychology, and high levels of risk perception may induce or reinforce depression in individuals (92,93). Individuals' depression is easily 'amplified' in an uncertain environment and can be transmitted to other individuals through emotional contagion, thus inducing and exacerbating depression in groups (94). People tend to avoid the risk of infection and cope with uncertainty by purchasing protective items and evacuating risk areas based on the risk information collected (94).

Conclusion

The prevalence of depression among the global public is at a high level during COVID-19. The level of risk perception of the epidemic (Sur-

rounded by cases of infection or not, Fear of being infected by COVID-19 or not) and the level of family support (marital status) received by the public are important factors influencing their depression state. There was a positive effect of perceived epidemic risk on depression. While the family support factors have an inverse effect on depression.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

This study was supported by the National Natural Science Foundation of China (Grant No. 71804131), 2022 Educational and Teaching Reform and Research Project of Shandong Second Medical University (2022YB018), Youth Innovation and Technology Program project of colleges and universities in Shandong Province (Grant No. 2020RWG014), and Taishan Scholar Talent Project (tsqn202312250).

Conflict of interest

The authors declare that there is no conflict of interests.

References

1. World Health Organization. (2023). Coronavirus disease (COVID-19) weekly epidemiological update and weekly operational update.
2. Hossain MM, Tasnim S, Sultana A, et al (2020). Epidemiology of mental health problems in COVID-19: a review. *F1000Res*, 9:636.
3. Ahmadi ZH, Mousavizadeh M, Nikpajouh A, et al (2021). COVID-19: A perspective from Iran. *J Card Surg*, 36(5):1672-1676.
4. Chow EJ, Uyeki TM, Chu HY (2023). The effects of the COVID-19 pandemic on com-

- munity respiratory virus activity. *Nat Rev Microbiol*, 21(3):195–210.
5. Takagi D, Kondo K, Kondo N, et al (2013). Social disorganization/social fragmentation and risk of depression among older people in Japan: multilevel investigation of indices of social distance. *Soc Sci Med*, 83:81-89.
 6. Magson NR, Freeman JYA, Rapee RM, et al (2021). Risk and Protective Factors for Prospective Changes in Adolescent Mental Health during the COVID-19 Pandemic. *J Youth Adolesc*, 50(1):44–57.
 7. Alldred SK, Takwoingi Y, Guo B, et al (2017). First trimester ultrasound tests alone or in combination with first trimester serum tests for Down's syndrome screening. *Cochrane Database Syst Rev*, 3(3):CD012600.
 8. Day T, Park A, Madras N, et al (2006). When is quarantine a useful control strategy for emerging infectious diseases? *Am J Epidemiol*, 163(5):479-485.
 9. Brooks SK, Webster RK, Smith LE, et al (2020). The psychological impact of quarantine and how to reduce it: a rapid review of the evidence. *Lancet*, 395(10227):912-920.
 10. Henderson SE, Johnson AR, Vallejo AI, et al (2013). A preliminary study of white matter in adolescent depression: relationships with illness severity, anhedonia, and irritability. *Front Psychiatry*, 4:152.
 11. Smith K (2014). Mental health: a world of depression. *Nature*, 515(7526):181.
 12. Holden C (2000). Global survey examines impact of depression. *Science*, 288(5463):39-40.
 13. Xie X, Xue Q, Zhou Y, et al (2020). Mental Health Status among Children in Home Confinement during the Coronavirus Disease 2019 Outbreak in Hubei Province, China. *JAMA Pediatr*, 174(9):898-900.
 14. Suryavanshi N, Kadam A, Dhumal G, et al (2020). Mental health and quality of life among healthcare professionals during the COVID-19 pandemic in India. *Brain Behav*, 10(11):e01837.
 15. Moher D, Liberati A, Tetzlaff J (2009). et al Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*, 6(7):e1000097.
 16. Chou R, Baker WL, Bañez LL, et al (2018). Agency for Healthcare Research and Quality Evidence-based Practice Center methods provide guidance on prioritization and selection of harms in systematic reviews. *J Clin Epidemiol*, 98:98-104.
 17. Zhao J, Liang G, Luo M, et al (2022). Influence of type 2 diabetes microangiopathy on bone mineral density and bone metabolism: A meta-analysis. *Heliyon*, 8(10):e11001.
 18. Alamri HS, Algarni A, Shehata SF, et al (2020). Prevalence of Depression, Anxiety, and Stress among the General Population in Saudi Arabia during Covid-19 Pandemic. *Int J Environ Res Public Health*, 17(24):9183.
 19. Choi EPH, Hui BPH, Wan EYF (2020). Depression and Anxiety in Hong Kong during Covid-19. *Int J Environ Res Public Health*, 17(10):3740.
 20. Kantor BN, Kantor J (2020). Mental Health Outcomes and Associations during the Covid-19 Pandemic: A Cross-Sectional Population-Based Study in the United States. *Front Psychiatry*, 11:569083.
 21. Rossi R, Socci V, Pacitti F, et al (2020). Mental Health Outcomes among Frontline and Second-Line Health Care Workers during the Coronavirus Disease 2019 (Covid-19) Pandemic in Italy. *JAMA Netw Open*, 3(5):e2010185.
 22. Rossi R, Socci V, Talevi D, et al (2020). Covid-19 Pandemic and Lockdown Measures Impact on Mental Health among the General Population in Italy. *Front Psychiatry*, 11:790.
 23. Ying Y, Ruan L, Kong F, et al (2020). Mental Health Status among Family Members of Health Care Workers in Ningbo, China, During the Coronavirus Disease 2019 (Covid-19) Outbreak: A Cross-Sectional Study. *BMC Psychiatry*, 20(1):379.
 24. Huang Y, N Zhao (2020). Generalized Anxiety Disorder, Depressive Symptoms and Sleep Quality during Covid-19 Outbreak in China: A Web-Based Cross-Sectional Survey. *Psychiatry Res*, 288: 112954.
 25. Fu W, Wang C, Zou L, et al (2020). Psychological Health, Sleep Quality, and Coping Styles to Stress Facing the Covid-19 in Wuhan, China. *Transl Psychiatry*, 10(1):225.
 26. Shevlin M, McBride O, Murphy J, et al (2020). Anxiety, Depression, Traumatic Stress and Covid-19-Related Anxiety in the UK General Population during the Covid-19 Pandemic. *BJPsych Open*, 6(6):e125.

27. Zhao SZ, Wong JYH, Luk TT, et al (2020). Mental Health Crisis under Covid-19 Pandemic in Hong Kong, China. *Int J Infect Dis*, 100:431-33.
28. Liu X, Luo WT, Li Y, et al (2020). Psychological Status and Behavior Changes of the Public during the Covid-19 Epidemic in China. *Infect Dis Poverty*, 9(1):58.
29. Wang C, Pan R, Wan X, et al (2020). A Longitudinal Study on the Mental Health of General Population during the Covid-19 Epidemic in China. *Brain Behav Immun*, 87: 40-48.
30. Chen F, Zheng D, Liu J, et al (2020). Depression and Anxiety among Adolescents during Covid-19: A Cross-Sectional Study. *Brain Behav Immun*, 88:36-38.
31. González-Sanguino C, Ausín B, Castellanos M^Á, et al (2020). Mental Health Consequences of the Coronavirus 2020 Pandemic (Covid-19) in Spain. A Longitudinal Study. *Front Psychiatry*, 11:565474.
32. Pérez-Cano HJ, Moreno-Murguía MB, Morales-López O, et al (2020). Anxiety, Depression, and Stress in Response to the Coronavirus Disease-19 Pandemic. *Cir Cir*, 88(5):562-568.
33. Al-Shannaq Y, Mohammad AA, Aldalaykeh M (2021). Depression, Coping Skills, and Quality of Life among Jordanian Adults during the Initial Outbreak of Covid-19 Pandemic: Cross-Sectional Study. *Heliyon*, 7(4):e06873.
34. Fukase Y, Ichikura K, Murase H, et al (2021). Depression, Risk Factors, and Coping Strategies in the Context of Social Dislocations Resulting from the Second Wave of Covid-19 in Japan. *BMC Psychiatry*, 21(1):33.
35. Gasteiger N, Vedhara K, Massey A, et al (2021). Depression, Anxiety, and Stress during the Covid-19 Pandemic: Results from a New Zealand Cohort Study on Mental Well-Being. *BMJ Open*, 11(5):e045325.
36. Genis-Mendoza AD, Martínez-Magaña JJ, López-Narváez ML, et al (2021). Mental Health Problems Due to Social Isolation during the Covid-19 Pandemic in a Mexican Population. *Front Public Health*, 9:703450.
37. Goularte JF, Serafim SD, Colombo R, et al (2021). Covid-19 and Mental Health in Brazil: Psychiatric Symptoms in the General Population. *J Psychiatr Res*, 132:32-37.
38. Harjana NPA, Januraga PP, Indrayathi PA, et al (2021). Prevalence of Depression, Anxiety, and Stress among Repatriated Indonesian Migrant Workers during the Covid-19 Pandemic. *Front Public Health*, 9:630295.
39. Hu Q, X Hu, B Zheng, et al (2021). Mental Health Outcomes among Civil Servants Aiding in Coronavirus Disease 2019 Control. *Front Public Health*, 9:601791.
40. Hyland P, Shevlin M, Murphy J, et al (2021). A Longitudinal Assessment of Depression and Anxiety in the Republic of Ireland before and During the Covid-19 Pandemic. *Psychiatry Res*, 300:113905.
41. Hyun J, Kim S, Kim H, et al (2021). Covid-19 and Risk Factors of Anxiety and Depression in South Korea. *Psychiatry Investig*, 18(9):801-808.
42. Idzik A, Leńczuk-Gruba A, Kobos E, et al (2021). Loneliness and Depression among Women in Poland during the Covid-19 Pandemic. *Int J Environ Res Public Health*, 18(20):10698.
43. Khademian F, Delavari S, Koohjani Z, et al (2021). An Investigation of Depression, Anxiety, and Stress and Its Relating Factors during Covid-19 Pandemic in Iran. *BMC Public Health*, 21(1):275.
44. Kim DM, Bang YR, Kim JH, et al (2021). The Prevalence of Depression, Anxiety and Associated Factors among the General Public during Covid-19 Pandemic: A Cross-Sectional Study in Korea. *J Korean Med Sci*, 36(29):e214.
45. Levy I, Cohen-Louck K (2021). Predicting Individual Function during Covid-19 Lockdown: Depression, Fear of Covid-19, Age, and Employment. *Front Psychol*, 12:682122.
46. Li, X., Yu, H., Yang, W., et al (2021). Depression and Anxiety among Quarantined People, Community Workers, Medical Staff, and General Population in the Early Stage of Covid-19 Epidemic. *Front Psychol*, 12:638985.
47. Mautong H, Gallardo-Rumbea JA, Alvarado-Villa GE, et al (2021). Assessment of Depression, Anxiety and Stress Levels in the Ecuadorian General Population during Social Isolation Due to the Covid-19 Outbreak: A Cross-Sectional Study. *BMC Psychiatry*, 21(1):212.
48. Motahedi S, Aghdam NF, Khajeh M, et al (2021). Anxiety and Depression among Healthcare Workers during Covid-19 Pandemic: A Cross-Sectional Study. *Heliyon*,

- 7(12):e08570.
49. Mary-Krause M, Herranz Bustamante JJ, Héron M, et al (2021). Impact of Covid-19-Like Symptoms on Occurrence of Anxiety/Depression during Lockdown among the French General Population. *PLoS One*, 16(7):e0255158.
 50. Qi T, Hu T, Ge QQ, et al (2021). Covid-19 Pandemic Related Long-Term Chronic Stress on the Prevalence of Depression and Anxiety in the General Population. *BMC Psychiatry*, 21(1):380.
 51. Rondung E, Leiler A, Meurling J, Bjärtå A (2021). Symptoms of Depression and Anxiety during the Early Phase of the Covid-19 Pandemic in Sweden. *Front Public Health*, 9:562437.
 52. Liu S, Han W, Shen C, et al (2021). Depressive State in the Emergency Department during Covid-19: A National Cross-Sectional Survey in China. *Front Psychiatry*, 12:566990.
 53. Zhou SJ, Wang LL, Qi M, et al (2021). Depression, Anxiety, and Suicidal Ideation in Chinese University Students during the Covid-19 Pandemic. *Front Psychol*, 12:669833.
 54. Hu Q, Hu X, Zheng B, et al (2021). Mental Health Outcomes among Civil Servants Aiding in Coronavirus Disease 2019 Control. *Front Public Health*, 9:601791.
 55. Liu S, Yang L, Zhang C, et al (2021). Gender Differences in Mental Health Problems of Healthcare Workers during the Coronavirus Disease 2019 Outbreak. *J Psychiatr Res*, 137:393-400.
 56. Yu M, Tian F, Cui Q, et al (2021). Prevalence and Its Associated Factors of Depressive Symptoms among Chinese College Students during the Covid-19 Pandemic. *BMC Psychiatry*, 21(1):66.
 57. Fu M, Han D, Xu M, et al (2021). The Psychological Impact of Anxiety and Depression on Chinese Medical Staff during the Outbreak of the Covid-19 Pandemic: A Cross-Sectional Study. *Ann Palliat Med*, 10(7):7759-7774.
 58. Sakib N, Akter T, Zohra F, et al (2023). Fear of Covid-19 and Depression: A Comparative Study among the General Population and Healthcare Professionals during Covid-19 Pandemic Crisis in Bangladesh. *Int J Ment Health Addict*, 21(2):976-992.
 59. Shahriarirad R, Erfani A, Ranjbar K, et al (2021). The Mental Health Impact of Covid-19 Outbreak: A Nationwide Survey in Iran. *Int J Ment Health Syst*, 15(1):19.
 60. Shi Z, Qin Y, Chair SY, et al (2021). Anxiety and Depression Levels of the General Population during the Rapid Progressing Stage in the Coronavirus Disease 2019 Outbreak: A Cross-Sectional Online Investigation in China. *BMJ Open*, 11(5):e050084.
 61. Siewe Fodjo JN, Ngarka L, Njamnshi WY, et al (2021). Fear and Depression during the Covid-19 Outbreak in Cameroon: A Nationwide Observational Study. *BMC Psychiatry*, 21(1):356.
 62. Villarreal-Zegarra D, Copez-Lonzoy A, Vilela-Estrada AL, et al (2021). Depression, Post-Traumatic Stress, Anxiety, and Fear of Covid-19 in the General Population and Healthcare Workers: Prevalence, Relationship, and Explicative Model in Peru. *BMC Psychiatry*, 21(1):455.
 63. Vujčić I, Safiye T, Milikić B, et al (2021). Coronavirus Disease 2019 (Covid-19) Epidemic and Mental Health Status in the General Adult Population of Serbia: A Cross-Sectional Study. *Int J Environ Res Public Health*, 18(4):1957.
 64. Dadgarmoghaddam M, Najafi M N, Ebrahimi A, et al (2021). Social Mental Health during COVID-19 Pandemic in Iran: A Cross-sectional Study among the General Population of Razavi Khorasan Province, Iran. *Iran Red Crescent Med J*, 23(11): e1010.
 65. Peng X, Liang S, Liu L, et al (2022). Prevalence and Associated Factors of Depression, Anxiety and Suicidality among Chinese High School E-Learning Students During the Covid-19 Lockdown. *Curr Psychol*, 1-12.
 66. Rosenberg M, Luetke M, Hensel D, et al (2021). Depression and Loneliness during April 2020 Covid-19 Restrictions in the United States, and Their Associations with Frequency of Social and Sexual Connections. *Soc Psychiatry Psychiatr Epidemiol*, 56(7):1221-1232.
 67. Briggs R, McDowell CP, De Looze C, et al (2021). Depressive Symptoms among Older Adults Pre- and Post-Covid-19 Pandemic. *J Am Med Dir Assoc*, 22(11):2251-2257.
 68. Chen X, Qi H, Liu R, et al (2021). Depression, Anxiety and Associated Factors among Chinese Adolescents during the Covid-19 Out-

- break: A Comparison of Two Cross-Sectional Studies. *Transl Psychiatry*, 11(1):148.
69. Greenberg N, Weston D, Hall C, et al (2021). Mental Health of Staff Working in Intensive Care during Covid-19. *Occup Med (Lond)*, 71(2):62-67.
 70. Kim Y, Kim SW, Chang HH, et al (2021). Significance and Associated Factors of Long-Term Sequelae in Patients after Acute Covid-19 Infection in Korea. *Infect Chemother*, 53(3):463-76.
 71. Oh H, Marinovich C, Rajkumar R, et al (2021). Covid-19 Dimensions Are Related to Depression and Anxiety among US College Students: Findings from the Healthy Minds Survey 2020. *J Affect Disord*, 292:270-75.
 72. Sonis J, Pathman DE, Read S, et al (2021). Generalized Anxiety, Depression and Posttraumatic Stress Disorder in a National Sample of US Internal Medicine Physicians during the Covid-19 Pandemic. *Gen Hosp Psychiatry*, 71:142-44.
 73. Goldberg X, Castaño-Vinyals G, Espinosa A, et al (2022). Mental Health and Covid-19 in a General Population Cohort in Spain (Covicat Study). *Soc Psychiatry Psychiatr Epidemiol*, 57(12):2457-2468.
 74. Humer E, Schaffler Y, Jesser A, et al (2022). Mental Health in the Austrian General Population during Covid-19: Cross-Sectional Study on the Association with Sociodemographic Factors. *Front Psychiatry*, 13:943303.
 75. Iftene F, Milev R, Farcas A, et al (2022). Covid-19 Pandemic: The Impact of Covid-19 on Mental Health and Life Habits in the Canadian Population. *Front Psychiatry*, 13:871119.
 76. Lee H, Choi D, Lee JJ (2022). Depression, Anxiety, and Stress in Korean General Population during the Covid-19 Pandemic. *Epidemiol Health*, 44:e2022018.
 77. Paccagnella O, Pongiglione B (2022). Depression Deterioration of Older Adults during the First Wave of the Covid-19 Outbreak in Europe. *Soc Sci Med*, 299:114828.
 78. Shahid H, Hasan MA, Ejaz O, et al (2022). The Severity of Depression, Anxiety, and Stress: Recommendations from Joint Work of Research Center and Psychology Clinics in Covid-19 Pandemic. *Front Psychiatry*, 13:839542.
 79. Turan O, Demirci NY, Güntülü AK, et al (2022). Anxiety and Depression Levels of Healthcare Workers during Covid-19 Pandemic. *Afr Health Sci*, 22(1):532-40.
 80. Udayanga L, Perera A, Dissanayaka L (2022). COVID-19 induced anxiety, depression and stress among healthcare professionals in Sri Lanka. *Asian Pacific Journal of Tropical Medicine*, 15(11): 485-495.
 81. Ullah I, Khan KS, Ali I, et al (2022). Depression and Anxiety among Pakistani Healthcare Workers amid Covid-19 Pandemic: A Qualitative Study. *Ann Med Surg (Lond)*, 78:103863.
 82. Kralova M, Brazinova A, Sivcova V, et al (2022). Mental Health of the Slovak Population during Covid-19 Pandemic: A Cross-Sectional Survey. *World J Clin Cases*, 10(25):8880-8892.
 83. Azmi FM, Khan HN, Azmi AM, et al (2022). Prevalence of Covid-19 Pandemic, Self-Esteem and Its Effect on Depression among University Students in Saudi Arabia. *Front Public Health*, 10:836688.
 84. Takada H, Ae R, Ogawa M, et al (2022). Depression Prevention in Healthcare Workers during the Covid-19 Pandemic. *Occup Med (Lond)*, 72(3):207-214.
 85. Van Wert MJ, Gandhi S, Gupta I, et al (2022). Healthcare Worker Mental Health after the Initial Peak of the Covid-19 Pandemic: A US Medical Center Cross-Sectional Survey. *J Gen Intern Med*, 37(5):1169-1176.
 86. Morin CM, Bjorvatn B, Chung F, et al (2021). Insomnia, anxiety, and depression during the COVID-19 pandemic: an international collaborative study. *Sleep Med*, 87:38-45.
 87. Georgieva I, Georgiev GV (2019). Redesign Me: Virtual Reality Experience of the Line of Life and Its Connection to a Healthier Self. *Behav Sci (Basel)*, 9(11):111.
 88. Wang ZF, Cheng YC, Zhang NH, et al (2021). Effect of Marital Status on Depression and Mortality among Patients with Chronic Kidney Disease from National Health and Nutrition Examination Survey 2005-2014. *Kidney Dis (Basel)*, 7(5):391-400.
 89. Han KT, Park EC, Kim JH, et al (2014). Is marital status associated with quality of life? *Health Qual Life Outcomes*, 12:109.
 90. Cori L, Bianchi F, Cadum E, Anthonj C (2020). Risk Perception and COVID-19. *Int J Environ Res Public Health*, 17(9):3114.
 91. Terraneo M, Lombi L, Bradby H (2021). Depressive symptoms and perception of risk

- during the first wave of the COVID-19 pandemic: A web-based cross-country comparative survey. *Sociol Health Illn*, 43(7):1660-1681.
92. Wang D, Zhang A, Feng X (2022). Advances in research on public risk perception, emotion, and behavior under major emergencies. *Nursing Research*, 36(10):1803-1809.
93. Fox ME, Lobo MK (2019). The molecular and cellular mechanisms of depression: a focus on reward circuitry. *Mol Psychiatry*, 24(12):1798-1815.
94. Hartings JA, Li C, Hinzman JM, et al (2017). Direct current electrocorticography for clinical neuromonitoring of spreading depolarizations. *J Cereb Blood Flow Metab*, 37(5):1857-1870.
95. Lindell MK, Perry RW (2012). The protective action decision model: theoretical modifications and additional evidence. *Risk Anal*, 32(4):616-32.