

# Prevalence of anxiety, depression, and psychological distress among the general population during the COVID-19 pandemic: A systematic review and meta-analysis

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## Abstract

**Background:** The COVID-19 pandemic is a worldwide epidemic declared by the world health organization as a public health emergency of concern and consequently inducing huge mental health and psychological reactions.

**Aims:** This study is aimed to summarize the existing data regarding anxiety, depression, and psychological distress during the covid-19 pandemic among the wider population so that effective intervention strategies will be initiated.

**Methods:** Pieces of literature that assessed anxiety, depression, and psychological distress among the general population during the COVID pandemic period were systematically gathered. Data extraction in Microsoft excel was done by two independent reviewers using predefined criteria. The analysis was done using a stata-11 and random effect model. A sub-group and sensitivity analysis was done. Besides, the funnel plot and egggers publication bias test was tested.

**Results:** Sixteen studies that assessed 78,225 participants were included. Nine studies were included in the meta-analysis for anxiety prevalence. The average prevalence of anxiety was found to be 38.12%. A sub-group analysis showed that anxiety was 33.33% in China and 47.70% in other countries (Italy, Turkey, and India). Anxiety prevalence in studies measured with the DASS-21 scale, GAD-7 scale, and other tools (SAS, HADS, and 5-point Likert scale) was 23.4%, 40.73%, and 44.47% respectively. The prevalence of anxiety in studies that assessed a sample size above 2,000 participants was 40.33%. The average prevalence of depression among included studies was 34.31% and a sub-group analysis showed that depression was higher in China (36.32%) than in other countries (28.3%). Moreover, six studies reported psychological distress and the average prevalence was 37.54%.

**Conclusion:** This study revealed that anxiety, depression, and psychological distress are potential public mental health problems of the global community that suggests the need for early recognition and initiation of interventions during the COVID-19 pandemic period.

## Keywords

COVID-19, anxiety, depression, psychological distress, global community

## Background

The ongoing outbreak of the coronavirus disease-2019 (COVID-19) has posed significant threats to international health and is becoming a recent global challenge in both the developing and developed nations. The disease has been recognized as a global public health emergency by the World Health Organization (WHO) after cases had started to be seen outside China (Wang, Pan, Wan, Tan, Xu, Ho et al., 2020).

This pandemic is a major health crisis affecting several nations with high transmission and death rates and such widespread outbreaks and mortality are associated with adverse mental health outcomes (4, 5). Studies showed that the global population is under extremely stressful conditions resulting in a higher risk of developing anxiety and

depression during COVID-19 outbreaks (Chaix et al., 2020; Özdin & Bayrak Özdin, 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020). Vulnerable populations and health care professionals are particularly affected by the mental

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health impact of the pandemic (Rajkumar, 2020). A systematic review and meta-analysis on the prevalence of anxiety, depression, and insomnia in health professionals obtained a high prevalence of mood and anxiety symptoms during the pandemic (Pappa et al., 2020).

The general population is highly affected by the psychological impact of the COVID-19. A Chinese study assessed the mental health burden of the COVID-19 pandemic on the general population and revealed that anxiety disorders and depressive symptoms were prevalent in 35.1%, and 20.1% of the population respectively (Huang & Zhao, 2020). Similarly, a study in China by Qiu et al. (2020) revealed that 35% of respondents had psychological distress. Other studies conducted during the COVID-19 period also showed that the prevalence of depression and anxiety was 906(33%) and 517(18%) respectively in Italy (Mazza et al., 2020), 81 (23.6%), and 155 (45.1%) in Turkey (Özdin & Bayrak Özdin, 2020). The prevalence of psychological distress was also 35% in China (Qiu et al., 2020), 76.9% in Australia (Collie et al., 2020), 674 (38.06%) in France (Chaix et al., 2020), and 27.2% in Italy (Mazza et al., 2020).

Stress and anxiety further affect the physical and psychological health status (Hu et al., 2020; Liu, Yang, et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020) and results in negative health outcomes (Roy-Byrne et al., 2008; Smeeding et al., 2010) such as heart disease, high blood pressure, diabetes. A further impact of this illness is neuropsychiatric complications like cognitive decline, affective, behavioral, and perceptual domains disturbances (Barah et al., 2014; Kankirawatana et al., 2000; Mellins et al., 2006). Besides, stress and depression weakens the immune system (Glaser & Kiecolt-Glaser, 2014; Kiecolt-Glaser et al., 1994, 2002), and hurt the body's ability to fight infection (Esterling et al., 1994). Therefore, knowing the extent and considering early interventions to alleviate symptoms of depression, psychological distress, and anxiety are important (Mahmoudi et al., 2015; Soderman et al., 1986).

Even though the psychological impact of the COVID-19 pandemic is reviewed ad meta-analysis was done in health care professionals (Pappa et al., 2020) and other vulnerable population (Rajkumar, 2020), to the investigator's knowledge this is the first meta-analysis study on the prevalence of depression, anxiety and psychological distress among the general population. The objective of the present systematic review and meta-analysis is therefore to review the existing evidence on the psychological impact of COVID-19 on the general population and generate weighted average evidence regarding the problem. The evidence obtained is believed to be an instrument for clinicians, policymakers, and researchers to design early intervention strategies and frameworks for anxiety, depression, and psychological distress during the COVID-19 pandemic period.

## Methods and materials

We adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols (PRISMA-P) guideline (Moher et al., 2015) during the present meta-analysis study. We also followed the Checklist of Meta-analyses of Observational Studies in Epidemiology.

### Search strategy and eligibility criteria

We all authors of this systematic review and meta-analysis together initially design a search strategy to be implemented during the data search and two of the authors independently perform a search for eligible articles on the prevalence of anxiety, depression, and psychological distress in the time of COVID-19 pandemic in the general population using the databases of Google Scholar, PubMed, Scopus, and African journal online. In line with the above databases, only peer-reviewed articles published in the English language were retrieved. Besides, this electronic search, the authors also conducted a manual selection of the articles for inclusion by looking for the reference list of published articles. The search queries used in the present study was: ('prevalence' OR 'magnitude') AND ('coronavirus' OR 'COVID-19' OR 'SARS-COV-2') AND ('anxiety' OR 'depression' OR 'psychological distress' OR 'mental health') AND ('general population' OR 'community' OR 'people' OR 'general public'). The target population for the present systematic review and meta-analysis study consisted of the general population in the study area where the individual studies were conducted and the age of 18 years and above. Both cross-sectional and cohort studies were included in the present study. Articles published in non-English language and with a target population of age less than 18 years old were excluded.

### Data extraction and quality assessment

Two of the authors (MN and MT) extract the relevant data from the individual included studies using a data extraction template consisted of the first author name, country of origin for the study, study design, sample size, measurement tool used, and methods of data collection and main findings of the study regarding the prevalence of depression, anxiety and psychological distress in the general population. If the data regarding the number and percentages of individuals with depression, anxiety, and psychological distress were not reported in the required format, necessary computations were done based on the available information in the study (for example numbers were converted to percentages and vice versa). The data extracted were checked for accuracy between the two independent authors and if no agreement was reached in between, a call for third review authors (MB) was done. The modified Newcastle–Ottawa Scale (NOS) (Stang, 2010) had been

used for the quality appraisal of included studies. Statistical quality, ascertainment of anxiety, depression and psychological distress, representativeness, and size of the sample, response rate were the dimensions of the NOS scale.

### **Definitions of the outcome variables (anxiety, depression, psychological distress)**

In this study, the definition of depression should be understood as a measured outcome variable on the general population aged 18 years and older during COVID-19 based on validated standardized screening tools. The measurement tools used for assessment of depression in the included studies were the Depression, Anxiety and Stress Scale (DASS-21) scale (Bottesi et al., 2015; Chan et al., 2012), Self-rating depression scale (SDS) (Zung, 1965), Center for Epidemiology Scale for Depression (CES-D) in Chinese version (Cheung & Bagley, 1998), the Chinese version of WHO-Five Well-Being Index (WHO-5) (Topp et al., 2015), Patient Health Questionnaire 9 (PHQ-9) (Manea et al., 2015), the Hospital Anxiety and Depression Scale (HADS) (Aydemir et al., 1997) and the Chinese version 9-item General Health Questionnaire (GHQ-9) (Shek, 1993). Besides, anxiety as an outcome variable in the included studies was assessed with Depression, Anxiety and Stress Scale (DASS-21) (Bottesi et al., 2015; Chan et al., 2012), Self-rating anxiety scale (SAS) (Xianchen et al., 1995), the Chinese version of Generalized Anxiety Disorder-7 (GAD-7) scale (Zeng et al., 2013), the 7-item Generalized Anxiety Disorder (GAD-7) (Spitzer et al., 2006), and the Hospital Anxiety and Depression Scale (HADS) (Aydemir et al., 1997). Moreover, psychological distress among the included studies was also defined based on the Kessler 6 psychological distress scale (Sunderland Hobbs et al., 2012), Kessler 10 Psychological Distress Scale (K10) (Moccia et al., 2020), the COVID-19 Peritraumatic Distress Index (CPDI) (Plomecka et al., 2020) and Depression, Anxiety, and Stress Scale (DASS-21) (Chan et al., 2012; Delvecchio et al., 2015).

### **Data synthesis and analysis**

The average prevalence of depression, anxiety, and psychological distress in the general population with its 95% CI were computed with Meta-XL version 5.3 (Barendregt & Doi, 2016) and Stata-11 Meta-prop package (Nyaga et al., 2014) using the random effect model. The Higgs  $I^2$  statistics (Higgins & Thompson, 2002) was employed and the Higgs  $I^2$  value of 50% and above indicates the existence of potential heterogeneity (Higgins & Thompson, 2002). In the present meta-analysis, we obtained a significant difference between the included studies. Therefore, we did a subgrouping analysis based on the country of origin of the study, the measurement tools, and sample size used for anxiety and based on country of origin for

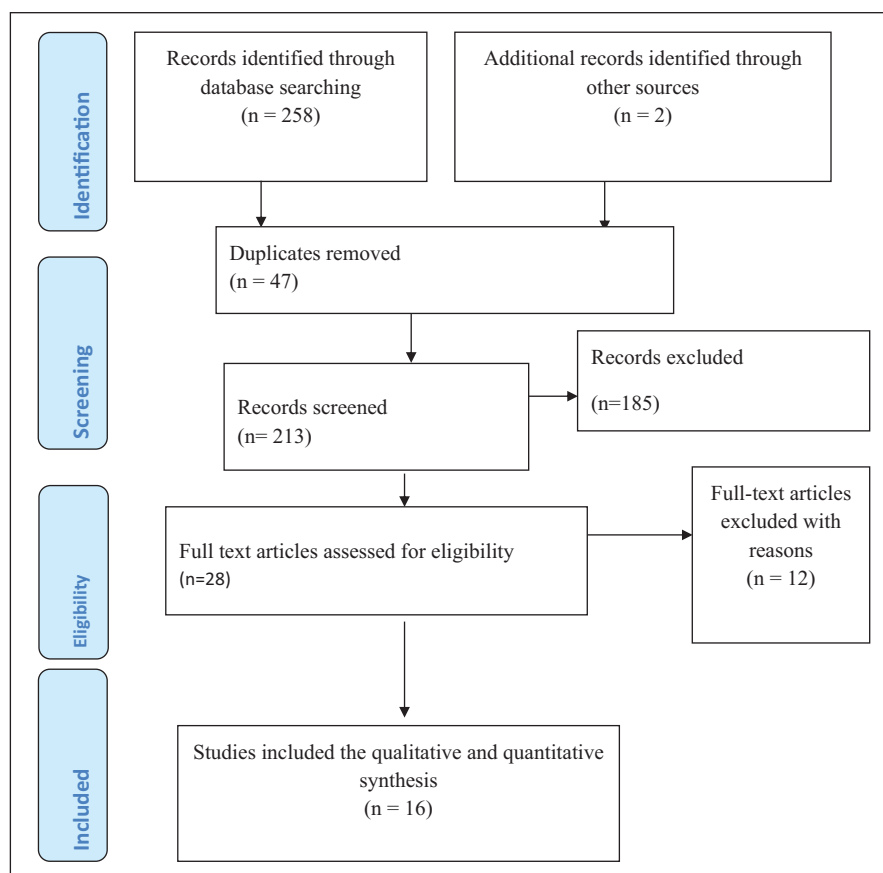
depression. Further screening for a single influential study was also performed by leaving a single study out from the analysis at a time. We did also screening for the presence of publication bias in the current study using a qualitative eyeball test (Liu, 2011) and quantitatively using the Eggers publication bias test. In this meta-analysis study a  $p$ -value  $< .05$  was interpreted as a statistically significant value.

## **Results**

A PRISMA flow diagram illustrating the steps of data search and refining process for the study on anxiety, depression, and psychological distress in the general population during the COVID-19 pandemic period as depicted in Figure 1.

### **Characteristics of included studies**

A total of 16 studies (Chaix et al., 2020; Collie et al., 2020; Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, et al., 2020; Mazza et al., 2020; Moccia et al., 2020; Moghanibashi-Mansourieh, 2020; Özdin & Bayrak Özdin, 2020; Qiu et al., 2020; Roy et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020; Wang, Xia et al., 2020; Zhang et al., 2020) that assessed one or more of the mental and psychological disorders (anxiety, depression or psychological distress) in 78,225 participants during the COVID-19 pandemic were included in the final analysis. Fifteen of the included studies were cross-sectional in design but one (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020) is a longitudinal study. More than half (9) (Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, Dou, et al., 2020; Qiu et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020; Wang, Xia et al., 2020; Zhang et al., 2020) of the studies were from China and the remaining studies were two from Italy (Mazza et al., 2020; Moccia et al., 2020), one from Australia (Collie et al., 2020), France (Chaix et al., 2020), India (Roy et al., 2020), Iran (Moghanibashi-Mansourieh, 2020), Turkey (Özdin & Bayrak Özdin, 2020). All of the studies assessed the outcome variable with an online survey method of data collection. Generalized anxiety disorder-7 (GAD-7) (Gao et al., 2020; Huang & Zhao, 2020; Li, Yang, Dou, et al., 2020; Zhang Lu et al., 2020) and Depression, Anxiety, and Stress scale (DASS-21) (Mazza et al., 2020; Wang, Pan, et al., 2020) were the two most common assessment instruments for the assessment of anxiety. On the other hand, DASS-21 (Mazza et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020) was the most frequently used tool for the screening of depression. A summary of the characteristics of the included studies based on the author's name and year of publication, number of participants, design of



**Figure 1.** PRISMA flow chart for the review search process.

the study, country origin, measurement tool, methods of data collection, and main findings are provided in Table 1.

### Quality of included studies

A quality score of the 16 included studies based on the modified Newcastle Ottawa Quality assessment scale is illustrated in Table 2.

### The prevalence of anxiety among the general population during the COVID-19 Period

Quantitative data regarding the prevalence of anxiety was reported in nine studies (Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, Dou, et al., 2020; Mazza et al., 2020; Özdin & Bayrak Özdin, 2020; Roy et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Zhang et al., 2020). The average prevalence of anxiety in the general population was 38.12% (95% CI: 18.29, 57.96,  $I^2=96\%$ ) as depicted in Figure 2. A sensitivity analysis was done and revealed that Li, Yang, Dou, et al., 2020 and Roy et al. (2020) have an influential effect on the overall anxiety prevalence as shown in Table 3. When these influential studies were excluded, the average anxiety prevalence was found to be 25.36% (95%CI: 17.28, 33.44,  $I^2=99\%$ ).

Six studies that assessed anxiety was from China (Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, Dou, et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Zhang et al., 2020) and the average anxiety prevalence in these studies was 33.33% (95%CI: 7.12, 59.55,  $I^2=96\%$ ). Three studies were from Italy, Turkey, and India (Mazza et al., 2020; Özdin & Bayrak Özdin, 2020; Roy et al., 2020), and the average prevalence of anxiety in these studies was 47.7% (95%CI: 9.05, 86.35,  $I^2=94.8\%$ ). Besides, the average prevalence of anxiety in studies that used DASS-21 (Mazza et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020), GAD-7 (Gao et al., 2020; Huang & Zhao, 2020; Li, Yang, Dou, et al., 2020; Zhang et al., 2020) and other measurement tools (SAS, HADS and a 5-point Likert scale) (Lei et al., 2020; Özdin & Bayrak Özdin, 2020; Roy et al., 2020) respectively was 23.4% (95% CI: 12.82, 33.98,  $I^2=99\%$ ), 40.73% (95% CI: 6.21, 75.24,  $I^2=98\%$ ), and 44.47% (95% CI: 1.92, 87.01,  $I^2=100\%$ ) (Figure 3).

Moreover, the average anxiety prevalence in studies that assessed a sample of more than 2000 participants (Gao et al., 2020; Huang & Zhao, 2020; Li, Yang, Dou, et al., 2020; Mazza et al., 2020) was 40.33% (95% CI: 5.96, 74.69,  $I^2=96\%$ ) and 36.36% (95% CI: 12.28, 60.44,  $I^2=92\%$ ) in studies with a sample less than 2000 participants (Lei et al., 2020; Özdin & Bayrak Özdin, 2020; Roy



**Table 1.** Characteristics of studies on psychological impact of covid-19 on the general population.

Author, year	Country of origin	Study design	Sample size	Measurement tool used	Methods of data collection	Main findings
Wang, Pan, Wan, Tan, Xu, Ho, et al. (2020)	China	CS	1,210	IES-R & DASS-21	Online survey	53.8% of respondents rated the psychological impact of the outbreak as moderate or severe. 16.5% reported moderate to severe depressive symptoms. 28.8% reported moderate to severe anxiety symptoms. 8.1% reported moderate to severe stress levels.
Lei et al. (2020)	China		1,590	SAS & SDS	Online survey	The prevalence of anxiety and depression was approximately 8.3 and 14.6%, respectively. The prevalence in the affected group (12.9, 22.4%) was significantly higher than that in the unaffected group (6.7, 11.9%).
Wang, Xia, et al. (2020)	China	CS	1,599	Kessler 6 psychological distress scale	Web based survey	Younger age ( $F = 102.04$ ), unmarried ( $t = 15.28$ ), with history of visiting Wuhan in the past month ( $t = -40.86$ ), with history of epidemics occurring in the community ( $t = -10.25$ ), more concern with media reports ( $F = 21.84$ ), perceived more impacts of the epidemic outbreak and negative coping style ( $t = 37.41$ ) were associated with psychological distress
Huang & Zhao (2020)	China	CS	7,236	GAD-7 & CES-D in Chinese version	Web-based survey	The overall prevalence of GAD, depressive symptoms, and sleep quality of the public were 35.1, 20.1, and 18.2%, respectively. Younger age groups reported a significantly higher prevalence of GAD and depressive symptoms than older people.
Qiu et al. (2020)	China	CS	52,730	CPDI	Online survey	Almost 35% of the respondents experienced psychological distress (29.29% of the respondents' scores were between 28 and 51, and 5.14% of the respondents' scores were $\geq 52$ ). Female gender: Age between 18 and 30 years of age or above 60, people with higher education, migrant workers and a region of the country.
Zhang et al. (2020)	China	CS	205	GAD-7 & GHQ-9	Online survey	Prevalence of depression was 21 (29.2%) in people with covid-19 infection, 6 (9.8%) in people at quarantine and 61 (34.7%) in the general public. Prevalence of Anxiety was 15 (20.8%) in people with covid-19 infection, 5 (10.2%) in people at quarantine, and 43 (19.6%) in the general public. Depression comorbid with Anxiety was present in 22 (22.4%) in the general public.
Gao et al. (2020)	China	CS	4,872	Chinese version WHO-5 & GAD-7	Online survey	The prevalence of depression, anxiety and combination of depression and anxiety (CDA) was 48.3, 22.6 and 19.4% respectively
Mazza et al. (2020)	Italy	CS	2,766	DASS-21	Online survey	906 (33%) scored above the average for depression sub-scale of DASS-21 517 (18%) scored above the average for anxiety sub-scale of DASS-21 In relation to stress, 2012 (72.8%) of respondents were in the average range, 404 (14.6%) were in the high range, and 347 (12.6%) were in the extremely high range

(Continued)

Table 1. (Continued)

Author, year	Country of origin	Study design	Sample size	Measurement tool used	Methods of data collection	Main findings
Moccia et al. (2020)	Italy	CS	807	K-10	Online survey	19.4 and 18.6% displayed mild and moderate-to-severe psychological distress. Cyclothymic (OR: 1.24; $p < .001$ ), depressive (OR: 1.52; $p < .001$ ) and anxious temperament (OR: 1.58; $p = .002$ ), and the ASQ 'Need for approval' (OR: 1.08; $p = .01$ ) were risk factors for moderate-to-severe psychological distress compared to no distress.
Wang, Pan, Wan, Tan, Xu, McIntyre, et al. (2020)	China	Longitudinal	1,738	DASS-21 & IES-R	Online survey	During the initial evaluation, stress, anxiety and depression were noted in 8.1, 28.8 and 16.5%, respectively and there were no significant longitudinal changes in stress, anxiety and depression levels ( $p > .05$ ).
Li, Yang, Dou, et al., 2020	China	CS	3,001	GAD-7 & PHQ-9	Online survey	85.6 and 83.7% of participants had minimal anxiety and depression respectively
Collie et al. (2020)	Australia	CS	551	Kessler-6 scale	Online survey	One third (31.0%) were experiencing severe psychological distress and a further 45.9% were experiencing moderate distress
Chiax et al. (2020)	France	CS	1,771	PDI	Online survey	38.06% (674) of the respondents had psychological distress (PDI $\geq 15$ ). Sex ( $p = .00132$ ), unemployment ( $p = 7.16 \times 10^{-6}$ ) and depression ( $p = 7.49 \times 10^{-7}$ ) were significantly associated with a higher PDI score.
Moghanibashi-Mansourieh et al. (2020)	Iran	CS	886	DASS-21	Online survey	The mean score of stress, anxiety and depression in medical students and patients with COVID-19 was significantly higher than medical staff and community population ( $p < .05$ ).
						The score of anxiety level in male was higher than that in female.
						The score of depression in unmarried participants was significantly higher than that in married group
Ozdin & Bayrak Özdin (2020)	Turkey	CS	343	HADS	Online survey	23.6% ( $n = 81$ ) of the population scored above the depression cut-off point, and 45.1% ( $n = 155$ ) scored above the cut-off point for anxiety.
Roy et al. (2020)	India	CS	662	Anxiety had been assessed by 18 items questionnaire that was supposed to be rated on a 5-point Likert scale		More than 80% of the participants were preoccupied with the COVID-19 pandemic
						Approximately 40% of the participants were paranoid with the thought of contracting the Novel Coronavirus infection over the past week.

Note. CES-D = center for epidemiology scale for depression; CPDI = COVID-19 peri-traumatic distress index; DASS-21 = depression, anxiety and stress scale; GAD-7 = general anxiety disorder-7; GHQ-9 = general health questionnaire-9; HADS = hospital anxiety and depression scale; K-10 = Kessler-10 scale; IES-R = impact of event scale-revised; PDI = peritraumatic distress index; PHQ-9 = patient health questionnaire 9; SAS = self rating anxiety; SDS = self rating depression scale; TMD = temporomandibular disorders; WHO-5 = WHO-five well-being index.

**Table 2.** Modified Newcastle-Ottawa quality assessment scale and total score of each study.

No	Author, year of publication	Representation	sampling	Random selection	Non-response bias	Data collection	Case definition	Reliability and validity	Method of data collection	Prevalence period	Numerator and denominator	Summary assessment
1	Lei et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
2	Huang & Zhao (2020)	1	1	1	1	1	1	1	0	1	1	9
3	Wang, Pan, Wan, Tan, Xu, Ho, et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
4	Wang, Xia, et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
5	Qiu et al. (2020)	1	1	1	1	1	1	1	0	1	1	9
6	Zhang et al. (2020)	0	0	1	1	1	1	1	0	1	1	7
7	Gao et al. (2020)	1	1	1	1	1	1	1	0	1	1	9
8	Mazza et al. (2020)	1	1	1	1	1	1	1	0	1	1	9
9	Moccia et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
10	Wang, Pan, Wan, Tan, Xu, McIntyre, et al. (2020)	1	1	1	1	1	1	1	0	1	1	8
11	Li et al. (2020)	1	1	1	0	1	1	1	0	1	1	8
12	Collie et al. (2020)	0	1	1	1	1	1	0	0	1	1	7
13	Chiax et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
14	Moghanibashi-Mansourieh et al. (2020)	0	1	1	1	1	1	1	0	1	1	8
15	Özdin & Bayrak Özdin (2020)	0	0	1	1	1	1	1	0	1	1	7
16	Roy et al. (2020)	0	0	1	1	1	1	0	0	1	1	1

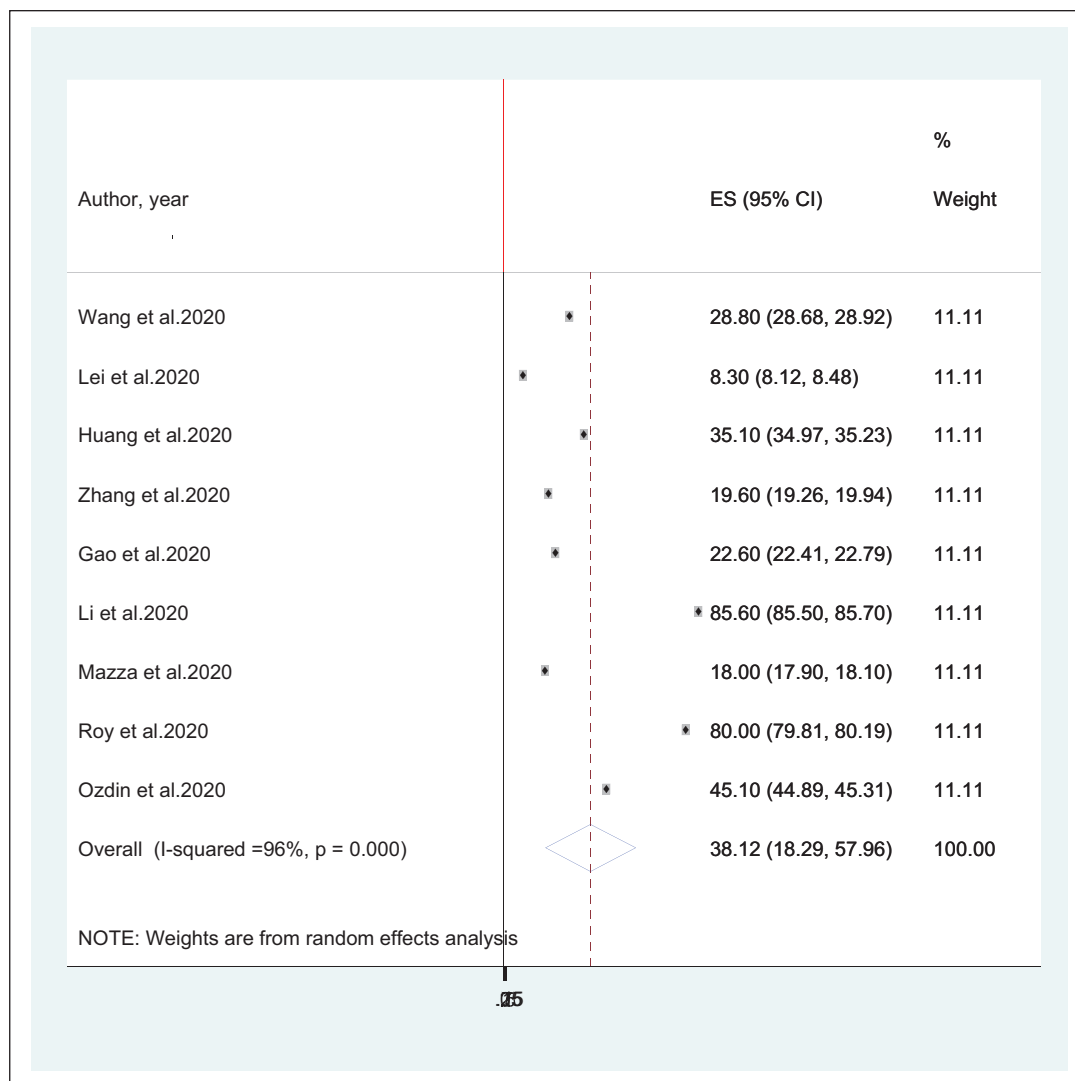
et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Zhang et al., 2020) (Table 4). There was no evidence of publication bias for the prevalence of anxiety as the funnel plot test is symmetric (Figure 4) and the Eggers test for publication bias was insignificant ( $B=50$ ,  $SE=31$ , and  $P=.33$ ).

### *The prevalence of depression among the general population during the COVID-19 pandemic Period*

Among the 16 included studies (Chaix et al., 2020; Collie et al., 2020; Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, et al., 2020; Mazza et al., 2020; Moccia et al., 2020; Moghanibashi-Mansourieh, 2020; Özdin & Bayrak Özdin, 2020; Qiu et al., 2020; Roy et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020; Wang, Xia, et al., 2020; Zhang et al., 2020), the prevalence of depression was reported in eight studies (Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, Dou, et al., 2020; Mazza et al., 2020; Özdin & Bayrak Özdin, 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Zhang et al., 2020) and the average depression prevalence was 34.31% (95% CI: 18.40, 50.22,  $I^2=94.6\%$ ) as illustrated in Figure 5. A sensitivity analysis revealed that one study Li et al. (2020) was influential and affected the average depression prevalence and when this study was excluded, the average prevalence was 27.26% (95% CI: 15.87, 38.64,  $I^2=92\%$ ). Among the eight included studies, six studies were from China (Gao et al., 2020; Huang & Zhao, 2020; Lei et al., 2020; Li, Yang, Dou, et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Zhang et al., 2020) and the average prevalence of depression in these studies is 36.32% (95% CI: 15.31, 57.32,  $I^2=99\%$ ) as illustrated in Table 5. Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020 and Mazza et al. (2020) used the DASS-21 scale; the average depression prevalence was 24.73% (95% CI: 8.28, 42.06,  $I^2=99\%$ ) in these studies. The remaining studies used different methods for depression assessment; SDS (Lei et al., 2020), CES-D (Huang & Zhao, 2020), GHQ-9 (Zhang et al., 2020), PHQ-9 (Li, Yang, Dou, et al., 2020), WHO-5 (Gao et al., 2020), and HADS (Özdin & Bayrak Özdin, 2020). There was no evidence of publication bias for the prevalence of depression as the funnel plot test is symmetric (Figure 6) and the Eggers test for publication bias was insignificant ( $B=-66$ ,  $SE=38$ , and  $P=.87$ ).

### *The prevalence of psychological distress among the general population during the COVID-19 Period*

Six of the 16 studies (Chaix et al., 2020; Collie et al., 2020; Mazza et al., 2020; Moccia et al., 2020; Qiu et al.,



**Figure 2.** A forest plot for the prevalence of anxiety among the general population during the COVID-19 pandemic.

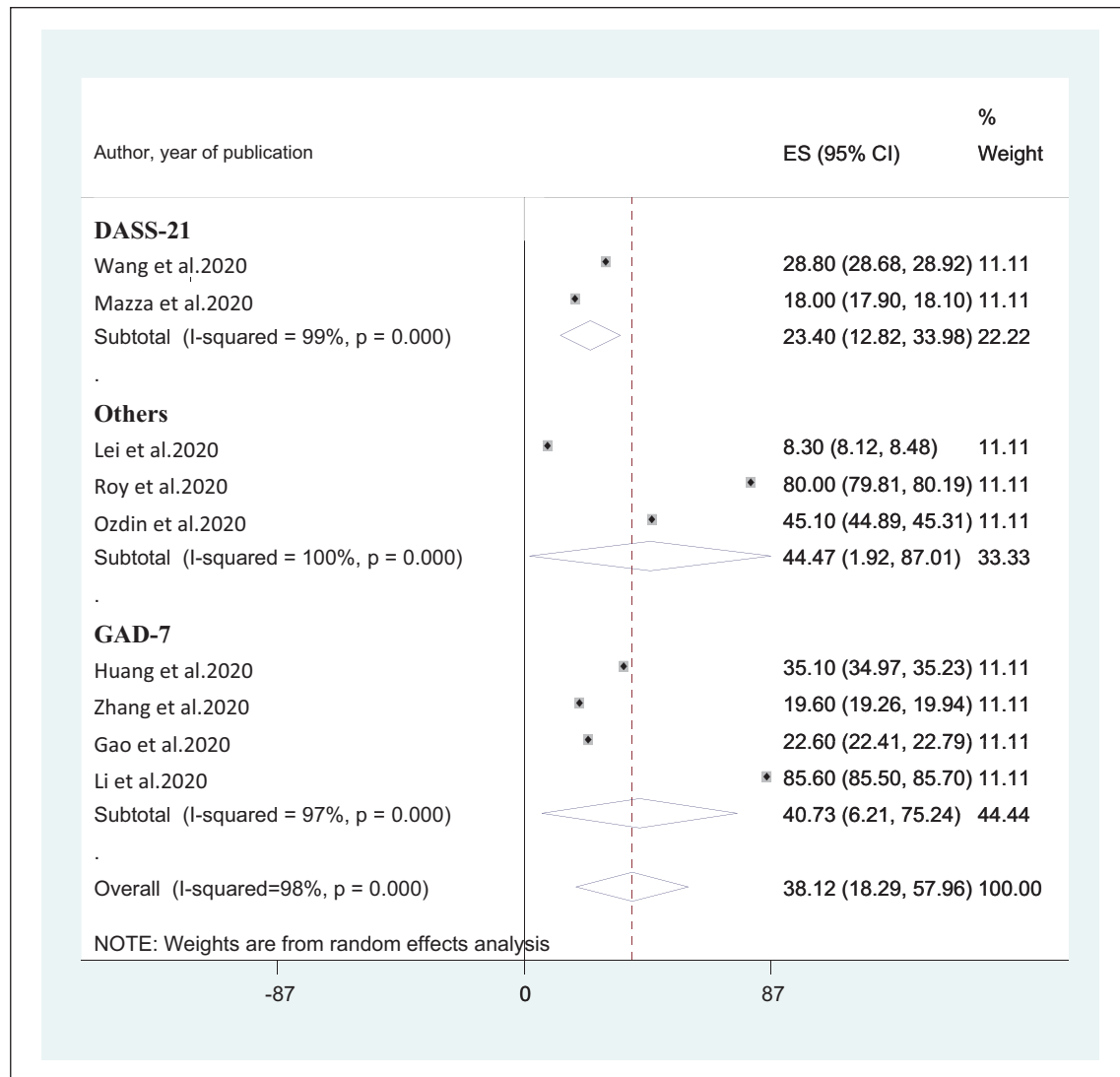
**Table 3.** A sensitivity analysis of the prevalence of anxiety among the general population during the COVID-19 period with its 95% confidence interval.

No	Study excluded	Prevalence of anxiety (%)	95% Confidence interval
1	Wang, Pan, Wan, Tan, Xu, Ho, et al. (2020)	39.23	16.53, 62.05
2	Lei et al. (2020)	41.85	20.96, 62.94
3	Huang & Zhao (2020)	38.50	15.48, 61.62
4	Zhang et al. (2020)	40.44	19.24, 61.64
5	Gao et al. (2020)	40.06	18.42, 61.70
6	Li, Yang, Dou, et al., 2020	32.19	18.81, 45.56
7	Mazza et al. (2020)	40.64	19.08, 62.20
8	Ozdin & Bayrak Özdin (2020)	37.25	12.39, 53.39
9	Roy et al. (2020)	32.89	15.50, 59.00

2020; Wang, Xia et al., 2020) reported the prevalence of psychological distress. The average psychological distress prevalence was 37.54% (95% CI: 28.58, 46.51,  $I^2=100\%$ ) as depicted in Figure 7. Among the six studies, Collie et al. (2020) was found to be influential over

the average prevalence, and the psychological distress prevalence when this influential study was excluded was 29.67% (95% CI: 23.23, 36.34,  $I^2=94\%$ ). There was no evidence of publication bias for the prevalence of psychological distress as the qualitative funnel plot test is

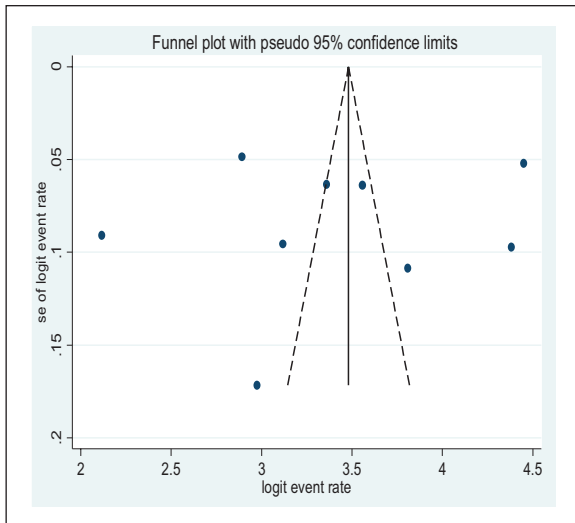




**Figure 3.** A sub-group analysis for prevalence of anxiety among the general population during the COVID-19 pandemic by the measurement tools.

**Table 4.** A sub-group analysis for the prevalence of anxiety and depression among the general population during the COVID-19 pandemic.

Subgroup		Number of studies	Estimates		Heterogeneity
			Prevalence (%)	95% CI	I <sup>2</sup> (%)
Sub-group analysis for the prevalence of anxiety					
Country	China	6	33.33	7.12, 59.55	98
	Others	3	47.70	9.05, 86.35	94.8
Measurement tool	DASS-21	2	23.4	12.82, 33.98	99
	GAD-7	4	40.73	6.21, 75.24	98
	Others	3	44.47	1.92, 87.01	100
Sample size studied	Above 2,000	4	40.33	5.96, 74.69	96
	Below 2,000	5	36.36	12.28, 60.44	92
Sub-group analysis for the prevalence of depression					
Country	China	6	36.32	15.31, 57.32	99
	Others	2	28.3	19.09, 37.51	94

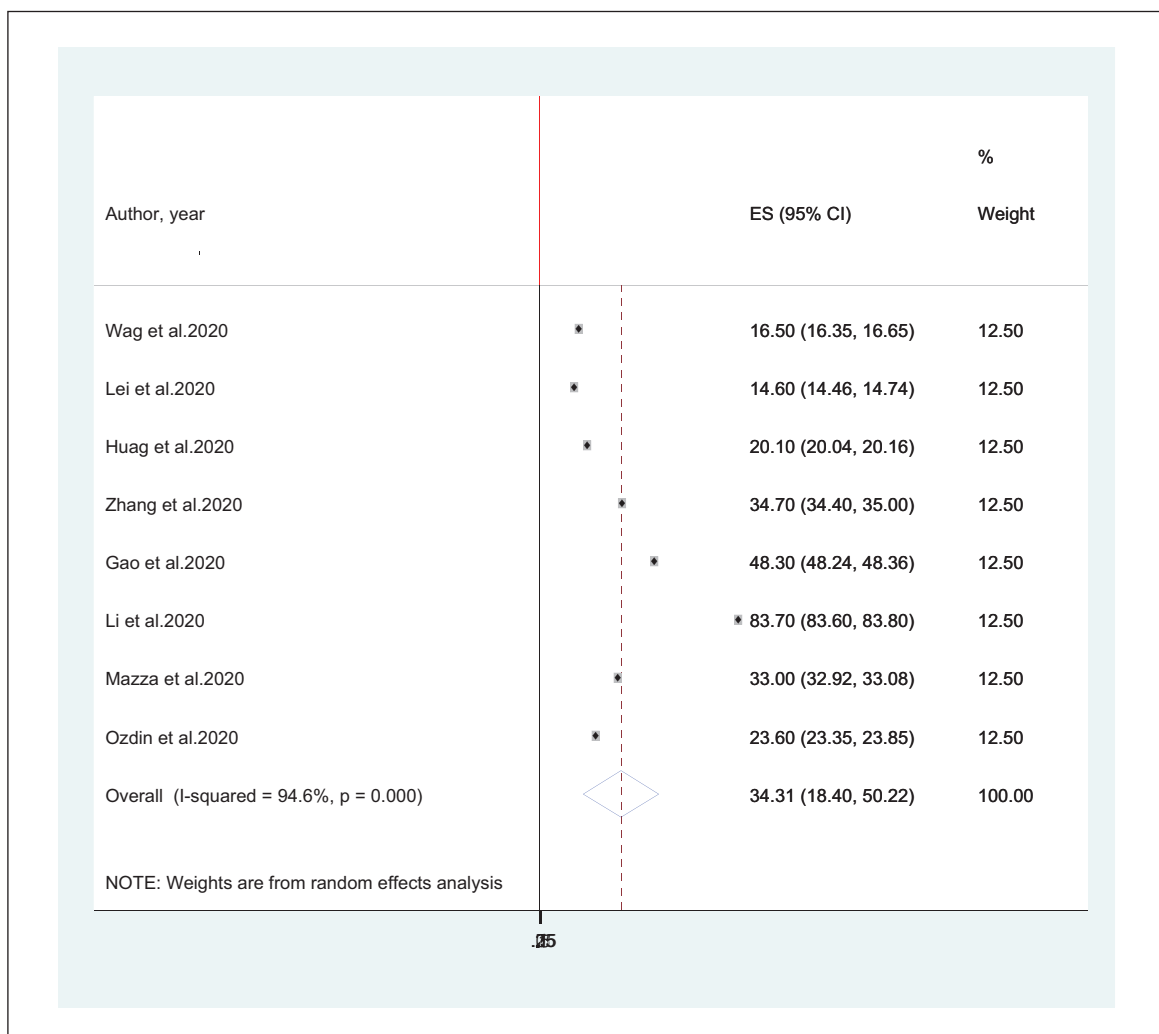


**Figure 4.** A funnel plot for the prevalence of anxiety among the general population.

symmetric (Figure 8) and the Eggers test for publication bias was insignificant ( $B = 19$ ,  $SE = 14$ , and  $P = .90$ ).

## Discussion

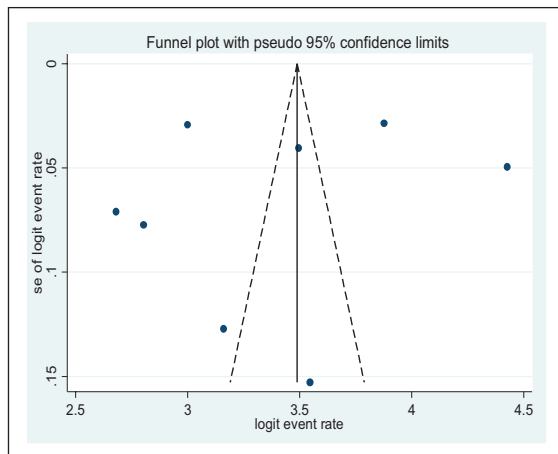
COVID-19 due to its pandemic (Richardson, 2020; Srivastava et al., 2020), the ease of transmission as well as the high rate of mortality (Liu, Gayle et al., 2020; Shim et al., 2020) is associated with multi-dimensional mental and psychological effects (Pfefferbaum & North, 2020; Torales et al., 2020; World Health Organization, 2020). This calls for evidence regarding the mental and psychological reactions of the global community toward this worldwide epidemic (Holmes et al., 2020). Even though there are few studies at the single level on depression, anxiety, and psychological distress, to the investigator's knowledge, this systematic review and meta-analysis study was the first of its kind that assessed the average prevalence of anxiety, depression, and



**Figure 5.** A forest plot for the prevalence of depression among the general population during the COVID-19 pandemic.

**Table 5.** A sensitivity analysis of the prevalence of depression among the general population during the COVID-19 period with its 95% confidence interval.

No	Study excluded	Prevalence of depression (%)	95% Confidence interval
1	Wang, Pan, Wan, Tan, Xu, Ho, et al. (2020)	36.90	19.68, 54.03
2	Lei et al. (2020)	37.13	20.23, 54.22
3	Huang et al. (2020)	36.34	18.34, 53.74
4	Zhang et al. (2020)	34.26	17.10, 51.42
5	Gao et al. (2020)	32.31	12.53, 52.10
6	Li, Yang, Dou, et al., 2020	27.26	15.87, 38.64
7	Mazza et al. (2020)	34.5	15.30, 53.70
8	Ozdin & Bayrak Özdin (2020)	35.84	18.68, 53.01

**Figure 6.** A funnel plot for the prevalence of depression among the general population during the COVID-19.

psychological distress in the global community during the COVID-19 pandemic period.

This timely aggregate assessment of anxiety, depression, and psychological distress on 16 studies and 78,225 community participants supplements evidence that higher rates of anxiety, depression, and psychological distress existed in the global community during this pandemic period. Pandemics such as COVID-19 are accompanied by mental health complications (Pfefferbaum & North, 2020; World Health Organization, 2020; Zandifar & Badrfam, 2020), and researches regarding this sensitive issue are expected to be guided by ethical procedures (Townsend et al., 2020). Therefore, we authors of this review and meta-analysis believed that all of the included studies are conducted in line with the above ethical guideline.

In this meta-analysis, the average prevalence of anxiety, depression, and psychological distress among the general population during the COVID-19 pandemic was 38.12% and 34.31%, and 37.54% respectively. This was higher than the prevalence of depression among older Chinese men and women (11.0%–14.5%) (Chi et al., 2005).

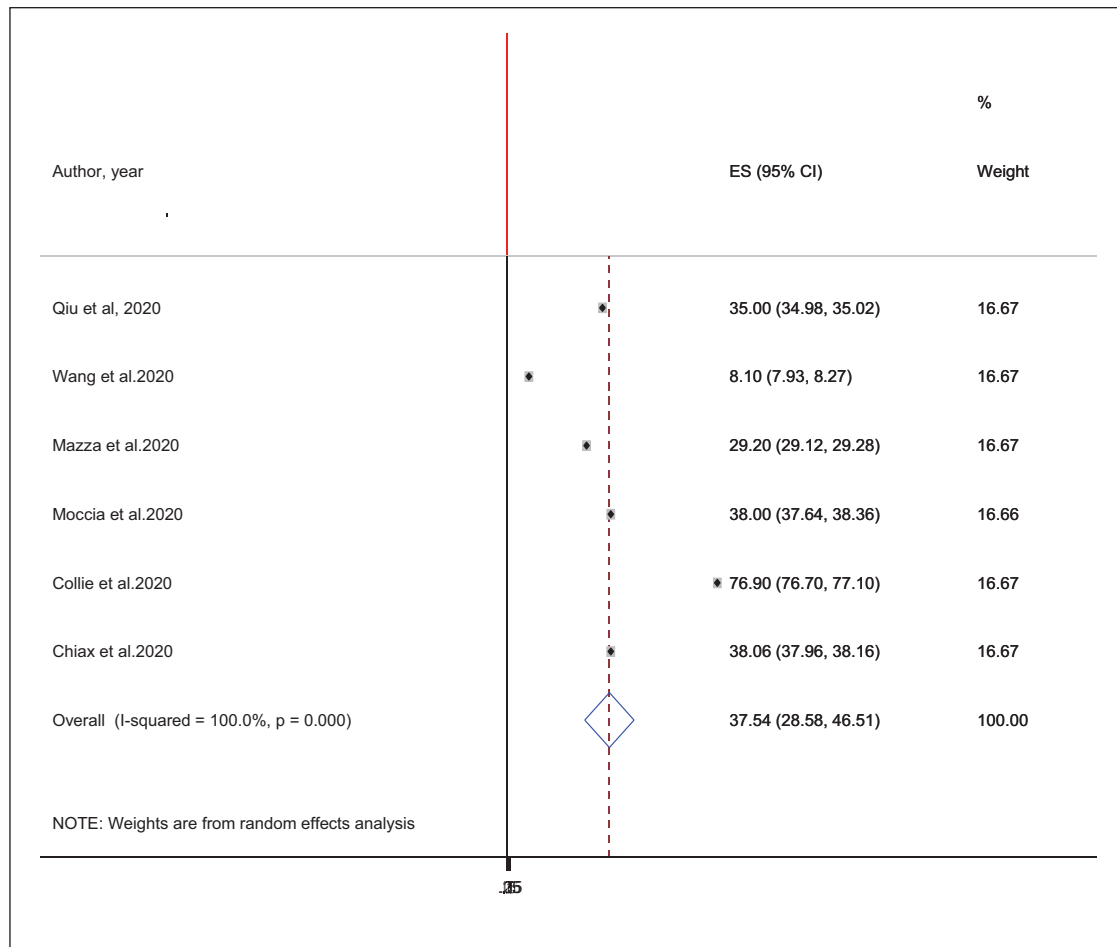
The present prevalence of anxiety and depression was also higher than the result of a systematic review and meta-analysis on health care professionals during

the COVID-19 period (23.2% for anxiety and 22.8% for depression) (Pappa et al., 2020). This could be due to the low level of awareness of the wider community regarding the potential transmission mechanisms, prevention strategies, mortality as compared to the health professionals who are better informed of this. A study in China revealed that health information regarding COVID-19 and its preventive measures was associated with a better psychological response (Roy et al., 2020; Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020). The high perceived severity of COVID-19 in the general population than the health care professionals may also responsible for this (Li, Yang, Dou, et al., 2020).

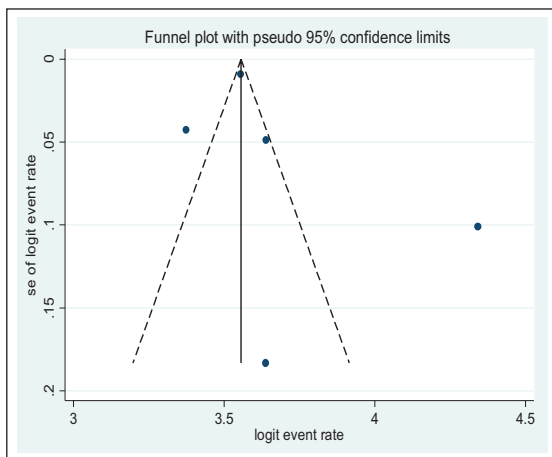
Based on the results of this study, the prevalence of anxiety and depression among the general population during the COVID-19 period was higher in the Chinese community than the prevalence noticed in other countries. This could be associated with China being the origin of the pandemic so that the population has no earlier information and lacks emergency preparedness in the outbreak beginning so that a psychological crisis could happen. Besides, the small number of studies included in the meta-analysis from other countries might be responsible for the discrepancy in the prevalence of anxiety and depression. Furthermore, the prevalence of anxiety shows a difference among studies considering the measurement tools. The prevalence of anxiety was relatively higher as measured with HADS, SAS, and 5-Point Likert scale together than the result obtained when measurement tools were DASS-21 and GAD-7. The difference in sensitivity and specificity of the assessment tools to screen out anxiety could be responsible for this.

Also, the average prevalence of anxiety was higher in studies that incorporated a sample population of more than 2000 individuals than the prevalence obtained in studies with study participants less than 2000. The increase in sample size with larger participant studies could increase the representativeness of the estimate and revealed the burden of high anxiety during the period of highly infectious and serious COVID-19 pandemic.

In general, given the high prevalence of anxiety, depression, and psychological distress in the general population during the COVID pandemic, tailored interventional



**Figure 7.** A forest plot for the prevalence of psychological distress among the general population during the COVID-19 pandemic.



**Figure 8.** A funnel plot for the prevalence of psychological distress among the general population.

strategies had to be designed and implemented. In support of this, a study from China recommended a strategic plan and organization of psychological first aid measures like telemedicine during major the pandemic period. Moreover,

crisis prevention and intervention plans like screening for mental health problems, monitoring its trend, referral of cases, and providing suitable interventions has to be routine practice during the pandemic period. Furthermore, psychoeducation, the establishment of virtual clinics, chat lines, and remote psychotherapies are recommended to averse the mental health complications of the COVID-19 pandemic (Duan & Zhu, 2020; Ho et al., 2020; Pappa et al., 2020). Up-to-date and precise information on the number of new and improved cases, available treatment modalities, and the transmission means has to be practiced to lower the psychological and mental health impact of the illness (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020).

This study has its strengths and drawbacks. The investigators assumed that this meta-analysis study in the global community during the COVID-19 period was the first to provide aggregate evidence regarding the prevalence of anxiety, depression, and psychological distress. Although multiple studies that are included in this meta-analysis are conducted, the present one is scientifically more valid in terms of the strength of evidence it provides as the implication for intervention and policy recommendations.

The separate report regarding the average prevalence of anxiety and depression based on country, measurement tool used, and the sample size is a further strength for this study. Moreover, the identification of influencing studies for anxiety, depression, and psychological depression prevalence and reporting the average prevalence when such influential studies were excluded is also a strength.

The limitation of the study starts with the inclusion of many studies in the meta-analysis for anxiety and depression from China that limits the generalizability of the results. The great heterogeneity between included studies and the health structure difference across countries could also be a constraint to the overall generalizability of the study result. Few studies were included in some groups during the sub-group analysis that might also be a threat to the precision of estimate and generalizability of the study findings. A further limitation of the current review is the shortage of literature from Africa countries that should be recognized during the utilization of research findings.

In conclusion, the present systematic review and meta-analysis are the first of its kind that provides average evidence regarding the high prevalence of anxiety, depression, and psychological distress among the general population. The findings of the study are therefore step-stones to design early intervention strategies for anxiety, depression, and psychological distress in the general population during the COVID-19 pandemic period.

## Conclusion

Anxiety, depression, and psychological distress were highly prevalent among the general population during the COVID-19 pandemic period. The magnitude of anxiety varies across the country of origin of the study, the measurement tool used, and the size of the studied sample. Depression in the general population also varies with the country of origin for the study. Therefore, clinicians, policymakers, and further researchers should be timely aware of and act accordingly to minimize the psychological and mental health impact of COVID-19 on the wider population.

## Author Contributions

MN: Conceived the study idea and procedure, MT and MT: Searched available literature, MN and MT: Analyzed the meta-analysis, MN and MT: Did the data extraction and quality assessment of the studies, MN: writes the manuscript first draft, MN, MT, MB, GB, and ET: Approved the final draft of the manuscript and MN: Facilitating the publication process.

## Conflict of interest

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