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

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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

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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 × 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.
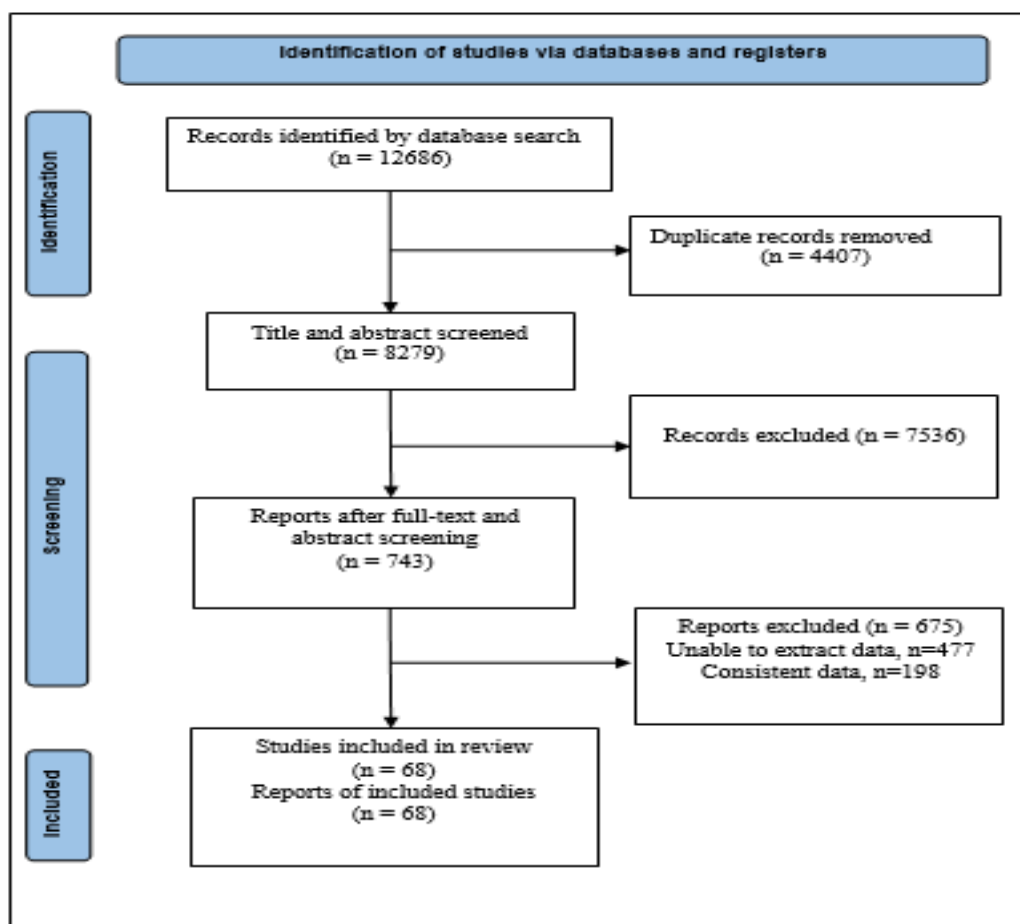

Fig. 1: Flow chart for literature screening

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 sampling	1996	Age/Income/gender/Educated/social 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 sampling	452	NA	32.1	7
43	2020.04	Iran	DASS-21	Non-Random sampling	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 sampling	2288	Sleep pattern/Restrictions in outside activities/Family conflicts	30.7	8
45	2020.03	Israeli	POAMS-TV	Random sampling	509	Economics fears/Individual function/Age/Employment et al	40.5	8
46	2020.03	China	SDS	Random sampling	3303	The self-rated health/The negligence or overindulgence toward the epidemic information	30.4	8
47	2020.04-05	Ecuador	DASS-21	Non-Random sampling	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 quarantined 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 sampling	1503	Age/Educated/Social stimulation et al	33.1	9
52	2020.03	China	PHQ-9	Non-Random sampling	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 sampling	11133	Gender/Educated/With personal COVID-19 exposure et al	37.0	8
54	2020.04	China	PHQ-9	Non-Random sampling	867	Gender/Age/Educated/Work experience	37.3	6
55	2020.01-02	China	PHQ-9	Non-Random sampling	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 sampling	7413	Age/Divorcees/Physical health et al	27.7	9
58	2020.04	Bangladesh	PHQ-9	Non-Random sampling	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 married/Healthcare worker	15.1	8
60	2020.02	China	HADS	Non-Random sampling	2651	Without political party membership/With contact history of COVID-19/Going out or gathering 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 sampling	830	post-traumatic stress/Healthcare worker	18.0	9
63	2020.03-04	Serbia	DASS-21	Non-Random sampling	1057	Uneasiness related to COVID-19	29.0	8

Table 1: Continued …

				pling		news/The feeling of helplessness et al		
64	2020.03	Iran	DASS-21	Non-Random sampling	461	Marital status/Medical staff/Educated et al	41.9	9
65	2020.02	China	PHQ-9	Not available	834	Gender/Implementing measures/worried about being infected et al	45.7	9
66	2020.04	the United States	CES-D	Random sampling	1010	Gender/Age/Income/Marital status 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).
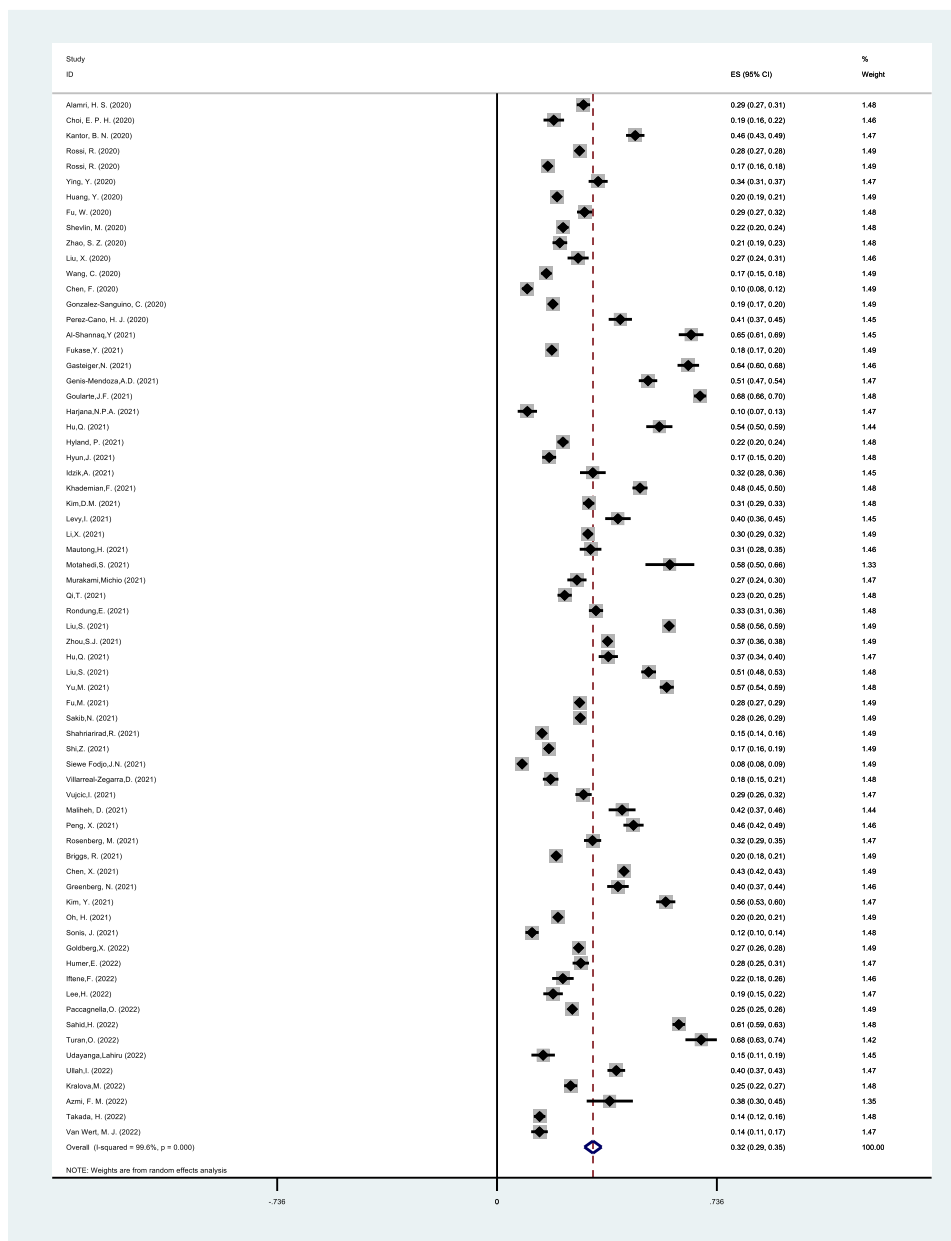
Fig. 2: The prevalence of depression of the global public under COVID-19

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 statuses ($P<0.05$) 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 heterogeneity, 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

Subgroup	Number of included literatures	The prevalence of depression (95% CI)	I²(%)	P for heterogeneity	P value*
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

Conflict of interest

The authors declare that there is no conflict of interests.

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