ORIGINAL ARTICLE



The Global Prevalence of Depression, Anxiety, Stress, and Insomnia Among General Population During COVID-19 Pandemic: A Systematic Review and Meta-analysis

Sultan Mahmud¹ · Md Mohsin¹ · Md. Nayem Dewan¹ · Abdul Muyeed²

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Abstract

This study aimed to examine research findings related to depression, anxiety, stress, and insomnia during the COVID-19 pandemic. This study also explored periodic changes in the prevalence of depression, anxiety, stress, and insomnia among the general people during this pandemic. We performed a meta-analysis by searching articles from several sources (PubMed, MEDLINE, and Google Scholar). We used the random-effects models, subgroup analysis, and heterogeneity test approaches. Results show that the prevalence of depression, stress, and insomnia increased during March to April 2020 (30.51%, 29.4%, and 25%, respectively) compared to the study period before February 2020 (25.25%, 16.27%, and 22.63%, respectively) and followed in May to June 2020 (16.47%, 5.1%, and 19.86, respectively). The prevalence of depression and anxiety from k=30 studies was 28.18% (95% CI: 23.81– 32.54) and 29.57% (95% CI: 24.67-34.47), respectively. And the prevalence of stress (k=13) was 25.18% (95% CI: 14.82–35.54), and the prevalence of insomnia (k=12) was 23.50% (95% CI: 16.44–30.57). These prevalence estimates during the pandemic are very high compared to normal times. Hence, the governments and policymakers should apply proven strategies and interventions to avoid psychological adversity and improve overall mental health during the COVID-19 pandemic.

Keywords COVID-19 · Meta-analysis · Depression · Anxiety · Stress · Insomnia · General population

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Introduction

In December 2019, a highly infectious acute respiratory syndrome caused by a novel coronavirus (SARS-CoV-2) originated in the city of Wuhan, China. The World Health Organization (WHO), on March 11, 2020, declared COVID-19 (the disease caused by the coronavirus) a pandemic (Huang et al., 2020; Mahmud et al., 2021b, 2021c; Mahmud et al., 2021a). It has already claimed several millions of lives across the globe. Its impact, however, should be assessed not only in terms of biological outcomes, but also in terms of economic, health, psychological, and social implications (O'Connor et al., 2020). It is normal to find higher psychological morbidities in the population in the event of a pandemic situation due to the widespread prevalence of disease and the increased number of cases and deaths (Krishnamoorthy et al., 2020). During outbreaks of the severe acute respiratory syndrome (SARS), H1N1 influenza, Ebola virus, and Middle East respiratory syndrome (MERS), related cases of higher psychological morbidities were also found in the past (Brooks et al., 2020). At least one of the many psychiatric morbidities such as depression, anxiety, stress, or sleep disorders occurred in over half of the patients with SARS, MERS, or Ebola (Chua et al., 2004; Jeong et al., 2016; Keita et al., 2017). As a ubiquitous infectious disease, COVID-19 may also affect the health, safety, and well-being of both individuals and community levels that are correlated with psychological distress and symptoms of mental illness (Bao et al., 2020). A recent study indicates that isolated and quarantined people go through substantial levels of anxiety, anger, confusion, and stress (Brooks et al., 2020). Due to the highly infectious and lethal nature of the virus, COVID-19 may disturb the mental health of people globally from infected patients, and healthcare workers to families, children, and students (Ryu et al., 2020; Bao et al., 2020; Chen et al., 2020). The pandemic has created enormous stress and fears, especially among elderly people due to their weak immune systems and chronic underlying diseases (Chen et al., 2020; Meng et al., 2020). Sometimes, psychological issues go unnoticed, especially during a pandemic due to the more direct impact of morbidity caused by a disease. But it is crucial to investigate the adverse psychosocial effects during long-term disasters like the COVID-19 pandemic in order to aid immediate and long-term recovery (O'Connor et al., 2020). Also, it is important to have a global view of the mental health problems and their impacts during the ongoing pandemic, because it may help define more effective strategies to fight off psychological problems during the COVID-19 pandemic and thereafter. Therefore, it is a pressing need to quantify the extent of psychological threats the COVID-19 pandemic places on people throughout the world.

Few published systematic reviews have been found on the same topic. A systematic review and meta-analysis (Salari et al., 2020) of 17 studies showed that the prevalence of depression, anxiety, and stress among the general population was respectively 33.7%, 31.9%, and 29.6%. Those 17 studies were published before May 2020. Another meta-analysis (Cooke et al., 2020) considered 14 studies published before May 26, 2020, that displayed only the prevalence

of posttraumatic and psychological stress among the general population during the COVID-19 pandemic. The study found that the prevalence of posttraumatic and psychological stress among the general population was 23.88% and 24.84%, respectively. Three similar types of meta-analysis (da Silva & Neto 2020; Pappa et al., 2020; Mahmud et al., 2021a) that included respectively 8, 12, and 69 studies demonstrated the prevalence of depression, anxiety, insomnia, or stress among health professionals. The reported prevalence estimates of psychological disorders during the COVID-19 pandemic are higher than the estimates of normal time (Pan et al., 2020; Xiong et al., 2020). The history of a pandemic that causes an enormous negative impact on physical and mental health and economies is very old (Qiu et al. 2017; Goulia et al., 2010). It may also have an association with higher psychological disorders in the current pandemic. During this pandemic, plenty of cross-sectional studies are emerging on the prevalence of psychological morbidity. The investigation on patterns of mental health rather than cross-sectional prevalence rates is more helpful to understand the psychological dysfunction and resilience (Chen & Bonanno, 2020). There is also evidence that those psychological crises are changing periodically during the pandemic (Mahmud et al., 2021a). However, there is an absolute shortage of literature that identifies the periodic variation in psychological conditions. This has motivated the authors to investigate psychological outcomes among the general population over time during the pandemic. Here, the general population refers to non-healthcare, nonfirst responders who have not been infected with the coronavirus. The purpose of this systematic review is to analyze the existing research findings which are related to psychological issues depression, anxiety, stress, and insomnia during this COVID-19 pandemic among the general people. The study also investigates the periodic changes and region-wise variations in mental health conditions during the COVID-19 pandemic.

Methods

We have strictly followed Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statements (Liberati et al., 2009) for conducting this systematic review. However, the review protocol was not previously registered. We have also followed the checklist of the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) (Pappa et al., 2020).

Search Strategy and Selection Criteria

In this study, we created an Endnote (version X.8) library to catalog articles and remove duplicates. We have conducted a comprehensive systematic review using a systematic methodology (Fig. 1) for depression, anxiety, stress, as well as insomnia separately through the searches of PubMed, MEDLINE, and Google Scholar. The keywords that have been used in the systematic searches were "Coronavirus," "COVID-19," "2019-ncov," "SARS-cov-2," "Mental illness," "Mental health

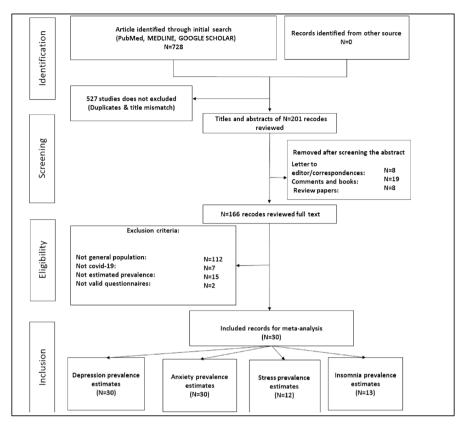


Fig.1 Flowchart showing the stages of including/excluding study in the systematic review (Liberati et al., 2009) (PRISMA 2009)

problem," "Insomnia," "Distress," "Anxiety," "Depression," and "General population." All possible combinations of keywords have been used for searching the relevant articles by limiting the search to studies published after December 30, 2019, to before August 30, 2020. We also imposed the language barrier while selecting articles. The studies that were included in the analysis were published only in English. We did crosscheck the reference list of the selected articles to identify additional articles that met inclusion criteria. Moreover, the preprint papers published on Medrxiv, PsyArXiv, bioRxiv, and SSRN servers were also included.

Inclusion/Exclusion Criteria

The studies were included if and only if the study population or part of the study population is the general population. The studies were excluded from the database if they did not use validated measures or did not report study duration, study site, as well as sample size. The papers were excluded from the catalog in case of no English version, in case of no original data, and in case of no prevalence estimates of depression/anxiety/stress/insomnia were available. We also removed the reviews, letters to the editor, and correspondence.

Quality Assessment

Two independent authors (SM, and AM) evaluated the risk of bias of the included studies using a modified form of the Newcastle–Ottawa scale (Pappa et al., 2020), and a third author (ND) helped them resolve the potential disagreements. Pappa et al. (2020) modified the Newcastle–Ottawa scale by considering the representativeness of the sample, sample size, determination of depression, distress, anxiety, and insomnia, and the use of appropriate statistical tools. With the cutoff point 3, the quality assessment score of the modified Newcastle–Ottawa scale ranged between 0 and 5. The quality assessment score of ≥ 3 indicates lower publication bias. On the other hand, a study has a high publication bias if the corresponding quality assessment score is < 3.

Screening and Extraction

The data were extracted by two independent authors (SM, and AM), with the presence of third reviews if necessary (MM). The first two authors screened all the articles (30) that satisfied the inclusion criteria and extracted data using a standardized form. The information extracted from the selected articles included article title, first author's name, year of publication, place of study, name of the authors, sampling method, duration of data collections, sample size, percentage of male respondents, assessment methods, the prevalence of depression, stress, anxiety, and insomnia.

Outcomes and Measures

Depression, anxiety, stress, and insomnia are the main outcomes of this systematic review. Clinical interviews or self-rated screening instruments/questionnaires have been used to diagnose these psychological outcomes. Most of the people were diagnosed using self-rated electronic questionnaires along with Beck Anxiety Inventory (BAI) (Magán et al., 2008); Beck Depression Inventory-II (BDI-II) (Beck et al., 1996); Acute Stress Disorder Scale (ASDS) (Bryant et al., 2000); Athens Insomnia Scale (AIS) (Soldatos et al., 2003); Depression, Anxiety, and Stress Scale (DASS-21) (Akin & Çetın, 2007); Center for Epidemiological Studies Depression (CES-D) (Hann et al., 1999; Radloff, 1977); Six-item K6 Screening (K-6-S) (Andersen et al., 2011); Perceived Stress Scale (PSS) (Lee 2012); Beck Anxiety Inventory (BAI) (Fydrich et al., 1992); Zung Self-Rating Depression Scale (SDS) (Biggs et al., 1978; Zung, 1965); Zung Self-Rating Anxiety Scale (SAS) (Zung, 1965); General Anxiety Disorder 7-item scale (GAD-7) (Spitzer et al., 2006); General Anxiety Disorder 2-item scale (GAD-2) (Wells, 2005); Patient Health Questionnaire depression module-9 (PHQ-9) (Derogatis & Cleary, 1977); Patient Health Questionnaire depression module-2 (PHQ-2) (Kroenke et al., 2003); Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989); and Insomnia Severity Index (ISI) (Bastien et al., 2001).

Statistical Analysis

The meta-analysis of the prevalence of depression, anxiety, stress, and insomnia among the general population was carried out by STATA, statistical software version 16. The significance of the hypothesis was tested using the z statistic (level of significance p < 0.05). The heterogeneity tests were considered with a 5% level of significance to measure the homogeneity of studies. Due to significant heterogeneity, the random-effects model was used to estimate the pooled prevalence of depression, anxiety, stress, as well as insomnia with 95% confidence intervals and the relative weight for each study. All the results of the meta-analysis were displayed in forest plots. The potential publication bias was inspected by using the funnel plot/ Egger's test (Egger et al., 1997). We also conducted the subgroup analysis based on study time/duration, study location country/region, and assessment methods to observe the prevalence of depression, anxiety, stress, and insomnia from different stratifications and inspect the source of heterogeneity. All the studies were classified into three groups based on study duration for conducting the subgroup analysis: Before February 2020, from March to April 2020, and from May to June 2020. The studies were also classified into different groups based on territories by following the WHO's regional classifications (Mahmud et al., 2021; WHO, n.d.).

Results

Study Characteristics

After the complete systematic selection procedure (depicted in Fig. 1) 30 studies (Ueda et al., 2020; Liu et al. 2020; Zhou et al. 2020a, 2020b, ; Sigdel et al. 2020; Kazmi et al., 2020; Othman, 2020; Shevlin et al., 2020; Odriozola-González et al., 2020; Agberotimi et al. 2020; Mazza et al., 2020; Shi et al., 2020; Rossi et al. 2020; Dai et al., 2020; Fu et al., 2020; Gualano et al., 2020; Tang et al. 2020; Huang & Zhao, 2020; Marelli et al., 2020; McCracken et al., 2020; Song et al., 2020; Wang et al., 2020a, 2020b, 2020c, 2020d; Islam et al. 2020; Salman et al. 2020; Verma & Mishra, 2020; Grover et al., 2020; Ozamiz-Etxebarria et al., 2020; Pieh, et al., 2020) with a total of 162,027 respondents were comprised in the analysis. Among all the respondents, on average, 41.14% were males. All the studies were cross-sectional and reported on anxiety, depression, stress, or insomnia. Most of the studies (70%) used an online survey and 13% of the studies used web-based/social media sampling. The remaining 17% of studies either used convenience sampling or snowball sampling or respondent driven sampling (RDS) or random sampling. Out of 30 studies, 11 studies took place in China, 4 in Italy, 3 in India, 2 in Spain, and 1 study was undertaken in each of the countries namely Austria, Japan, Bangladesh, Iran, Malaysia, Nepal, Nigeria, Pakistan, Sweden, United Kingdom (UK). There were 7 preprint (23.33%) and 23 published (76.67%) papers included in this study and 43% (13/30) of similar studies were found in another systematic review (Salari et al., 2020). A total of 7 studies used DASS-21 tools for assessing depression, anxiety, and stress. PHQ-9 tools were considered in 18 studies and CES-D was considered in 3 studies for screening depression. 3 studies used three different assessment tools (SDS, PQH-2, BDI-II). For assessing anxiety, 19 studies used GAD-7, 4 studies used four different tools (SAS, CES-D, GAD-2, BAI). For assessing stress, 3 studies used PSS and another two studies used ASDS and K6-S. Nine studies considered ISI, two studies used AIS, and another two studies used PSQI for measuring the severity of insomnia. Brief characteristics for each study are provided in Table 1 which includes the sample size, study location, duration of the study, male/female ratio, sampling method, assessment method, the prevalence of depression, anxiety, stress, and insomnia. The Modified Newcastle–Ottawa quality (Papa et al., 2020) assessment results show that the score for most of the studies (27) is greater than 3 which indicates there is lower or no publication bias for the corresponding study (Table 2). And the remaining 3 studies scored exactly 3 which also indicates a lower publication bias.

Statistical Heterogeneity and Publication Bias

Heterogeneity of the studies was investigated using *Q*-test and I^2 (%) indices. We have found significant heterogeneity in our meta-analysis of effect of COVID-19 on depression ($Q = x^2_{(29)} = 14,826.12, p < 0.05$) ($I^2 = 99.75\%, p < 0.0001$), anxiety ($Q = x^2(29) = 10,806.67, p < 0.05$) ($I^2 = 99.79\%, p < 0.0001$), stress ($Q = x^2(11) = 3612.96, p < 0.05$) ($I^2 = 99.89\%, p < 0.0001$), and insomnia ($Q = x^2(12) = 10,071.34, p < 0.05$) ($I^2 = 99.89\%, p < 0.0001$). To evaluate the publication bias of the selected studies, the Funnel plot and Eggers's test indices for depression (z = 0.33, p = 0.73) (Fig. 2a), anxiety (z = 1.38, p = 0.17) (Fig. 2b), stress (z = -0.01, p = 0.98) (Fig. 2c), and insomnia (z = 1.82, p = 0.067) (Fig. 2d), which indicates that there is no publication bias for any of the four clinical symptoms.

Prevalence

The prevalence of depression among the general population was estimated using 30 studies. The estimated pooled prevalence was 28.18% (95% CI: 23.81–32.54) for depression, presented in Fig. 3a. Similarly, 30 studies were used to estimate the pooled prevalence of anxiety during the COVID-19 pandemic among the general population. A pooled prevalence of 29.57% (95% CI: 24.67–34.47) was estimated for anxiety, presented in Fig. 3b. The prevalence of stress was calculated using 13 studies, where a pooled prevalence of 25.18% (95% CI: 14.82–35.54) was appraised (Fig. 3c). In the case of estimation of the prevalence of insomnia, 12 studies were used and we obtained a pooled prevalence of 23.50% (95% CI: 16.44–30.57) (Fig. 3d).

Subgroup Analysis Based on Study Periods

Subgroup analysis of the prevalence of depression, anxiety, stress, and insomnia was done based on the study period. For depression, the pooled prevalence of the study periods before February 2020, March to April 2020, and May to June 2020

Table 1 Basic characteristics of the included studies	ic chara	cteristics of	f the incluc	led studies									
Author	Year	Year Location	Preprint	Study popula- tion	Study period	Male (%)	Assess- ment method	Cut off	Sam- pling method	Depres- sion, % (n)	Anxiety, % (n)	Stress, % (n)	Insomnia, % (n)
Liu.et al	2020	2020 China	Yes	14,592	Before Janu- ary	31.60%	PHQ-9 GAD-7	N.A	Online survey	53.5% (7807)	44.6% (6508)	N. A	N. A
Wang et al	2020	2020 China	No	600	Before Janu- ary	44.50%	SDS SAS	≥53≥50	Online survey	17.17% (103)	6.33% (38) N. A	N. A	N. A
Shi et al	2020	2020 China	yes	56,679	Before Janu- ary	47.90%	PHQ-9 GAD-7 ASDS ISI	>5>5>9>8	Online survey	27.9% (15,813)	31.6% (17,911)	24.4% (13,830)	29.2% (16,550)
Wang et al	2020	2020 China	No	1210	Before Janu- ary	33.00%	DASS- 21	>9 A>6>10	Online survey	16.5% (200)	28.8% (348)	8.1% (98)	N. A
Fu et al	2020	2020 China	No	1242	Before Janu- ary	30.30%	PQH-9 GAD-9 AIS	>4>4>3	Online survey	29.3% (364)	27.5% (342)	N.A	30% (373)
Tang et al	2020	2020 China	No	1160	Before Janu- ary	37.79%	CES- D-20 GAD-7	≥15≥5	Online survey	26.47% (307)	70.78% (821)	N.A	N. A
Huang and Zhao	2020	2020 China	No	7236	Before Janu- ary	45.40%	CES-D GAD-7 PSQI	≥28≥9>7	Online survey	20.1% (1454)	35.1% (2540)	N.A	18.2% (1317)
Wang et al	2020	2020 China	No	19,372	Before Janu- ary	48.00%	PHQ-9 GAD-7 ISI	> 15 > 15 > 15	QS sam- pling	11% (2131)	12.2% (2363)	N.A	13.3% (2576)
Ueda et al	2020	2020 Japan	Yes	1000	March to April	49.60%	PHQ-9 GAD-7	≥10≥10	Online survey	43.1% (431)	33.2% (332)	N.A	N. A

Table 1 (continued)	ntinued)												
Author	Year	Year Location	Preprint	Study popula- tion	Study period	Male (%)	Assess- ment method	Cut off	Sam- pling method	Depres- sion, % (n)	Anxiety, % (n)	Stress, % (n)	Insomnia, % (n)
Zhou et al	2020	2020 China	No	8079	March to April	46.50%	PHQ-9 GAD-7	>4>4	Online survey	43.7% (3531)	37.4% (3022)	N. A	N. A
Sigdel et al	2020	2020 Nepal	Yes	349	March to April	54.20%	PHQ-9 GAD-7	≥10≥10	Online survey	34% (119)	31% (108)	N. A	N. A
Kazmi et al	2020 India	India	No	1000	March to April	38.00%	DASS- 21	>9>7>10	Online survey	38.9% (389)	43% (430)	35.7% (357)	N. A
Othman et al	2020 Iraq	Iraq	No	548	March to April	49.60%	DASS- 21	>9>7>10	Online survey	44.9% (246)	47.1% (258)	17.5% (96)	N.A
Shevlin et al 2020 UK	2020	UK	No	2025	March to April	48.00%	PHQ-9 GAD-7	≥10≥10	Online survey	22.12% (448)	21.63% (438)	N.A	N.A
Odriozola- González et al	2020	2020 Spain	Yes	3550	March to April	35.10%	DASS- 21	>9>6>10	Social media	44.1% (1566)	32.4% (1150)	37% (1314)	N. A
Agberotimi et al	2020	2020 Nigeria	Yes	502	March to April	53.60%	PHQ-9 GAD-7 ISI	>5≥10>7	RDS & RSS	23.5% (118)	49.6% (249)	N.A	15.1% (76)
Mazza et al	2020 Italy	Italy	No	2766	March to April	28.30%	DASS- 21	>9>6>10	Online survey	32.8% (907)	18.7% (517)	27.2% (752)	N.A
Rossi et al	2020 Italy	Italy	No	18,147	March to April	20.40%	PHQ-9 GAD-7 PSS ISI	> 1 5 > 15 > 10 > 22	Online survey	17.3% (3139)	20.8% (3775)	21.8% (3956)	7.3% (1325)
Gualano et al	2020 Italy	Italy	No	1515	March to April	34.40%	PQH-2 GAD-2 ISI	>2>2>4	Online survey	24.7% (374)	23.2% (351)	N. A	42.2% (639)

Table 1 (continued)	tinued)												
Author	Year	Year Location	Preprint	Study popula- tion	Study period	Male (%)	Assess- ment method	Cut off	Sam- pling method	Depres- sion, % (n)	Anxiety, % (n)	Stress, % (n)	Insonnia, % (n)
Marelli et al	2020 Italy	Italy	No	400	March to April	24.20%	BDI-II BAI ISI	> 13 > 7 > 3	Web- based survey	27.8% (111)	34.3% (137)	N. A	40% (160)
Song et al	2020	2020 China	No	709	March to April	25.80%	CES-D GAD-7 ISI	>14>9>8	CSB sam- pling	13.5% (96)	13.5% (96) 12.7% (90) N. A	N. A	20.7% (147)
Zhou et al	2020	2020 China	No	11,835	March to April	49.10%	PHQ-9 GAD-7 PSQI	> 5 > 5 > 5	Online survey	44.9% (5314)	34.4% (4071)	N. A	34.5% (4083)
Verma and Mishra	2020 India		No	354	March to April	51.70%	DASS- 21	>9>7>14	Conveni- ence sam- pling	25% (89)	28% (99)	11.6% (41) N. A	N.A
Grover et al	2020 India	India	No	1685	March to April	63.70%	PHQ-9 GAD-7 PSS	>4>4>13	Snowball sam- pling	29% (489)	38.1% (642)	74.1% (1249)	N. A
Ozamiz- Etxebarria et al	2020	2020 Spain	No	976	March to 18.90% April	18.90%	DASS- 21	>9>7>14	Online survey	18.9% (184)	26% (254)	23.6% (230)	N. A
Pieh et al	2020	2020 Austria	No	1005	March to April	47.00%	PHQ-9 GAD-7 PSS ISI	> 10 > 10 > 15	Online Survey	21% (211)	19% (191)	16% (161)	16% (161)
Dai et al	2020	2020 Malaysia No	No	669	May to June	48.43%	PQH-9 GAD-7 K6-S AIS-5	> 3 > 3 > 3 > 5	Online survey	4.49% (30)	4.49% (30) 4.36% (29) 5.1% (34)	5.1% (34)	1.76% (12)

Table 1 (continued)	ntinued)												
Author	Year	Year Location	Preprint Study popula tion	Study popula- tion	Study period	Male (%)	Assess- ment method	Cut off	Sam- pling method	Depres- Anxie sion, % (n) % (n)	Anxiety, % (n)	Stress, % Insomnia, (n) % (n)	Insomnia, % (n)
McCracken 2020 Sweden et al	2020	Sweden	No	1212	May to June	27.00%	PHQ-9 GAD-7 ISI	May to 27.00% PHQ-9 >10>8>7 June GAD-7 ISI	Online survey	30% (364) 24.2% (293)	24.2% (293)	N. A	38% (461)
Islam et al	2020	2020 Bangla- desh	No	476	May to June	67.20%	PHQ-9 ≥10≥10 GAD-7	≥10≥10	Web- based survey	15% (71)	15% (71) 18.1% (86) N. A	N. A	N. A
Salman et al 2020 Pakistan	2020	Pakistan	Yes	1134	N. A	29.50%	PHQ-9 > 10> 10 GAD-7	> 10> 10	Web- based survey	45% (510)	45% (510) 34% (386) N. A	N. A	N. A
BAI Beck Au Pittsburgh Si Patient Healt	nxiety I leep Qu th Quesi	nventory, <i>I</i> ality Index tionnaire-9	3DI-II Becl , DASS-21 , PQH-2 Pa	k Depression Depression atient Heal	on Inventor 1 Anxiety a th Questior	'y-II, <i>ISI</i> In nd Stress S maire-2, S⊬	somnia Sev cale, GAD- <i>IS</i> Self-Rati	<i>BAI</i> Beck Anxiety Inventory, <i>BDI-II</i> Beck Depression Inventory-II, <i>ISI</i> Insomnia Severity Index, <i>ASDS</i> Acute Stress Disorder Scale, AIS Athens Insomnia Scale, <i>PSQI</i> Pittsburgh Sleep Quality Index, <i>DASS-21</i> Depression Anxiety and Stress Scale, GAD-7 Generalized Anxiety Disorder-7, <i>GAD-2</i> Generalized Anxiety Disorder-2, <i>PHQ-9</i> Patient Health Questionnaire-9, <i>PQH-2</i> Patient Health Questionnaire-2, <i>SAS</i> Self-Rating Anxiety Scale, <i>SDS</i> Self-Rating Depression Scale, <i>CES-D</i> Center for Epidemio-	ute Stress] y Disorder- S Self-Ratii	Disorder Scal 7, <i>GAD-2</i> Gen ng Depression	le, AIS Ather neralized An n Scale, CES	ns Insomnia xiety Disord -D Center fo	Scale, <i>PSQI</i> er-2, <i>PHQ-9</i> ır Epidemio-

logical Studies Depression, PSS Perceived Stress Scale, BAI Beck Anxiety Inventory, K-6-S Six-item K6 Screening, RDS Respondent-driven sampling, RSS random survey sampling, QS quota and snowball, CSS convenience and snowball sampling, MA not available

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Score need for further calculations Adequate statistics and no The study employed valid measurement tools with appropriate cutoffs Modified Newcastle-Ottawa quality assessment scale udy Response rate 80% $\overline{}$ Sample size greater than 600 sentative of the A represample Malaysia Nigeria Region Sweden China China China China China China China China China Nepal Spain China India Italy Japan Iraq UK Italy Italy Year 2020 Odriozola-González et al Huang and Zhao Agberotimi et al McCracken et al Gualano et al Othman et al Shevlin et al Mazza et al Kazmi et al Sigdel et al Wang et al Wang et al Wang et al Jeda et al Zhou.et al Rossi et al Tang et al Song et al Shi et al Dai et al Liu.et al Fu et al Author Tabl

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Author	Year	Region	Modified Newcastle-Ottawa quality assessment scale	stle–Ottawa qual	lity assessmer	ıt scale		Score
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Islam et al	2020	Bangladesh	0	0	1	1	1	ю
Salman et al	2020	Pakistan	0	1	1	1	1	4
Verma and A Mishra	2020	India	1	0	1	1	1	4
Grover et al	2020	India	1	1	1	1	1	5
Pieh et al	2020	Austria	1	1	1	1	1	5
Wang et al	2020	China	1	1	1	1	1	5
Grover et al	2020	India	1	1	0	1	1	4

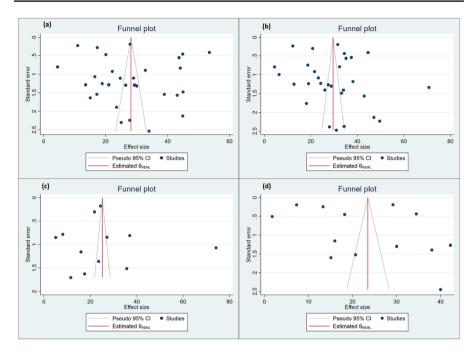


Fig. 2 Funnel plot of result of the prevalence of depression (a), anxiety (b), stress (c), and insomnia (d) among the general population

was 25.25% (95% CI: 16.17–34.34), 30.51% (95% CI: 25.60–35.42), and 16.47% (95% CI: 1.93–31.02), respectively (Fig. 4a). In the case of anxiety, the pooled prevalence of the study periods before February 2020, March to April 2020, and May to June 2020 were 32.10% (95% CI: 18.37–45.83), 30.51% (95% CI: 25.79–35.23), and 15.51% (95% CI: 3.93–27.09), respectively (Fig. 4b). For stress, the pooled prevalence of the study periods before February 2020, March to April 2020, and May to June 2020 were 16.27% (95% CI: 0.29–32.24), 29.41% (95% CI: 18.71–40.10), and 5.10% (95% CI: 3.43–6.77), respectively (Fig. 4c). Similarly, in the case of insomnia, the pooled prevalence of the study periods before February 2020, March to April 2020, March to April 2020, and May to June 2020 was 22.63% (95% CI: 14.55–30.72), 25% (95% CI: 14.85–35.15), and 19.86% (95% CI: -15.66-55.37), respectively (Fig. 4d).

According to our pooled prevalence estimates (Fig. 5) from the subgroup analysis based on time, the prevalence of depression among the general population reached its peak to 30.51% during March and April 2020 from 25.25% before February 2020 and then decreased by almost half (16.47%) during May and June 2020. The prevalence of anxiety decreased substantially among the general population from 32.10% during December 2019 and February 2020 to 30.51% during March and April 2020 and then to 15.51% during May and June 2020. In the case of stress, the prevalence increased during March and April 2020 (29.41%) from the beginning of the pandemic (before February 2020, 16.27%) and then decreased substantially during May and June 2020 (5.10%). The prevalence estimate of insomnia also had a similar trend. It was highest during March and April 2020 (25%) increasing from 22.63%

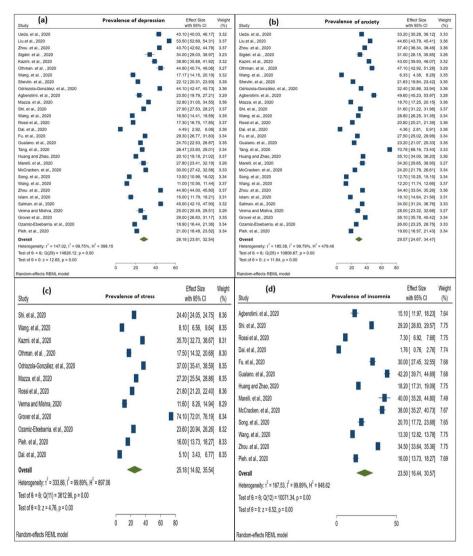


Fig.3 Forest plot showing the meta-analyses of the pooled prevalence of depression (a), anxiety (b), stress (c), and insomnia (d) among the general population

before February 2020 and then decreased considerably to 19.86% during May and June 2020.

Subgroup Analysis Based on Assessment Tools

Another subgroup analysis of the prevalence of depression, anxiety, stress, and insomnia was done using assessment tools. For depression, pooled prevalence of assessment tools DASS-21, PHQ-9, and Others (SDS, PQH-2, BDI-II, CES-D) were

study (a) Prevalence of depress	ion Effect Size with 95% CI	Weight (%)	Study (b) Prevalence of anxiety	Effect Size with 95% CI	Weigt (%)
Before Februarya			Before Februarya		()
Liu.et al., 2020	53.50 [52.69, 54.31		Liu.et al., 2020	44.60 [43.79, 45.41]	
Wang. et al. , 2020	17.17 [14.15, 20.19		Wang, et al., 2020	6.33 [4.38, 8.28] 31.60 [31.22, 31.98]	
Shi. et al., 2020 📕	27.90 (27.53, 28.27) 16.50 (14.41, 18.59)	3.37	Vang, et al., 2020	28.80 [26.25, 31.35]	
Fu. et al., 2020	29.30 [26.77, 31.83	3.35	Fu. et al., 2020	27.50 [25.02, 29.98]	3.34
Tang. et al., 2020	26.47 [23.93, 29.01	3.34	Tang. et al., 2020 Huang and Zhao, 2020	70.78 [68.16, 73.40] 35.10 [34.00, 36.20]	
Huang and Zhao, 2020	20.10 [19.18, 21.02	3.37	Huang and Zhao, 2020 Wang, et al., 2020	35.10 [34.00, 36.20] 12.20 [11.74, 12.66]	
Wang. et al., 2020 Heterogeneity: r ² = 170.84, l ² = 99.90%, H ² = 987.33	11.00 [10.56, 11.44 25.25 [16.17, 34.34	3.37	Heterogeneity: r ² = 391.74, l ² = 99.95%, H ² = 2086.98	32.10 [18.37, 45.83]	
Test of $\theta_i = \theta_i$: Q(7) = 9034.72, p = 0.00	20.20 [10.11, 04.04		Test of $\theta_i = \theta_i$: Q(7) = 8060.40, p = 0.00		
March to April			March to April		
Ueda. et al., 2020	43.10 (40.03, 46.17	3.32	Ueda. et al., 2020	33.20 [30.28, 36.12]	3.33
Zhou .et al., 2020 Sigdel. et al., 2020 -	43.70 [42.62, 44.78 - 34.00 [29.03, 38.97	3.37	Zhou .et al., 2020	37.40 [36.34, 38.46] 31.00 [26.15, 35.85]	3.3
Kazmi, et al., 2020 –	34.00 [29.03, 38.97] 38.90 [35.88, 41.92]	3.32	Kazmi. et al., 2020	43.00 [39.93, 46.07]	3.2
Othman. et al. , 2020		3.27	Othman. et al. , 2020	47.10 [42.92, 51.28]	3.2
Shevlin. et al., 2020	22.12 [20.31, 23.93	3.35	Shevlin. et al., 2020	21.63 [19.84, 23.42]	3.3
Odriozola-González, et al., 2020 Apberotimi, et al., 2020	44.10 [42.47, 45.73] 23.50 [19.79, 27.21	3.36	Odriozola-González, et al., 2020	32.40 [30.86, 33.94] 49.60 [45.23, 53.97]	3.3
Mazza et al., 2020	32.80 [31.05, 34.55		Mazza. et al., 2020	18.70 [17.25, 20.15]	
Rossi et al., 2020	17.30 [16.75, 17.85		Rossi et al., 2020	20.80 [20.21, 21.39]	3.3
Gualano, et al., 2020	24.70 [22.53, 26.87 27.80 [23.41, 32.19		Gualano. et al., 2020	23.20 [21.07, 25.33] 34.30 [29.65, 38.95]	
Marelli, et al., 2020	27.80 [23.41, 32.19 13.50 [10.98, 16.02		Marelli, et al., 2020	34.30 [29.65, 38.95] 12.70 [10.25, 15.15]	
Zhou .et al., 2020	44.90 [44.00, 45.80	3.37	Zhou .et al., 2020	34.40 [33.54, 35.26]	3.3
Verma and Mishra, 2020	25.00 [20.49, 29.51		Verma and Mishra, 2020	28.00 [23.32, 32.68]	
Grover et al., 2020	29.00 [26.83, 31.17 18.90 [16.44, 21.36		Grover et al., 2020	38.10 [35.78, 40.42] 26.00 [23.25, 28.75]	
Pieh. et al., 2020	18.90 [16.44, 21.36 21.00 [18.48, 23.52		Pieh. et al., 2020	26.00 [23.25, 28.75] 19.00 [16.57, 21.43]	
Heterogeneity: x ² = 110.81, I ² = 99.34%, H ² = 152.33	30.51 [25.60, 35.42		Heterogeneiity: x ² = 102.10, I ² = 99.30%, H ² = 143.40	30.51 [25.79, 35.23]	
Test of $\theta_i = \theta_j$: Q(17) = 4504.82, p = 0.00			Test of $\theta_i = \theta_i$: Q(17) = 1889.17, p = 0.00		
May to June			May to June		
Dai. et al., 2020	4.49 [2.92, 6.06]		Dai. et al., 2020	4.36 [2.81, 5.91]	
McCracken. et al., 2020	30.00 [27.42, 32.58	3.33	McCracken. et al., 2020	24.20 [21.79, 26.61]	3.3
Islam. et al., 2020 Heterogeneity: r ² = 163.53, I ² = 99.10%, H ² = 111.62	15.00 [11.79, 18.21] 16.47 [1.93, 31.02		Islam. et al., 2020 Heterogeneity: r ² = 102.96, I ² = 98.61%, H ² = 72.16	18.10 [14.64, 21.56] 15.51 [3.93, 27.09]	
Test of $\theta_{i} = \theta_{j}$: Q(2) = 278.31, p = 0.00	10.47 (1.50, 01.02)		Test of $\theta_1 = \theta_2$; Q(2) = 201.99, p = 0.00	10.011 0.00, 21.03	
Dverall 🔶	27.60 [23.23, 31.96		Overall	29.42 [24.36, 34.48]	
Heterogeneity: r ² = 141.95, l ² = 99.75%, H ² = 395.46	27.00 [20.20, 01.00		Heterogeneity: r ² = 191.32, l ² = 99.80%, H ² = 508.45	23.42 [24.30, 34.40]	
Test of 0. = 0;: Q(28) = 14645.97, p = 0.00			Test of 0. = 0;: Q(28) = 10777.94, p = 0.00		
Test of group differences: Q _b (2) = 3.75, p = 0.15			Test of group differences: Q ₁ (2) = 5.78, p = 0.06	·,	
0 20 Random-effects REML model	40 60		0 20 40	60 80	
vanuonmemects REML model			Random-effects REML model		
	Effect Size	Weight	(-1)	Effect Circ	Weig
(C) Prevalence of stress	Effect Size with 95% CI	Weight (%)	(d) Prevalence of insomnia	Effect Circ	Weiç (%
(C) Prevalence of stress			(d) Browlance of incompil	Effect Size	
(C) Prevalence of stress Study Before Februarya	with 95% CI	(%)	(d) Prevalence of insomnia <u>Study</u> Before Februarya	Effect Size with 95% CI	(%
Study Prevalence of stress Study Strice Februarya Stil. et al., 2020	with 95% Cl 24.40 [24.05, 24.75	(%)	(d) Prevalence of insomnia Before Februarya Sh. et al., 2020	Effect Size with 95% CI 29.20 [28.83, 29.57]	(%)
(C) Prevalence of stress before Februarya Shi et al., 2020	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64	(%) 8.36 8.35	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Image: Compare State	Effect Size with 95% CI 29.20 [28.83, 29.57] 30.00 [27.45, 32.55]	(% 7.7 7.6
(C) Prevalence of stress Study (C) Study (C) Study (C) Wang, et al., 2000 (C) Wang, et al., 2012 (C) Study (C)	with 95% Cl 24.40 [24.05, 24.75	(%) 8.36 8.35	(d) Prevalence of insomnia Before Februarya Shi, et al., 2020 Fu, et al., 2020 Image: arrow and arro	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09]	(9 7.7 7.6 7.7
(C) Prevalence of stress Study (C) Study (C) Study (C) Wang, et al., 2000 (C) Wang, et al., 2012 (C) Study (C)	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64	(%) 8.36 8.35	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 B Fu, et al., 2020 B Wang and Zhao, 2020 B Wang et al., 2020 B	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78]	(%) 7.7 7.6 7.7 7.7
C. Prevalence of stress Study or Februarya 514, et al., 2000 Wang, et al., 2020 94, 270, 114, 114, 114, 114, 114, 114, 114, 11	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64	(%) 8.36 8.35	(d) Prevalence of insomnia Before Februarya Shi, et al., 2020 Fue et al., 2020 Huang and Zhao, 2020 Wang, et al., 2020 Huang and Zhao, 2020 Wang, et al., 2020 Huang and Zhao, 2020	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09]	(%) 7.7 7.6 7.7 7.7
	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64	(%) 8.36 8.35	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 B Fu, et al., 2020 B Wang and Zhao, 2020 B Wang et al., 2020 B	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78]	(% 7.7 7.6 7.7 7.7
(C) Prevalence of stress Study Enforce Fabruarya Sti, et al., 2020 Yang, et al., 2020 Varag, et al., 2020 Enforce Fabruarya East of 6, = 8; O(1) = 410.16, p = 0.00 March to Aprill	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64	(%) 8.36 8.35	(d) Prevalence of insomnia Before Februarya 5% Shi, et al., 2020 8 Huang and Zhao, 2020 8 Wang et al., 2020 8 Hederogeneity: "f = 67.56, f ² = 99.84%, H ² = 639.88 8 Test of 8, = 6; Cl(5) = 2772.45, p = 0.00 8	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78]	(%) 7.7 7.6 7.7 7.7
(C) Prevalence of stress Study Effore Februarya Sh. et al., 2020 Marg. et al., 2020 Veterogeneity: " = 112, 52, 1" = 99,76%, H" = 410,16 Effore Februarya Set of B, = 6; C(1) = 410,16, p = 0.00 March to April March to April Efforement et al., 2020 Efforement et al., 2020	with 95% CI 24.40 [24.05, 24.75 8.10 [6.58, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67	(%) 8.36 8.35 8.31	(d) Prevalence of insomnia Before Februarya Shi, et al., 2020 Fue et al., 2020 Huang and Zhao, 2020 Wang, et al., 2020 Huang and Zhao, 2020 Wang, et al., 2020 Huang and Zhao, 2020	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78]	(%) 7.7 7.6 7.7 7.7
(C) Prevalence of stress Study Celore Februarya Shi et al., 2020 Name, et al., 2020 Wang, et al., 2020 Eet of 8, e 8, Ci (1) = 410.16, p = 0.00 March to Aprill Gazmi, et al., 2020	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 20.68	(%) 8.36 8.35 8.31 8.30	(d) Prevalence of insomnia Before Februarya 5% Shi, et al., 2020 8 Huang and Zhao, 2020 8 Wang et al., 2020 8 Hederogeneity: "f = 67.56, f ² = 99.84%, H ² = 639.88 8 Test of 8, = 6; Cl(5) = 2772.45, p = 0.00 8	Effect Size with 95% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78]	(%) 7.7 7.6 7.7 7.7
(C) Prevalence of stress Study Eefore Fabruarya Shi et al., 2020 Wang, et al., 2020 Wang, et al., 2020 Eefore/Shin, H ² = 410, 16 Fest of 9, = 8, O(1) = 410, 16, p = 0,00 March to April Karmi, et al., 2020 B Otheram, et al., 2020 B	wth 95% Cl 24.40 [24.05, 24.75 8.101 6.86, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 20.68 37.00 [35.41, 38.59	(%) 8.36 8.35 8.31 8.30 8.35	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Image and Zhao, 2020 Fu, et al., 2020 Image and Zhao, 2020 Wang, et al., 2020 Image and Zhao, 2020 Wang, et al., 2020 Image and Zhao, 2020 Test of 8, = 6; O(3) = 2772.45, p = 0.00 Image and Zhao, 2020 March to April Image and Zhao, 2020	Effect Size with 95% CI 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.09] 13.30 [12.82, 13.78] 22.63 [14.55, 30.72] 15.10 [11.97, 18.23]	(9 7.7 7.6 7.7 7.7
(C) Prevalence of stress Study C Prevalence of stress Study Status Status Status Status Status Status Status Status Status Status Status Status Status Status Status	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 206 37.70 [35.41, 38.59 27.20 [25.54, 28.68	(%) 8.36 8.35 8.31 8.30 8.35 8.35	(d) Prevalence of insomnia Before Februarya Shi ett., 2020 Fui ett., 2020 # Huang and Zhao, 2020 # Wang, et al., 2020 # Heatogoneity, "f = 07.50, f" = 09.84%, H" = 639.88 # Test of 0, = 6; O(3) = 2772.45, p = 0.00 # March to April Agberotim. et al., 2020 #	Effect Size with 85% Cl 29.20 [28.83, 29.57] 30.00 [27.45, 32.55] 18.20 [17.31, 19.00] 13.30 [12.22, 13.78] 22.63 [14.55, 30.72] 15.10 [11.97, 18.23] 7.30 [9.92, 7.88]	(9 7.7 7.6 7.7 7.7 7.7 7.7
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(C) Prevalence of stress Study Gefore Februarya Sti, et al., 2020 Stress Wang, et al., 2020 Stress Best of al., 2020 Stress Best of B., et al., 2020 Stress March to Aprill April. 2020 March to Aprill Stress Stress et al., 2020 Stress Oricotal-Consulties: et al., 2020 Stress March at J. 2020 Stress et al., 2020	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 206 37.70 [35.41, 38.59 27.20 [25.54, 28.68	(%) 8.36 8.35 8.31 8.30 8.35 8.35 8.35 8.36	(d) Prevalence of insomnia Before Februarya Shi, et al., 2020 Fui, et al., 2020 # Huang and Zhao, 2020 # Wang, et al., 2020 # Hearogeneity: "f = 67.56, f ² = 99.84%, H ² = 639.88 # Test: of tla = 60; CI(S) = 2772.45, p = 0.00 # March to April Appondim: et al., 2020 # Appondim: et al., 2020 # # March to April Appondim: et al., 2020 # Marelit, et al., 2020 # #	Effect Saa with 55% Cl 28 20 [28.8.2 857] 30 00 [27.45, 32.55] 18 20 (17.31, 1900) 13 30 [1228, 13.78] 22 65 [14.55, 30.72] 73.01 [692, 7488] 42 20 [30.71, 46.03] 42 20 [30.71, 46.03]	(%) 7.7. 7.7. 7.7. 7.7. 7.7. 7.7. 7.6. 7.4.
(C) Prevalence of stress Study Edire Februarya Shi et al., 2020 Stress Shi et al., 2020 Stress Status Tay 252, 21 = 99,76%, H ² = 410,16 Status Stress Stress Stres Stress	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 206 37.00 [32.54, 38.69 27.20 [25.54, 28.69 21.80 [21.20, 22.40 11.00 [32.61, 14.54	(%) 8.36 8.35 8.31 8.31 8.30 8.35 8.35 8.36 8.29	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 ■ Fu, et al., 2020 ■ Hanag and Zhao, 2020 ■ Wang, et al., 2020 ■ Hethroopeniey, '' = 67.56, i' = 69.84%, H' = 639.88 ■ Test of 8, = 69, O(3) = 2772.45, p = 0.00 ■ March to April Agberotimi, et al., 2020 ■ Rosist et al., 2020 ■ ■ Rosist et al., 2020 ■ ■ Guadano, et al., 2020 ■ ■ Goage, et al., 2020 ■ ■	Effect Size with 55% Cl 28 20 [28.8, 29.57] 30 00 [27.45, 2525 1820 [17.3, 19.00] 13 30 [12.82, 13.78] 22.83 [14.55, 30.72] 15.10 [11.97, 18.23] 7.30 [692, 7.68] 42.20 [39.71, 44.69] 20.27 [17.31, 22.33]	(9 7.5 7.6 7.5 7.6 7.6 7.6 7.6 7.6
(C) Prevalence of stress Study Celeror Februarya Str. et al., 2020 Wang et al., 2020 Wang et al., 2020 Entropeneity: 1" = 132 52, 1" = 99, 76%, H" = 410, 16 Start of al., 2020 March to April Karme et al., 2020 Drinnan, et al., 2020 Orderost-Rocaleace, et al., 2020 Entropeneity: 1" = 132, 2020 Waraze, et al., 2020 Entropeneity: 1" = 140, 2020 Waraze, et al., 2020 Entropeneity: 1" = 140, 2020 Waraze, et al., 2020 Entropeneity: 1" = 140, 2020 Waraze, et al., 2020 Entropeneity: 1" = 140, 2020 Waraze, et al., 2020 Entropeneity: 1" = 140, 2020	with 95% Cl 24.40 [24.05, 24.75 8.10 [6.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 206 37.70 [35.41, 38.59 27.20 [25.54, 28.66 21.80 [21.20, 22.40 11.60 [8.20, 14.94 11.60 [7.20, 7.61]	(%) 8.36 8.35 8.31 8.30 8.35 8.35 8.35 8.36 8.29 8.34	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Image and Zhao, 2020 Huang and Zhao, 2020 Image and Zhao, 2020 Wang, et al., 2020 Image and Zhao, 2020 Hederogeneity, r ¹ = 639, 85, r ² = 98, 84%, r ² = 639, 88 Text of R = (5, (0, 3) = 2772, 45, p = 0.00 March to April Apportoini, et al., 2020 Guatano, et al., 2020 March to 41, 2020 Choust et al., 2020 Choust et al., 2020 Choust et al., 2020	Effect Saa with 55% Cl 28 20 [28.8.2 857] 30 00 [27.45, 32.55] 18 20 (17.31, 1900) 13 30 [1228, 13.78] 22 65 [14.55, 30.72] 73.01 [692, 7488] 42 20 [30.71, 46.03] 42 20 [30.71, 46.03]	(9 7.5 7.6 7.5 7.6 7.6 7.6 7.6 7.6
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(C) Prevalence of stress Study Exfort = Ebruarya Study Exfort = Ebruarya Stri et al. 2020 Image and the stress Wang et al. 2020 Image and the stress Start of a = 0; (11) = 410.16, $p = 0.00$ Image and the stress and the stres	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 208 37.00 [32.41, 38.59 27.20 [25.54, 28.86 21.80 [21.20, 22.40 11.00 [28.26, 14.94 11.00 [28.26, 14.94 11.00 [28.26, 14.94 23.60 [20.94, 28.26 16.00 [13.73, 16.27 28.40 [17.11, 41.69 5.10 [3.43, 6.77 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before Februarya Yu, et al., 2020 Before Februarya Huang and Zhao, 2020 Before Februarya Wang, et al., 2020 Before Februarya Huang and Zhao, 2020 Before Februarya Wang, et al., 2020 Before Februarya Adherogeneity: " = 67.56, i" = 99.41%, if " = 639.88 Test of 8 = 6; O(3) = 2772.45, p = 0.00 March to April Appendim: et al., 2020 Before Februarya March to April Appendim: et al., 2020 Before Februarya March to April Appendim: et al., 2020 Before Februarya Prob., et al., 2020 Before Februarya Before Februarya Maret of tal. El, 2020 Before Februarya	Effect Sub with 5% Cl 22 20 [28.8.29 57] 30.00 [27.45, 3265] 13.30 [17.31, 1800] 13.30 [12.24, 13.78] 22.65] 14.55, 30.72] 7.30 [692, 768] 42.20 [30.71, 44.69] 24.20 [30.71, 44.69] 20.27 [7.31, 23.29] 15.10 [13.73, 18.27] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73] 19.86 [-15.66, 55.37]	(9 7.3 7.0 7.3 7.3
(C) Prevalence of stress Study Selor Februarya Shi et al., 2020 Marg. et al., 2020 Wang, et al., 2020 Selor Februarya Test of 6, = 8; CI(1) = 410.16, p = 0.00 March to April March to April March to April March to April Selor Februarya March to April Selor	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 36.67 17.50 [14.32, 20.66 37.00] 35.41, 38.59 27.20 [25.54, 28.66 21.80 [21.20, 22.40 11.60 [32.8, 14.94 2.410 [72.01, 76.1 2.30 0.94, 22.62 16.00 [13.73, 18.27 29.40 [17.11, 41.69 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before Februarya Yuk et al., 2020 Before Februarya Huang and Zhao, 2020 Before Februarya Wang et al., 2020 Before Februarya Heterogeneity: '' = 67.56, i' = 98.64%, H' = 638.68 Before Februarya Rest of 8, = 60; O(3) = 2772.45, p = 0.00 Before Februarya March to April Agborotini, et al., 2020 Before Februarya Song, et al., 2020 Before Februarya Before Februarya Song, et al., 2020 Before Februarya Before Februarya Mendit, et al., 2020 Before Februarya Before Februarya Song, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya March to A, 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Muchaten, et al., 2020 Befor	Effect State with 15% Cl 22 20 [28.8, 29.57] 30.00 [27.45, 3263 18.20 [17.3, 19.00] 15.30 [12.22, 13.78] 22.63 [14.55, 30.72] 42.20 [33.71, 44.69] 42.20 [33.71, 44.69] 20.271 [17.31, 22.31] 34.50 [33.64, 35.36] 10.00 [13.73, 162.7] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73]	(9 7.7 7.6 7.7 7.7 7.7 7.7 7.7 7.7
(C) Prevalence of stress Study Prevalence of stress Study Prevalence of stress Shi et al., 2020 March to April Starmit et al., 2020 March to April Starma et al., 2020 March to April Start of B, e J(B) = 2022, SA, p = 0.00 March to April March to April March to April Start of B, e J(D) = 0.00, $F =$	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 208 37.00 [32.41, 38.59 27.20 [25.54, 28.86 21.80 [21.20, 22.40 11.00 [28.26, 14.94 11.00 [28.26, 14.94 11.00 [28.26, 14.94 23.60 [20.94, 28.26 16.00 [13.73, 16.27 28.40 [17.11, 41.69 5.10 [3.43, 6.77 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before februarya Yu, et al., 2020 Before februarya Haung and Zhanz, 2020 Before februarya Yu, et al., 2020 Before februarya Haung and Zhanz, 2020 Before februarya Mederogeneity: '' = 67.56, I' = 99.84%, H' = 639.88 Test of 6; = 6; O(3) = 2772.45, p = 0.00 March to April Agborotinit, et al., 2020 Before februarya Gosing et al., 2020 Before februarya Before februarya Zhou, et al., 2020 Before februarya Before februarya Dai, et al., 2020 Before februarya Before februarya Meterogeneity: '' = 185.66, I' = 69.75%, H' = 393.71 Test of 6; = 6; O(6) = 3971.05, p = 0.00 Before februarya Muchada et al., 2020 Before februarya Before februarya Before februarya Dai, et al., 2020 Before februarya Before februarya Before februarya Microarban, et al., 2020 Before februarya Before februarya Before februarya Victuarya 18, 2020 Before februarya Before februarya <	Effect Sub with 15% Cl 22 20 [28.8.29 57] 30.00 [27.45, 3265] 13.30 [17.31, 1800] 13.30 [12.24, 13.78] 22.65] 14.55, 30.72] 7.30 [692, 768] 42.20 [30.71, 44.69] 24.20 [30.71, 44.69] 20.27 [7.31, 23.29] 15.10 [13.73, 18.27] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73] 19.86 [-15.66, 55.37]	(9 7.3 7.0 7.3 7.3
(c) Prevalence of stress Study Prevalence of stress Study Prevalence of stress Stre of = 26, 2020 Image of the stress Wang et al., 2020 Image of the stress Wards to April (assume the stress) Stress of al., 2020 Drimman et al., 2020 Image of the stress of the	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 208 37.00 [32.41, 38.59 27.20 [25.54, 28.86 21.80 [21.20, 22.40 11.00 [28.26, 14.94 11.00 [28.26, 14.94 11.00 [28.26, 14.94 23.60 [20.94, 28.26 16.00 [13.73, 16.27 28.40 [17.11, 41.69 5.10 [3.43, 6.77 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before Februarya Yuk et al., 2020 Before Februarya Huang and Zhao, 2020 Before Februarya Wang et al., 2020 Before Februarya Heterogeneity: '' = 67.56, i' = 98.64%, H' = 638.68 Before Februarya Rest of 8, = 60; O(3) = 2772.45, p = 0.00 Before Februarya March to April Agborotini, et al., 2020 Before Februarya Song, et al., 2020 Before Februarya Before Februarya Song, et al., 2020 Before Februarya Before Februarya Mendit, et al., 2020 Before Februarya Before Februarya Song, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya March to A, 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Jone, et al., 2020 Before Februarya Before Februarya Muchaten, et al., 2020 Befor	Effect Sub with 15% Cl 22 20 [28.8.29 57] 30.00 [27.45, 3265] 13.30 [17.31, 1800] 13.30 [12.24, 13.78] 22.65] 14.55, 30.72] 7.30 [692, 768] 42.20 [30.71, 44.69] 24.20 [30.71, 44.69] 20.27 [7.31, 23.29] 15.10 [13.73, 18.27] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73] 19.86 [-15.66, 55.37]	(9 7.7 7.6 7.7 7.7 7.7 7.7 7.7 7.7
(C) Prevalence of stress hudy Selore February bit et al. 2000 Image: Selore February bit et al. 2020 <	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 208 37.00 [32.41, 38.59 27.20 [25.54, 28.86 21.80 [21.20, 22.40 11.00 [28.26, 14.94 11.00 [28.26, 14.94 11.00 [28.26, 14.94 23.60 [20.94, 28.26 16.00 [13.73, 16.27 28.40 [17.11, 41.69 5.10 [3.43, 6.77 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before Februarya Yu, et al., 2020 Before Februarya Hawag and Zhao, 2020 Before Februarya Wang, et al., 2020 Before Februarya Hearogeneity: '' = 67.56, i' = 69.84%, if '' = 639.88 Before Februarya Advectorments: '' = 67.56, i' = 69.84%, if '' = 639.88 Before Februarya March to April Approximit et al., 2020 Before Februarya March to April Approximit et al., 2020 Before Februarya Stong et al., 2020 Before Februarya Before Februarya Stong et al., 2020 Before Februarya Before Februarya Path, et al., 2020 Before Februarya Before Februarya McCracken, et al., 2020 Before Februarya Before Februarya McCracken, et al., 20	Effect Sub with 15% Cl 22 20 [28.8.29 57] 30.00 [27.45, 3265] 13.30 [17.31, 1800] 13.30 [12.24, 13.78] 22.65] 14.55, 30.72] 7.30 [692, 768] 42.20 [30.71, 44.69] 24.20 [30.71, 44.69] 20.27 [7.31, 23.29] 15.10 [13.73, 18.27] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73] 19.86 [-15.66, 55.37]	(9 7.3 7.0 7.3 7.3
(c) Prevalence of stress hudy Geore Februarya hu, et al., 2020 Image et al., 2020 Wang, et al., 2020 Image et al., 2020 March to April azaro, et al., 2020 Image et al., 2020 Warnan, et al., 2020 Image et al., 2020 Warnan, et al., 2020 Image et al., 2020 Warnan, et al., 2020 Image et al., 2020 Variaze, et al., 2020 Image et al., 2020 Image et al., 2020	wth 95% Cl 24.40 [24.05, 24.75 8.10 [8.56, 9.64 16.27 [0.29, 32.24 35.70 [32.73, 38.67 17.50 [14.32, 208 37.00 [32.41, 38.59 27.20 [25.54, 28.86 21.80 [21.20, 22.40 11.00 [28.26, 14.94 11.00 [28.26, 14.94 11.00 [28.26, 14.94 23.60 [20.94, 28.26 16.00 [13.73, 16.27 28.40 [17.11, 41.69 5.10 [3.43, 6.77 5.10 [3.43, 6.77	(%) (%) (%) (%) (%) (%) (%) (%)	(d) Prevalence of insomnia Study Before Februarya Shi, et al., 2020 Before februarya Yu, et al., 2020 Before februarya Haung and Zhanz, 2020 Before februarya Yu, et al., 2020 Before februarya Haung and Zhanz, 2020 Before februarya Mederogeneity: '' = 67.56, I' = 99.84%, H' = 639.88 Test of 6; = 6; O(3) = 2772.45, p = 0.00 March to April Agborotinit, et al., 2020 Before februarya Gosing et al., 2020 Before februarya Before februarya Zhou, et al., 2020 Before februarya Before februarya Dai, et al., 2020 Before februarya Before februarya Meterogeneity: '' = 185.66, I' = 69.75%, H' = 393.71 Test of 6; = 6; O(6) = 3971.05, p = 0.00 Before februarya Muchada et al., 2020 Before februarya Before februarya Before februarya Dai, et al., 2020 Before februarya Before februarya Before februarya Microarban, et al., 2020 Before februarya Before februarya Before februarya Victuarya 18, 2020 Before februarya Before februarya <	Effect Sub with 15% Cl 22 20 [28.8.29 57] 30.00 [27.45, 3265] 13.30 [17.31, 1800] 13.30 [12.24, 13.78] 22.65] 14.55, 30.72] 7.30 [692, 768] 42.20 [30.71, 44.69] 24.20 [30.71, 44.69] 20.27 [7.31, 23.29] 15.10 [13.73, 18.27] 25.00 [14.85, 35.16] 1.76 [0.76, 2.76] 38.00 [35.27, 40.73] 19.86 [-15.66, 55.37]	(9 7.3 7.0 7.3 7.3

Fig. 4 Forest plot showing the meta-analyses of the pooled prevalence of depression (**a**), anxiety (**b**), stress (**c**), and insomnia (**d**) in different periods (December 2019 to June 2020)

respectively 31.57% (95% CI: 22.89–40.25), 29.10% (95% CI: 22.62–35.58), and 21.53% (95% CI: 17.08–25.98) (Fig. 6a). In case of anxiety, pooled prevalence of assessment tools DASS-21, GAD-7, and Others (SDS, CES-D, GAD-2, BAI) was respectively 31.93% (95% CI: 24.61–39.25), 30.13% (95% CI: 23.28–36.97), and 22.73% (95% CI: 11.07–34.40) (Fig. 6b). For stress, pooled prevalence of assessment tools ASDS, DASS-21, K6-S, and PSS was 24.40% (95% CI: 24.05–24.75), 22.97% (95% CI: 14.63–31.31), 5.10% (95% CI: 3.43–6.77), and 37.30% (95% CI:

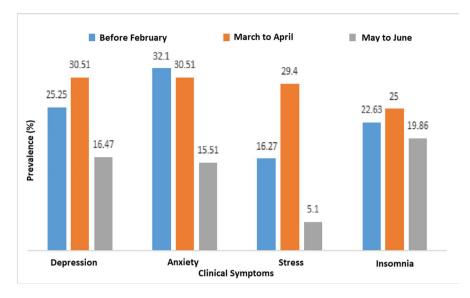


Fig. 5 Estimated prevalence of depression, anxiety, stress, and insomnia among general population during December 2019 to June 2020

1.09–73.50), respectively (Fig. 6c). Similarly, in case of insomnia, pooled prevalence of assessment tools AIS, ISI, and PSQL was 15.58% (95% CI: 0.76–2.76), 24.53% (95% CI: 17.39–32.75), and 26.35% (95% CI: 10.38–42.32), respectively (Fig. 6d).

Subgroup Analysis Based on Geographic Region and Countries

To compare the findings among different countries and regions, we have defined different subgroups of the studies based on study locations (Six regions of WHO) namely: African Region, Eastern Mediterranean Region, European Region, Southeast Asia Region, and Western Pacific Region (no study was found from the Region of the Americas). Table 3 illustrates the regional and country-wise comparison of the prevalence of depression, anxiety, stress, and insomnia. The highest prevalence of depression, anxiety, stress, and insomnia was found respectively in Eastern Mediterranean Region (44.90%, 95% CI: 40.74–4906), African Region (49.60%, 95% CI: 45.23–53.97), Southeast Asia Region (40.49%, 95% CI: 4.49–76.16), and European Region (31.18%, 95% CI: 15.57–48.04). On the other hand, Western Pacific Region (13.42% 95% CI: 4.90–21.94) and European Region (24.97%, 95% CI: 21.24–28.70) showed respectively the lowest prevalence of anxiety and stress. African Region showed the lowest prevalence of depression (15% 95% CI:11.97-18.23) and insomnia (23.50%, 95% CI: 19.79–27.21). However, the between-country comparisons show that Malaysia has the lowest prevalence of depression (4.49%, 95% CI: 2.92–6.06), anxiety (4.36%, 95% CI: 2.81–5.91), stress (5.10%, 95%

Study	revalence of Depression	Effect Size with 95% CI	Weight (%)	study (b) Prevalence of Anxiety	Effect Size Weight with 95% CI (%)
DASS-21		16.50 [14.41, 18.59]		DASS-21	28.80 [26.25, 31.35] 3.34
Wang. et al., 2020 Kazmi et al. 2020		16.50 [14.41, 18.59] 38.90 [35.88, 41.92]		Wang, et al., 2020	28.80 [26.25, 31.35] 3.34 43.00 [39.93, 46.07] 3.32
Othman et al. 2020		44 90 [40 74 49 06]		Othman et al. 2020	47.10 [42.92, 51.28] 3.29
Odríozola-González et al., 2020		44.10 [42.47, 45.73]		Odriozola-González. et al., 2020	32.40 [30.86, 33.94] 3.36
Mazza. et al., 2020		32.80 [31.05, 34.55]		Mazza. et al., 2020	18.70 [17.25, 20.15] 3.36
Verma and Mishra, 2020		25.00 [20.49, 29.51]	3.26	Verma and Mishra, 2020	28.00 [23.32. 32.68] 3.27
Ozamiz-Etxebarria. et al., 2020 Heterogeneity: 1 ² = 134.83, l ² = 98.91	15 H ¹ = 91.60	18.90 [16.44, 21.36] 31.57 [22.89, 40.25]	3.34	Ozamiz-Etxebarria. et al., 2020 Heterogeneity: r ² = 95.13, l ² = 98.47%, H ² = 65.53 ↔	26.00 [23.25, 28.75] 3.33 31.93 [24.61, 39.25]
Test of $\theta_{-} = \theta_{+}$: Q(6) = 597.87, p = 0.0	0	31.57 [22.09, 40.25]		Test of $\theta_{-} = \theta_{1}$; Q(6) = 363.17, p = 0.00	31.93 [24.61, 39.29]
OTHER				GAD-7	
Wang. et al., 2020 Tang. et al., 2020		17.17 [14.15, 20.19] 26.47 [23.93, 29.01]	3.32	Llu.et al., 2020	44.60 [43.79, 45.41] 3.36 31.60 [31.22, 31.98] 3.37
Huang and Zhao, 2020		20.10 [19.18, 21.02]	3.37	Tang. et al., 2020	70.78 [68.16, 73.40] 3.33
Gualano, et al., 2020		24.70 [22.53. 26.87]	3.35	Huang and Zhao, 2020	35.10 [34.00, 36.20] 3.36
Marelli. et al., 2020	-	27.80 [23.41, 32.19]	3.26	Wang. et al., 2020	12.20 [11.74, 12.66] 3.37
Song. et al., 2020 Heterogeneity: 1 [°] = 28.97, 1 [°] = 95.941	- M- 2402	13.50 [10.98, 16.02] 21.53 [17.08, 25.98]	3.34	Ueda. et al., 2020	33.20 [30.28, 36.12] 3.33 37.40 [36.34, 38.46] 3.36
Test of 0. = 0.: Q(5) = 81.24, p = 0.00	6, H = 24.03	21.55[17.00, 25.90]		Sigdel et al., 2020	31.00 [26.15, 35.05] 3.26
				Shevlin. et al., 2020	21.63 [19.84, 23.42] 3.35
PHQ-9 Liu.et al., 2020		53.50 [52.69, 54.31]		Agberotimi. et al., 2020	49.60 [45.23, 53.97] 3.28
Shi et al. 2020		27.90 [27.53, 28.27]	3.37	Rossi et al., 2020	20.80 [20.21, 21.39] 3.36 12.70 [10.25, 15.15] 3.34
Fu. et al., 2020	-	29.30 [26.77, 31.83]	3.34	Zhou et al., 2020	34.40 [33.54, 35.26] 3.36
Wang. et al., 2020	-	11.00 [10.56, 11.44]		Grover et al., 2020	38.10 [35.78, 40.42] 3.34
Ueda. et al., 2020	-	43.10 [40.03, 46.17]		Pieh. et al., 2020	19.00 [16.57, 21.43] 3.34
Zhou et al., 2020 Sindel et al., 2020		43.70 [42.62, 44.78] 34.00 [29.03, 38.97]		Dai. et al., 2020	4.36 [2.81, 5.91] 3.36
Sigdel. et al., 2020 Shevlin. et al., 2020		34.00 [29.03, 38.97] 22.12 [20.31, 23.93]		McCracken. et al., 2020	24.20 [21.79, 26.61] 3.34 18.10 [14.64, 21.56] 3.31
Agberotimi et al., 2020	-	23.50 [19.79, 27.21]	3.29	Salman, et al., 2020	18.10 [14.64, 21.56] 3.31 34.00 [31.24, 36.76] 3.33
Rossi et al., 2020	-	17.30 [16.75, 17.85]	3.37	Heterogeneity: 1' = 230.54, 1' = 99.88%, H' = 840.85	30.13 [23.28, 36.97]
Zhou .et al., 2020		44.90 [44.00, 45.80]	3.37	Test of 0. = 0.: Q(18) = 9997.53, p = 0.00	
Grover et al., 2020 Pieh. et al., 2020	_	29.00 [26.83, 31.17] 21.00 [18.48, 23.52]	3.35	OTHER	
Dai et al. 2020		4.49 [2.92, 6.06]	3.36	Wang. et al. , 2020	6.33[4.38, 8.28] 3.35
McCracken. et al., 2020		30.00 [27.42, 32.58]	3.33	Fu. et al., 2020	27.50 [25.02, 29.98] 3.34
Islam. et al., 2020	-	15.00 [11.79, 18.21]		Gualano. et al., 2020	23.20 [21.07, 25.33] 3.35
Salman. et al., 2020 Heterogeneity: r ² = 184.15, I ² = 99.86	-	45.00 [42.10, 47.90] 29.10 [22.62, 35.58]		Marelli. et al., 2020 Heterogeneity: r ² = 139.40, l ² = 98.85%, H ² = 86.91	34.30 [29.65, 38.95] 3.27 22.73 [11.07, 34.40]
Test of 0 = 0: Q(16) = 13752.60, p =	0.00	29.10 [22.62, 35.58]		Heterogeneity: r' = 139.40, l' = 98.85%, H' = 86.91 Test of 0. = 0; Q(3) = 263.41, p = 0.00	22.73 [11.07, 34.40]
Overall	+	28.18 [23.81, 32.54]		Overall	29.57 [24.67, 34.47]
Heterogeneity: $r^2 = 147.02$, $l^2 = 99.75$ Test of θ . = θ : Q(29) = 14826.12, p =	%, H ² = 398.15			Heterogeneity: x ² = 185.38, 1 ² = 99.79%, H ² = 479.46 Test of 0 = 0; Q(29) = 10806.67, p = 0.00	
Test of θ = θ ; Q(29) = 14826.12, p = Test of group differences; Q ₁ (2) = 6.0				Test of 0. = 0; Q(29) = 10806.67, p = 0.00 Test of group differences; Q.(2) = 1.74, p = 0.42	
		60		0 20 40	08 00
Random-effects REML model		Effect Size	Weight	Random-effects REML model	Effect Size Weight
Study (C)	evalence of Stress	with 95% CI	(%)	(d) Prevalence of Insomnia	with 95% CI (%)
ASDS	_			AIS	
Shi. et al., 2020					
Heterogeneity: 12 = 0.00, 12 = .%, H2	-	24.40 [24.05, 24.75]		Fu. et al., 2020	30.00 [27.45, 32.55] 7.68
meterogeneity: 1 = 0.00, 1 = .%, H	=. 1	24.40 [24.05, 24.75] 24.40 [24.05, 24.75]			
Test of θ _i = θ _i : Q(0) = -0.00, p = .	- 1			Dai. et al., 2020	1.76 [0.76, 2.76] 7.74
	=. I			Dai. et al., 2020 Heterogeneity: r ² = 397.77, l ² = 99.76%, H ² = 409.11	
	1			Dai. et al., 2020	1.76 [0.76, 2.76] 7.74
Test of $\theta_i = \theta_j$; Q(0) = -0.00, p = . DASS-21		24.40 [24.05, 24.75]		Dai. et al., 2020 Heterogeneity: r ² = 397.77, l ² = 99.76%, H ² = 409.11	1.76 [0.76, 2.76] 7.74
Test of θ _i = θ _i ; Q(0) = -0.00, p = . DASS-21 Wang. et al., 2020	· · ·	24.40 [24.05, 24.75] 8.10 [6.56, 9.64]	8.35	Dai. et al., 2020 Heterogeneity: r ² = 397.77, l ² = 99.76%, H ² = 409.11	1.76 [0.76, 2.76] 7.74
Test of θ _i = θ _j ; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020	 	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67]	8.35	Dai, et al., 2020 Heterogeneity: r ² = 397.77, r ² = 99.76%, H ² = 409.14 Test of 8; = 6; Q(1) = 409.11, p = 0.00 ISI	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53]
Test of θ _i = θ _j ; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020 Othman, et al., 2020		24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68]	8.35 8.31 8.30	Dai, et al., 2020 Heterogeneity, r ² = 597.77, l ² = 59.76%, H ² = 409.11 Test of 8 = 0;(1) = 409.11, p = 0.00 ISI ISI	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75
Test of θ, = θ; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi. et al., 2020 Odrinora, et al., 2020 Odriozola-González, et al., 2020		24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59]	8.35 8.31 8.30 8.35	Dal, et al., 2020 Heterogeneity, r ² = 597.77, l ² = 69.76%, H ² = 409.11 Test of 4, -9; O(1) = 409.11, p = 0.00 ISI Shi, et al., 2020	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.78] 7.75
Test of θ, = θ;: Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020 Odmana, et al., 2020 Odriozola-Genzález, et al., 2020 Mazza, et al., 2020		24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86]	8.35 8.31 8.30 8.35 8.35	Dai et al. 2020 HeterogramBy: if = 597.77, if = 697.6%, H ² = 409, 15 HeterogramBy: if = 50(1) = 409, 15, p = 0.00 ISI Shi, et al. 2020 Wang et al. 2020 Magedomtin, et al. 2020	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.78] 7.75 15.10 [11.97, 18.23] 7.84
Test of θ _i = θ _i ; O(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi. et al., 2020 Othman. et al., 2020 Othmaza. et al., 2020 Verma and Mishra, 2020		24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 11.60 [8.26, 14.94]	8.35 8.31 8.30 8.35 8.35 8.35 8.29	Dal, et al., 2020 Heterogeneity, r ² = 597.77, l ² = 69.76%, H ² = 409.11 Test of 4, -9; O(1) = 409.11, p = 0.00 ISI Shi, et al., 2020	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.78] 7.75
Test of 8; = 8; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Marzni, et al., 2020 Odriozola-González, et al., 2020 Odriozola-González, et al., 2020 Verma and Mishra, 2020 Verma and Mishra, et al., 2020	12	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86]	8.35 8.31 8.30 8.35 8.35 8.35 8.29	Dai et al. 2020 HeterogramBy: if = 597.77, if = 697.6%, H ² = 409, 15 HeterogramBy: if = 50(1) = 409, 15, p = 0.00 ISI Shi, et al. 2020 Wang et al. 2020 Magedomtin, et al. 2020	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.78] 7.75 15.10 [11.97, 18.23] 7.84
Test of 8; = 6; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020 Odrizozla-González, et al., 2020 Odrizozla-González, et al., 2020 Verma and Mishra, 2020 Verma and Mishra, 2020	12	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 11.60 [8.26, 14.94]	8.35 8.31 8.30 8.35 8.35 8.29 8.32	Dai et al. 2020 Heterogenetic, i' - 597.77, i' = 597.765, H' = 409.15 Heterogenetic, i' - 597.77, i' = 597.765, H' = 409.15 HE Shi et al. 2020 Wang, et al. 2020 Approximit, et al. 2020 Appr	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.76] 7.75 15.10 [11.97, 18.23] 7.84 7.30 [6.92, 7.68] 7.75 44, 20 [39.71, 44.69] 7.86
Test of 8; = 6; Q(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020 Othman, et al., 2020 Othmosel, 2020 Othmosel, 2020 Werma and Mishra, 2020 Ozamiz-Excelaria, et al., 2020 Ozamiz-Excelaria, et al., 2020	ok, H ² = 105.81	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 11.60 [8.26, 14.84] 23.60 [20.94, 26.26]	8.35 8.31 8.30 8.35 8.35 8.29 8.32	Dai, et al., 2020 Heterogravity, i' = 397.77, i' = 99.76%, H' = 409.15 Test of 8, = 90,(1) = 409.15, p = 0.00 Shi, et al., 2020 Wang et al., 2020 Appendim, et al., 2020 Qualiton et al., 2020 Manufi, et al., 2020	178 [0.76, 2.78] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [122, 1317] 7.75 15.10 [1127, 18.23] 7.44 7.30 [6.92, 7.88] 7.75
Test of 8; = 8; 2(0) = -0.00, p = . DASS-21 Wang, et al., 2020 Kazmi, et al., 2020 Othrozan-Gorozákez, et al., 2020 Othrozan-Gorozákez, et al., 2020 Werma and Mishra, 2020 Ozamiz-Etxebarria, et al., 2020 Ozamiz-Etxebarria, et al., 2020	ok, H ² = 105.81	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 11.60 [8.26, 14.84] 23.60 [20.94, 26.26]	8.35 8.31 8.30 8.35 8.35 8.29 8.32	Dai, et al., 2020 Heterogeneity, r ² = 597.77, r ² = 697.6%, H ² = 409.11 Tet of 8 = 90.(1) = 409.11, p = 0.00 SI Si Si et al., 2020 Wang, et al., 2020 Gualano, et al., 2020 Gualano, et al., 2020 Mareili, et al., 2020 Mareili, et al., 2020	178 [0.76, 2.78] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.97, 18.23] 7.64 17.30 [632, 7.88] 7.75 4.220 [39.71, 44.69] 7.88
Test of 8, = 6; Q(0) = 0.00, p = . DASS-21 Wang, et al., 2020 Kamm, et al., 2020 Offmann, et al., 2020 Offmann, et al., 2020 Offmann, et al., 2020 Verma and Muhana, 2020 Verma and Muhana, 2020 Toamic-Etherbain, et al., 2020 Heteorogeneity, r ² = 125.02, l ² = 90.0 Test of 0, = 6; Q(6) = 609.63, p = 0.0	ok, H ² = 105.81	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 11.60 [8.26, 14.84] 23.60 [20.94, 26.26]	8.35 8.31 8.30 8.35 8.35 8.29 8.32	Dai, et al., 2020 Heterogravity, i' = 397.77, i' = 99.76%, H' = 409.15 Test of 8, = 90,(1) = 409.15, p = 0.00 Shi, et al., 2020 Wang et al., 2020 Appendim, et al., 2020 Qualiton et al., 2020 Manufi, et al., 2020	178 [0.76, 2.78] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [122, 1317] 7.75 15.10 [1127, 18.23] 7.44 7.30 [6.92, 7.88] 7.75
Test of 8 = 6; Q(0) = -0.00, p = . DASS-21 Warg, et al., 2020 Marzan, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Unaza, et al., 2020 Unaza, et al., 2020 Unaza, et al., 2020 Unaza, et al., 2020 Diamine, Exobiantia, et al., 2020 Diamine, Exobiantia, et al., 2020 Heaterogeneity, r ¹ = 125, 02, r ² = 90.0 Heaterogeneity, r ² = 0.0, 01 = 90.053, p = 0.0 K6-6	ok, H ² = 105.81	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 11.60 [8.26, 14.94] 23.60 [20.94, 26.26] 22.97 [14.63, 31.31]	8.35 8.31 8.30 8.35 8.35 8.29 8.32	Dai, et al., 2020 Heterogeneity, r ² = 597.77, r ² = 697.6%, H ² = 409.11 Tet of 8 = 90.(1) = 409.11, p = 0.00 SI Si Si et al., 2020 Wang, et al., 2020 Gualano, et al., 2020 Gualano, et al., 2020 Mareili, et al., 2020 Mareili, et al., 2020	178 [0.76, 2.78] 7.74 15.85 [-11.82, 43.53] 28.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.97, 18.23] 7.64 17.30 [632, 7.88] 7.75 4.220 [39.71, 44.69] 7.88
Test of 8 = 9; Q(0) = -0.00, p = . DAS5-21 Wong et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, 2020 Warza, et al., 2020 Versma and Minkar, 2020 Otamic-Evebarris, et al., 2020 Test of 0, = 6; Q(6) = 509.53, p = 0.0 Ke-6 Dat et al., 2020	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.69] 27.20 [25.54, 28.68] 23.80 [20.94, 28.28] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77]	8.35 8.31 8.30 8.35 8.29 8.32	Dai, et al., 2020 Heterogravity, i ¹ = 397.77, i ² = 99.76%, H ² = 409.11 Test of 8 = 90.(1) = 409.11, p = 0.00 Si et al., 2020 Wang et al., 2020 Appenditi, et al., 2020 Qualation, et al., 2020 Sang et al., 2020 Sang et al., 2020 Peh, et al., 2020 Carakino, et al., 2020	178 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 28.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.77, 18.23] 7.44 7.30 [6.92, 7.68] 7.75 4.220 [30.71, 44.69] 7.85 4.200 [30.71, 44.69] 7.85 4.200 [30.71, 43.23] 7.69 3.800 [3.72, 40.37] 7.69 3.72 [3.72, 40.37] 7.75 3.72 [3.72
Test of B, = B; Q(0) = 0.00, p = . DASS 21 Wang, et al., 2020 Marzan, et al., 2020 Otheran, et al., 2020 Otheran, et al., 2020 Uncortical-Gordanica, et al., 2020 Uncortical-Gordanica, et al., 2020 Uncortical-Board, et al., 2020 Oramic-Evelbarnis, et al., 2020 Dramic-Evelbarnis, et al.,	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.59] 11.60 [8.26, 14.94] 23.60 [20.94, 26.26] 22.97 [14.63, 31.31]	8.35 8.31 8.30 8.35 8.29 8.32	Dai et al. 2020 Heterogenetic, if * 997.75, if * 997.65, if * e09.15 Est Shi et al. 2020 Vilong et al. 2020 Appendim et al. 2020 Appendim et al. 2020 Manifi et	1.78 0.76, 2.76 7.74 15.86 1.11.82, 43.53 13.30 12.82, 13.76 7.75 15.10 11.87, 18.23 7.64 7.30 0.82, 7.88 7.75 4 42.01 9.371, 44.69 7.68 4 42.01 9.371, 44.69 7.68 4 40.00 35.20, 44.60 7.49 20.271 (17.31, 23.21 7.65 16.00 (13.31, 18.27) 7.06
Test of 0, = 0; (2(0) = -0.00, p = . DAS-21 Wang, et al., 2020 Otheran, 202	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.69] 27.20 [25.54, 28.68] 23.80 [20.94, 28.28] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77]	8.35 8.31 8.30 8.35 8.29 8.32	Dai, et al., 2020 Heterogravity, i ¹ = 397.77, i ² = 99.76%, H ² = 409.11 Test of 8 = 90.(1) = 409.11, p = 0.00 Si et al., 2020 Wang et al., 2020 Appenditi, et al., 2020 Qualation, et al., 2020 Sang et al., 2020 Sang et al., 2020 Peh, et al., 2020 Carakino, et al., 2020	1.76 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 22.20 [20.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.77, 18.23] 7.44 7.30 [6.92, 7.68] 7.75 4.220 [30.71, 44.69] 7.86 4.200 [30.71, 44.69] 7.86 4.200 [35.20, 44.80] 7.46 20.277 [17.31, 23.23] 7.65 3.800 [37.7, 40.37] 7.69 3.800 [37.7, 40.37] 7.67 3.800 [37.7, 40.37] 7.69 3.800 [37.7, 40.37] 7.69 3.800 [37.7, 40.37] 7.69 3.800 [37.7, 40.37] 7.69 3.800 [37.7, 40.37] 7.67 4.800 [37.7, 40.37] 7.69 4.800 [37.7, 40.37] 7.69 4.800 [37.7, 40.37] 7.67 4.800 [37.7, 40.37] 7.67 5.800 [37.7, 40.37] 7.77 5.800 [37.7, 40.37
Test of 0, = 0; Q(0) = 0.00, p = . DASS-21 Warg, et al., 2020 Kasami, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Vienna and Minhra, 2020 Othman, et al., 2020 Vienna and Minhra, 2020 Dialet al., 2020 Metarogeneity, r ² = 125, 02, f = 99, 0 Heterogeneity, r ² = 0, 00, f = 5%, H ² Test of 0, = 0, 00, f = 5%, H ² Test of	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.88] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 5.10 [3.43, 6.77]	8.35 8.31 8.35 8.35 8.29 8.32 8.32	Dai et al. 2020 Heterogenetic, if * 997.75, if * 997.65, if * e09.15 Est Shi et al. 2020 Vilong et al. 2020 Appendim et al. 2020 Appendim et al. 2020 Manifi et	176 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 28.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.77, 18.23] 7.44 7.30 [6.92, 7.68] 7.75 4.220 [30.71, 44.69] 7.85 4.200 [30.71, 44.69] 7.85 4.200 [30.71, 43.23] 7.69 3.800 [3.72, 40.37] 7.777 3.757 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.75777 [3.75777 [3.75777 [3.757777
Test of 0, = 0; Q(0) = 0.00, p = . DASS-21 Warg, et al., 2020 Kasami, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Vienna and Minhra, 2020 Othman, et al., 2020 Vienna and Minhra, 2020 Dialet al., 2020 Metarogeneity, r ² = 125, 02, f = 99, 0 Heterogeneity, r ² = 0, 00, f = 5%, H ² Test of 0, = 0, 00, f = 5%, H ² Test of	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.68] 37.00 [35.41, 38.69] 27.20 [25.54, 28.68] 23.80 [20.94, 28.28] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77]	8.35 8.31 8.35 8.35 8.29 8.32 8.32	Dai et al. 2020 Heterogenetic; i ² - 597.71; i ² - 597.765; H ² = 409.15 Est et al. 9, e3, c0 (1) = 400, 11, p = 0.00 Sti et al. 2020 Wong, et al. 2020 Mong, et al. 2020 Manufit, et al. 2020 MacChaoken, e	176 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 28.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.77, 18.23] 7.44 7.30 [6.92, 7.68] 7.75 4.220 [30.71, 44.69] 7.85 4.200 [30.71, 44.69] 7.85 4.200 [30.71, 43.23] 7.69 3.800 [3.72, 40.37] 7.777 3.757 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.757] 7.7777 [3.75777 [3.75777 [3.75777 [3.757777
Test of $\theta_{i} = \theta_{i}^{2} (Q(0) = 0.00, p = . DAS-21 Wang, et al., 2020 Xazm, et al., 2020 Otheran, et al., 2020 Otherangemethy, r^{2} = 10.52, l = 9.00, lTest of \theta_{i} = \theta_{i}^{2} (Q(0) = 809, 53, p = 0.1 KeSDas, et al., 2020Test of \theta_{i} = \theta_{i}^{2} (Q(0) = 809, 53, p = 0.1 KeSTest of \theta_{i} = \theta_{i}^{2} (Q(0) = 0.00, l^{2} = .51, pt^{2} Test of \theta_{i} = \theta_{i}^{2} (Q(0) = 0.00, l^{2} = .51, pt^{2} $	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [6.56, 9.64] 35.70 [32.73, 38.67] 17.50 [14.32, 20.88] 37.00 [35.41, 38.59] 27.20 [25.54, 28.86] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 5.10 [3.43, 6.77]	8.35 8.31 8.35 8.35 8.35 8.32 8.32 8.32	Dai, et al., 2020 Heterogeneity, r. I [*] = 397.77, l [*] = 99.76%, H ² = 409.51 Test of 8 = 90.(1) = 409.61, p = 0.00 SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN SN	176 0.76, 276 77 15.85 1-11.82, 43.53 29.20 28.83, 29.57 7.75 13.30 1222, 13.73 775 15.10 11.77, 18.23 7.64 7.30 16.92, 7.68 775 42.20 19.71, 44.69 78 42.00 19.520, 44.80 7.46 16.00 13.73, 18.27 7.69 3.300 35.27, 40.73 7.7 24.53 16.00, 33.03 16.20 17.31, 19.06 7.75
Test of 0, = 0; (2(0)) = -0.00, p = . DASS-21 Wang, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Varma and Mahra, 2020 Othman, et al., 2020 Othersongeneity, r ¹ = 125, 02, r ² = 99, 0. Test of 0, = 0, (0) = 909, 53, p = 0, 0 KK-5 Dial, et al., 2020 Hearogramity, r ¹ = 0, 00, r ² = 5, 0, H ² Test of 0, = 0, 00, 00, 00, 00, H ² Test of 0, = 0, 00, 00, 00, 00, H ² Test of 0, = 0, 2020 Grower et al., 2020	o%, H² = 105.81 ≫	24.40 [24.05, 24.75] 8.10 [0.56, 0.64] 35.70 [27.72, 38.67] 37.00 [35.4, 38.59] 37.00 [35.4, 38.59] 37.00 [35.4, 38.59] 27.20 [25.4, 28.86] 37.00 [25.4, 28.86] 37.00 [25.4, 28.86] 37.00 [25.4, 28.86] 37.01 [3.43, 6.77] 5.10 [3.43, 6.77] 21.50 [21.20, 22.40] 74.10 [72.01, 72.40]	8.35 8.31 8.35 8.29 8.32 8.35 8.35	Dai et al. 2020 Heterogenetic, if * 997.75, if * 997.6%, if * e097.11 Est et al. e. e. (2) (1) = 499.11, p. e. 0.0 ISI Shi et al. 2020 Wang et al. 2020 Algorodini, et al. 2020 Algorodini, et al. 2020 Manifi, et al. 2020 Heterogenetic, r. 1675.85, i = 90.50%, if * 1051.97 Test of 4, - 8; O(8) = 7525.45, p. e. 0.09 PSGL Hang and Zhao, 2020	1.76 0.76, 2.76 7.74 15.85 1.1182, 43.53 13.30 12.82, 13.78 7.75 15.00 1182, 14.82, 13.78 15.00 1182, 12.82 4 42.00 35.20, 44.80 7.49 20.27 11.73, 12.32 7.85 16.00 13.57, 44.69 7.49 20.27 11.73, 12.32 7.65 16.00 13.57, 40.73 7.67 24.53 16.03, 33.03 16.20 (17.51, 19.00 7.75 34.50 13.34, 55.38 7.75
Test of $\theta_{i} = \theta_{i}^{2} (Q(0) = 0.00, p = . DAS-21 Wang, et al., 2020 Nazar, et al., 2020 Ohman, et al., 2020 Ohzensi -Greating and Minka, 2020 Ozamiz-Eteobarnis, et al., 2020 Uzamiz-Eteobarnis, et al., 2020 Distant expansion, r^{-1} (ESS, l^{-1} 90, L^{-1} 5%, l^{+2} (Test of \theta_{i} = \theta_{i}^{-1} (Q(0) = 0.00, p^{-1} = .5%, l^{+2} (Test of \theta_{i} = \theta_{i}^{-1} (Q(0) = 0.00, p^{-1} = .5%, l^{+2} (Test of \theta_{i} = \theta_{i}^{-1} (Q(0) = 0.00, p^{-1} = .5%, l^{+2} (R_{i} = 0.20) (Growr et al., 2020 Growr et al., 2020$	o%, H ² = 105.01 0	24.40 [24.05, 24.76] 8.10 [6.56, 9.64] 9.70 [32.73, 38.77] 17.50 [4.32, 20.87] 17.00 [3.43, 38.69] 17.00 [3.43, 38.69] 17.00 [3.43, 6.77] 5.10 [3.43, 6.77] 21.80 [21.20, 22.40] 7.40 [22.07, 76.19]	8.35 8.31 8.30 8.35 8.29 8.32 8.32 8.35 8.35	Dai et al. 2020 Heterogree Per, I' = 397.77, I' = 99.76%, H' = 409.51 Heterogree Per, I' = 597.75, H' = 99.76%, H' = 409.51 SH SH = 41.2020 Wang et al. 2020 Appendim: et al. 2020 Appendim: et al. 2020 McCraken, et al. 202	176 [0.76, 2.76] 7.74 15.85 [-11.82, 43.53] 29.20 [28.83, 29.57] 7.75 13.30 [12.82, 13.73] 7.75 15.10 [11.77, 18.23] 7.45 15.00 [13.70, 14.66] 7.88 42.20 [35.71, 44.66] 7.88 42.20 [35.71, 44.66] 7.88 16.00 [13.73, 18.27] 7.69 3.30 [35.27, 40.73] 7.67 24.53 [16.00, 33.03] 18.20 [17.31, 19.06] 7.75
Test of $\theta_i = \theta_i (Q(0) = 0.00, p = . DASS-21 Minag. et al., 2020 Manz, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Otherma and Minhae, 2020 Otherma panel, r2 = 125, 62, r2 = 90.0 Heinrogeneity, r2 = 125, 62, r2 = 90.0 Dial, et al., 2020 Heinrogeneity, r2 = 0.00, r2 = .50, r4 Test of \theta_i = \theta_i (Q(0) = 0.00, p = . Free PSE Rossi et al., 2020 Heinrogeneity, r2 = 1022, 83, r2 = 00 Dial, et al., 2020 Heinrogeneity, r2 = 1022, 83, r2 = 102 Dial, et al., 2020 Heinrogeneity, r2 = 1022, 83, r2 = 102 Dial, et al., 2020 Heinrogeneity, r2 = 1022, 83, r2 = 102 Heinrogeneity, r2 = 1022, 83, r2 = 00 Heinrogeneity, r2 = 1022, 84, r2 = 1022, r2 = 102$	5%, H ² = 105.51	24.40 [24.05, 24.75] 8.10 [0.56, 0.64] 35.70 [27.72, 38.67] 37.00 [35.4, 38.59] 37.00 [35.4, 38.59] 37.00 [35.4, 38.59] 27.20 [25.4, 28.86] 37.00 [25.4, 28.86] 37.00 [25.4, 28.86] 37.00 [25.4, 28.86] 37.01 [3.43, 6.77] 5.10 [3.43, 6.77] 21.50 [21.20, 22.40] 74.10 [72.01, 72.40]	8.35 8.31 8.30 8.35 8.29 8.32 8.32 8.35 8.35	Dai et al. 2020 Heterogenetic, if * 997.75, if * 997.6%, if * e097.11 Est et al. e. e. (2) (1) = 4694.11, p. e. 0.0 ISI Shi et al. 2020 Wang et al. 2020 Algorodini, et al. 2020 Algorodini, et al. 2020 Manifi, et al. 2020 Heterogenetic, r. 1675.85, i = 90.90%, if * 1051.97 Test of 4, = 6; U(8) = 7525.45, p. e. 0.09 PSGL Hang and Zhao, 2020	1.76 0.76, 2.76 7.74 15.85 1.1182, 43.53 13.00 12.83, 29.57 7.75 13.00 12.82, 13.76 7.75 15.10 1137, 18.23 7.64 42.00 15.20, 44.80 7.49 20.27 11.73, 18.23 7.65 16.00 15.20, 44.00 7.49 20.27 11.73, 18.23 7.65 16.00 15.27, 40.73 7.67 24.53 16.03, 33.03 18.20 (17.51, 19.06) 7.75 34.50 13.34, 55.38 7.75
Test of $\theta_i = \theta_i (Q(0) = 0.00, p = . DASS 21 Wang, et al., 2020 Marga, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Watza, et al., 2020 Werma and Mithara, 2020 Otamic-Evelbarnis, et al., 2020 Otamic-Evelbarnis, et al., 2020 Dial, et al., 2020 West Dial, et al., 2020 West Possi et al., 2020 Freesi et al., 2020 Free of the = 0; (Q(0) = 0.00, p = . PS Dial, et al., 2020 Free of the = 0; (Q(0) = 0.01, p = . PS Test of the = 0; (Q(0) = 0.02, p = . PS Test of the set $	5%, H ² = 105.51	24.40 [24.05, 24.76] 8.50 [55.6, 24.76] 17.50 [14.22, 205 17.50 [14.22, 205 17.50 [14.22, 205 15.00 [25.4, 13.66] 15.00 [25.4, 13.66] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 17.76] 16.00 [13.73, 16.27] 16.00 [13.73, 16.27] 17.50 [10.0, 73.60]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai et al. 2020 Heterogree Per, I' = 397.77, I' = 99.76%, H' = 409.51 Heterogree Per, I' = 597.75, H' = 99.76%, H' = 409.51 SH SH = 41.2020 Wang et al. 2020 Appendim: et al. 2020 Appendim: et al. 2020 McCraken, et al. 202	1.76 [0.76, 2.76] 7.74 1.585 [.1182, 43.53] 29.00 [28.83, 29.57] 7.75 15.00 [11282, 13.76] 7.75 15.00 [1127, 18.23] 7.65 47.201 [6.92, 7.86] 7.75 47.201 [5.97] 4.460 [7.89 20.27] (17.31, 23.23] 7.65 16.00 [35.27, 40.73] 7.67 24.53] 16.00, 33.03] 18.20 [17.31, 19.09] 7.75 34.50 [13.34, 42.53] 18.20 [13.34, 42.53] 7.55 26.35 [10.38, 42.32]
Test of B, = B; Q(0) = -0.00, p = . DAS3-21 Wang, et al., 2020 Mazar, et al., 2020 Ohman, et al., 2020 Dist, et al., 2020 Dist, et al., 2020 Heaterogeneity, r = 100, r = %, H ² Test of B, = 0; Q(0) = 000, 53, p = 0. Media Dist, et al., 2020 Grower et al., 2020 Heaterogeneity, r = 1022, 83, l = 99 Ress Notasi et al., 2020 Heaterogeneity, r = 1022, 83, l = 99 Heaterogeneity, r = 1022, 83, l = 99 Test et B, et Q(2) = 228, 58, p = 0 Overati	0%, H ² = 106.01 0 =. 09%, H ² = 1409.21	24.40 [24.05, 24.76] 8.10 [6.56, 9.64] 9.70 [32.73, 38.77] 17.50 [4.32, 20.87] 17.00 [3.43, 38.69] 17.00 [3.43, 38.69] 17.00 [3.43, 6.77] 5.10 [3.43, 6.77] 21.80 [21.20, 22.40] 7.40 [22.07, 76.19]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai et al. 2020 Heterogenetic; if ' 997.75, if ' 997.95, if ' e 907.95, if a 2007 Heterogenetic; if al. 2020 Marati, et al. 2020 Pah, et al. 2020 Marati, et al. 2020 Pah, et al. 2020 Marati, et al. 2020 Ma	1.76 0.76, 2.76 7.74 15.86 1.1182, 43.53 13.00 12.82, 13.76 7.75 15.00 11.97, 18.23 7.84 7.30 0.82, 7.88 7.75 4 42.00 35.20, 44.80 7.49 20.27 11.73, 18.27 7.65 16.00 13.57, 44.89 7.49 20.27 13.73, 18.27 7.65 16.00 13.57, 44.97 3.6 3.80.01 55.27, 40.73 7.67 2.45.31 16.03, 33.03
Test of 0, = 0; (2(0) = -0.00, p = . DAS-31 DAS-31 Nama, et al., 2020 Mazza, et al., 2020 Darama, et al., 2020 Darama, Et Alama, 2020 Darama, Et Ababara, et al., 2020 Darama, Et Ababara, et al., 2020 Darama, Et Ababara, 2020 Darama, Et Ababara, 2020 Darama, Et Ababara, 2020 Darama, Et Ababara, 2020 Darama, 2020 Hoterogenesity, " 1 = 500, r] = 90, Bios et al., 2020 Darama, et al., 2020 Hoterogenesity, " 1 = 1022, 83, r] = 199 Hoterogenesity, " 1 = 1022, 83, r] = 109 Hoterogenesity, " 1 = 100, r] = 1	0%, H ² = 106.01 0 =. 09%, H ² = 1409.21	24.40 [24.05, 24.76] 8.50 [55.6, 24.76] 17.50 [14.22, 205 17.50 [14.22, 205 17.50 [14.22, 205 15.00 [25.4, 13.66] 15.00 [25.4, 13.66] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 17.76] 16.00 [13.73, 16.27] 16.00 [13.73, 16.27] 17.50 [10.0, 73.60]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai, et al., 2020 Heterogenetic, if * 997.75, if * 997.65, if * 909.15 Est Shi, et al., 2020 Wang, et al., 2020 Wang, et al., 2020 Alexandre, et al., 2020 Alexandre, et al., 2020 Marsili, et al., 20	1.76 [0.76, 2.78] 7.74 1.585 [.1182, 43.53] 29.201 [28.83, 29.57] 7.75 15.00 [11.62, 13.76] 7.75 15.00 [11.67, 18.23] 7.64 47.201 [6.92, 7.88] 7.75 44.203 [53.71, 4469] 7.68 44.203 [53.71, 4469] 7.68 38.00 [35.27, 40.73] 7.67 24.53 [16.03, 33.03] 7.75 34.50 [17.31, 19.06] 7.75 34.50 [17.31, 19.06] 7.75 34.50 [13.34, 42.32] 7.55 26.35 [10.38, 42.32]
Test of $\theta_{i} = \theta_{i}^{2} (Q(0) = 0.00, p = . DAS-21 Mang. et al., 2020 Mang. et al., 2020 Otheran. et al., 2020 Dial. et al., 2020 Dial. et al., 2020 Dial. et al., 2020 Beside et al., 2020 Grower et al., 2020 Heterogramity, r2 = 1022.83, l2 = 99 Test of \theta_{i} = \theta_{i}^{2} (Q_{i}^{2}) = 2285.85, p = 0 Overall$	5%, H ² = 105.61 0 53%, H ² = 1468.21 00 9%, H ² = 697.06	24.40 [24.05, 24.76] 8.50 [55.6, 24.76] 17.50 [14.22, 205 17.50 [14.22, 205 17.50 [14.22, 205 15.00 [25.4, 13.66] 15.00 [25.4, 13.66] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 17.76] 16.00 [13.73, 16.27] 16.00 [13.73, 16.27] 17.50 [10.0, 73.60]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai et al. 2020 Heterogenetic; if ' 997.75, if ' 997.95, if ' e 907.95, if a 2007 Heterogenetic; if al. 2020 Marati, et al. 2020 Pah, et al. 2020 Marati, et al. 2020 Pah, et al. 2020 Marati, et al. 2020 Ma	1.76 [0.76, 2.76] 7.74 1.585 [.1182, 43.53] 29.00 [28.83, 29.57] 7.75 15.00 [11282, 13.76] 7.75 15.00 [1127, 18.23] 7.65 47.201 [6.92, 7.86] 7.75 47.201 [5.97] 4.460 [7.89 20.27] (17.31, 23.23] 7.65 16.00 [35.27, 40.73] 7.67 24.53] 16.00, 33.03] 18.20 [17.31, 19.09] 7.75 34.50 [13.34, 42.53] 18.20 [13.34, 42.53] 7.55 26.35 [10.38, 42.32]
Test of $\theta_i = \theta_i (Q(0) = 0.00, p = . DASS-21 Wang, et al., 2020 Wang, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Othman, et al., 2020 Wanza, et al., 2020 Wanza, et al., 2020 Wennegandhy, r2 + 125, 62, r2 = 90.0 Test of \theta_i = \theta_i (Q(0) = 000, 52, p = 0.0Kr-6Dial, et al., 2020Wennegandhy, r2 = 0.00, r2 = .5%, r2Test of \theta_i = \theta_i (Q(0) = 0.00, 52, p = .5)PSRossi et al., 2020Panh, et al., 2020Panh, et al., 2020Panh, et al., 2020$	6%, H ² = 105.01 0 93%, H ² = 1409.21 00 9%, H ² = 847.06 0.00	24.40 [24.05, 24.76] 8.50 [55.6, 24.76] 17.50 [14.22, 205 17.50 [14.22, 205 17.50 [14.22, 205 15.00 [25.4, 13.66] 15.00 [25.4, 13.66] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 17.76] 16.00 [13.73, 16.27] 16.00 [13.73, 16.27] 17.50 [10.0, 73.60]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai, et al., 2020 Heterogenetic, if * 997.75, if * 997.65, if * 909.15 Est Shi, et al., 2020 Wang, et al., 2020 Wang, et al., 2020 Alexandre, et al., 2020 Alexandre, et al., 2020 Marsili, et al., 20	1.76 0.76, 2.76 7.74 15.86 1.11.82, 43.53 13.00 12.88, 29.57 7.75 15.50 0 11.87, 18.23 7.64 7.30 16.92, 7.88 7.75 4 42.00 13.97, 44.69 7.68 4 40.00 15.20, 44.60 7.49 20.27 1.731, 1232 7.65 16.00 13.57, 44.73 7.67 24.53 16.00, 33.03 18.20 (17.51, 19.09) 7.75 34.50 13.364, 35.38 7.75 26.35 10.38, 42.52
Test of $\theta_i = \theta_i (Q(0) = 0.00, p = . DAS-21 Minag. et al., 2020 Manag. et al., 2020 Othman. et al., 2020 Othman. et al., 2020 Othman. et al., 2020 Othman. et al., 2020 Mazza. et al., 2020 Meanoganahy, r2 = 125.02, r2 = 90.0 Meanoganahy, r2 = 10.00, r2 = . %, H2 Test of \theta_i = \theta_i (Q(0) = 0.00, p = . Pes Pes Pes Pes (12, 2200 Meanoganahy, r2 = 1022.83, l2 = 90 Test of \theta_i = \theta_i (Q(2) = 228.68, B, p = 0 Overall Meanoganahy, r2 = 103.386, r2 = 90.3 Test of \theta_i = \theta_i (Q(1) = 3612.86, p = 1 Meanoganahy, r2 = 303.86, r2 = 90.00 Test of \theta_i = \theta_i (Q(1) = 3612.86, p = 1 $	6%, H ² = 105.01 0 93%, H ² = 1409.21 00 9%, H ² = 847.06 0.00	24.40 [24.05, 24.76] 8.50 [55.6, 24.76] 17.50 [14.22, 205 17.50 [14.22, 205 17.50 [14.22, 205 15.00 [25.4, 13.66] 15.00 [25.4, 13.66] 22.97 [14.63, 31.31] 5.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 6.77] 15.10 [3.43, 17.76] 16.00 [13.73, 16.27] 16.00 [13.73, 16.27] 17.50 [10.0, 73.60]	8.35 8.31 8.35 8.29 8.32 8.35 8.35 8.35 8.35 8.35	Dai et al. 2020 Heterogenetic, if $=$ 397.71, if $=$ 99.76%, H ² = 409.11 Heterogenetic, if $=$ 99.77%, H ² = 409.11 Heterogenetic, if $=$ 2000 Here et al. 2020 Here al. 2020 Appendim, et al. 2020 Appendim, et al. 2020 Marcell, et al. 2020 Marcell, et al. 2020 Marcell, et al. 2020 Heterogenetic, if $=$ 105.1 s f Heterogenetic, if $=$ 105.2 s f Heterogenetic, if $=$ 105.2 s f Heterogenetic, if $=$ 105.2 s f Heterogenetic, if $=$ 105.7 s f H	1.76 0.76, 2.76 7.74 15.86 1.11.82, 43.53 13.00 12.88, 29.57 7.75 15.50 0 11.87, 18.23 7.64 7.30 16.92, 7.88 7.75 4 42.00 13.97, 44.69 7.68 4 40.00 15.20, 44.60 7.49 20.27 1.731, 1232 7.65 16.00 13.57, 44.73 7.67 24.53 16.00, 33.03 18.20 (17.51, 19.09) 7.75 34.50 13.364, 35.38 7.75 26.35 10.38, 42.52

Fig. 6 Forest plot showing the meta-analyses of the pooled prevalence of depression (a), anxiety (b), stress (c), and insomnia (d) for different assessment methods

CI: 3.43-6.77), and insomnia (1.76%, 95% CI: 0.76-2.76). Studies in Pakistan reported the highest prevalence of depression (45%, 95% CI: 42.10-47.90) and anxiety (34%, 95% CI: 31.24-36.76). The highest prevalence of stress and insomnia were reported respectively in India (40%, 95% CI: 4.81-76.16) and Italy (29.76%, 95% CI: 7.57-51.96).

Table 3 Su	bgroup analysis of l	Table 3 Subgroup analysis of prevalence of depression, anxiety, stress, and insomnia by different territories and countries	ssion, anxiety, stres	ss, and insomnia by	different terr	itories and count	ries		
Region	Prevalence of depression (95% CI) (I^2 , <i>p</i> -value)	Prevalence of anxi- Prevalence of ety (95% CI) (l^2 , stress (95% CI) p -value) p -value)) (1 ² ,	Prevalence of insomnia (95% CI) (<i>I</i> ² , <i>p</i> -value)	Country	Prevalence of depression (95% CI) (I^2 , <i>p</i> -value)	Prevalence of anxiety (95% CI) $(l^2, p$ -value)	Prevalence of stress (95% CI) $(l^2, insomnia (95% CI)$ p -value) $(l^2, p$ -value)	Prevalence of insomnia (95% CI) (<i>I</i> ² , <i>p</i> -value)
European Region	27.21 (21.16-33.27) $(p^2 = 99.06,$ <i>p</i> -value < 0.001)	24.97 $(21.24-28.70)$ $(p^2 = 97.64,$ <i>p</i> -value < 0.001)	27.41 (20.73-34.08) $(l^2 = 98.87, p-value < 0.001)$	31.81 (15.57-48.04) $(p^2 = 99.56, p$ -value < 0.001)	UK Spain	22.12 (20.31 21.63 (19.84 23.93)* 23.93)* 23.42)* 23.42)* 23.42)* 31.52 (6.82 29.31 (23.04 56.21) ($l^2 = 99.64$, 35.97) ($l^2 = 93.66$; p-value <0.001) p-value <0.001)	÷.	- 30.34 (17.21-43.48) $(t^2 = 98.61,$ p-value < 0.001)	1 1
					Italy	$\begin{array}{llllllllllllllllllllllllllllllllllll$	25.97 (19.04 23.97 (17.49- 32.10) $(l^2 = 98.29, 30.44) (l^2 = 98.53, p-value < 0.001)$ p-value < 0.001)	24.44 (19.15-29.73) $(l^2 = 97.22, p$ -value <0.001)	29.76 $(7.57-51.96)$ $(l^2 = 99.66,$ <i>p</i> -value < 0.001)
					Sweden	30.00 (27.42– 32.58)*	24.20 (21.79– 26.61)*	I	38.00 (35.27– 40.73)*
African Region	23.50 (19.79– 27.21)*	49.60 (45.23– 53.97)*	I	15.10 (11.97– 18.23)*	Nigeria	23.50 (19.79– 27.21)*	49.60 (45.23– 53.97)*	I	15.10 (11.97– 18.23)*
Eastern Mediter- ranean Region	44.90 (40.74– 49.06)*	47.10 (42.92– 51.28)*	17.50 (14.32– 20.68)*	I	Iraq	44.90 (40.74– 49.06)*	47.10 (42.92– 51.28)*	17.50 (14.32– 20.68)*	I
Southeast Asia	31.17 (22.63–39.71)	32.11 (25.15–39.07)	$40.49 \ (4.81 - 76.16) \\ (I^2 = 99.80,$	I	Nepal	34.00 (29.03– 38.97)*	31.00 (26.15– 35.85)*	I	I
Region	$(1^2 = 97.67, p$ -value < 0.001)	$(I^2 = 96.32, p$ -value < 0.001)	<i>p</i> -value < 0.001)		India	$31.06 (23.03 - 39.10) (l^2 = 95.06, p-value < 0.001)$	31.06 (23.03- 36.53 (28.06- 39.10) ($l^2 = 95.06$, 45.01) ($l^2 = 95.22$, <i>p</i> -value <0.001) <i>p</i> -value <0.001)	$\begin{array}{l} 40.49 \; (4.81 - 76.16) \\ (I^2 = 99.80, \\ p \text{-value} < 0.001) \end{array}$	1
					Bangladesh	15.00 (11.79– 18.21)*	18.10 (14.64– 21.56)*	I	I
					Pakistan	45.00 (42.10– 47.90)*	34.00 (31.24– 36.76)*	I	I

Table 3 (continued)	ontinued)								
Region	Prevalence of depression (95% CI) $(I^2, p$ -value)	Prevalence of anxi- Prevalence of ety (95% CI) (l^2 , stress (95% CI p-value) p-value)	Prevalence of stress (95% CI) (l^2 , insomnia (95% CI) p -value) p -value)	Prevalence of insomnia (95% CI) (<i>I</i> ² , <i>p</i> -value)	Country	Prevalence of depression (95% CI) $(I^2, p$ -value)	Prevalence ofPrevalence ofPrevalence ofdepression (95%anxiety (95% CI)stress (95% CI)CI) (l^2 , p -value)(l^2 , p -value) p -value)	Prevalence of depression (95%Prevalence of stress (95% CI)Prevalence of issonnia (95% CI)CI) $(I^2, p$ -value) $(I^2, p$ -value) $(I^2, p$ -value)	Prevalence of insomnia (95% CI) $(I^2, p$ -value)
Western Pacific Region	26.62 (18.92–34.32) $(l^2 = 99.89, p-value < 0.001)$	28.42 $(19.34-37.51)$ $(1^2 = 99.92,$ <i>p</i> -value < 0.001)	$\begin{array}{l} 13.42 \ (4.90-21.94) 20.45 \\ (l^2=99.43, (13.4) \\ p \text{-value} < 0.001) (l^2=p \text{-value} \\ p \text{-value} < 0.001) \end{array}$	$20.45 (13.06-27.84) (l^2 = 99.85, p-value < 0.001)$	China	27.66 (19.30– 36.03) ($l^2 = 99.90$, 4 <i>p</i> -value < 0.001) <i>p</i>		31.03 (20.56- 16.27 (0.29-32.24) 24.31 1.51) ($l^2 = 99.93$, ($l^2 = 99.76$, (17 -value < 0.001) <i>p</i> -value < 0.001) (l^2 , <i>p</i> -v	24.31 (17.76-30.87) (l2 = 99.79, p-value < 0.001)
					Japan	43.10 (40.03– 46.17)*	33.20 (30.28– 36.12)*	I	
					Austria	21.00 (18.48– 23.52)*	19.00 (16.57- 16.00 (13.73- 21.43)* 18.27)*	16.00 (13.73– 18.27)*	16.00 (13.73– 18.27)*
					Malaysia	4.49 (2.92–6.06)*	* 4.36 (2.81–5.91)*	4.49 (2.92–6.06)* 4.36 (2.81–5.91)*5.10 (3.43–6.77)* 1.76 (0.76–2.76)*	1.76 (0.76–2.76)*

Discussion

This meta-analysis investigated the mental health difficulties of general people during the COVID-19 pandemic. It analyzed the prevalence of depression, anxiety, stress, and insomnia segregated by two periods and by WHO regions. This study followed the PRISMA and MOOSE checklists. All the studies included in the data analysis were cross-sectional. According to results from our data synthesis, during the COVID-19 pandemic, the prevalence of depression, anxiety, stress, and insomnia respectively was 28.18%, 29.57%, 20.18%, and 23.50% in the general population. These psychiatric prevalence estimates are notably higher compared to before-pandemic situations (Huang et al., 2019; Krishnamoorthy et al., 2020; Lim et al., 2018). A previous meta-analysis found a similar prevalence of anxiety of 30% and a slightly higher prevalence of depression of 33% among the general population (Wang, Di, et al., 2020; Wang, Kala, et al., 2020; Wang, Pan, et al., 2020). Comparatively, a higher prevalence of stress of 29.6% and an almost similar prevalence of depression and anxiety were found in another systematic review and meta-analysis (Salari et al., 2020). However, none of them showed the over-time changes and regional disparities among those psychological morbidities.

These intensified symptoms of COVID-19-related depression, anxiety, stress, and insomnia could be attributed to a result of psychosocial stressors such as life disturbance, disease concern, or fear of negative economic consequences. The prolonged quarantine/isolation time is also a potential explanation for such a high burden during the pandemic period (Krishnamoorthy et al., 2020). Among those who endure it, quarantine is an uncomfortable experience. Stress factors linked to finances, work, school closure, and stigma attached to the disorder may also be present. Previous studies of the psychological effects of quarantine during previous outbreaks showed that the incidence among the general population under quarantine was substantially higher (Brooks et al., 2020). Social media/news is also identified as a reason behind the higher prevalence of anxiety and stress during the pandemic (Gao et al., 2020). The perception of risk, mortality rate, food insecurity, stigma, and prejudice are major factors responsible for high psychological disorders among infected patients (Krishnamoorthy et al., 2020). Moreover, as there is no definite therapeutic agent or vaccine (as of the study) for COVID-19, there is still ambiguity about the outcome among patients that can further aggravate their mental status.

The subgroup analysis of the prevalence of depression, anxiety, stress, and insomnia based on the study period shows that prevalence is decreasing over time (see in Fig. 5). Our findings show that the prevalence of depression at the beginning of the COVID-19 pandemic, "Before February 2020," was 25.25%; during "March to April 2020," it was 30.51% which is the highest prevalence followed by 16.47% in May to June 2020 (Fig. 4a). A similar pattern was found for stress and insomnia (Fig. 5). At the beginning of the pandemic, "Before February 2020," the prevalence of stress was 16.27% that rose to 29.41% during "March to April" followed by 5.10% in May to June 2020. The prevalence of insomnia before February 2020 was 22.63% that increased to 25% in March and April 2020 and fell to 19.86% in May and June 2020. However, in the case of anxiety, people were more anxious before February 2020 (32.10%), slightly decreased in March and April 2020 (30.51%), and

then decreased to half (15.51%) during May and June 2020. The pandemic spread all over the world after February 2020 and lockdowns in almost all countries and territories of the world started from the beginning of March 2020 (early lockdowns in China and some western nations). And after April 2020, people across the globe probably started to cope with the psychological challenges the pandemic poses. This might be the rationale behind the highest prevalence of depression, stress, and insomnia during March and April 2020 and an abatement thereafter. Several studies also reported a higher prevalence of psychological outcomes when individuals were challenged by isolation, unexpected unemployment, and economic uncertainty associated with the pandemic (Xiong et al., 2020). Before February 2020, people all over the world became more anxious by the news of the invention of a new case of atypical pneumonia (previous version of COVID-19) that was reported in Wuhan, China (Anand et al. 2020). And over time, it made people more depressed, stressful, and sleepless.

The subgroup analysis also provides the changes in psychological morbidities across the countries and territories. The results show Malaysia has the lowest prevalence of psychological morbidities depression (4.49%), anxiety (4.36%), stress (5.10%), and insomnia (1.76%) compared to other countries (Table 3). Some effective initiatives taken by the Malaysian Government reduced psychological illness among the population at the beginning of the pandemic such as increased the capacity of the hospital, isolation center, nationwide laboratories, allocated a huge budget for financial support, and ensured circulation of authentic information (Azlan et al., 2020; Kalok et al., 2020). People in Pakistan were more depressed (45%) and anxious (34%), Indians were highly stressed (40%) and Italian were more sleepless (29.76%) (Table 3). A study found that the poor sanitation, lack of basic preventive measures, lack of proper testing, and medical facilities are the reasons behind the higher psychological disorder, COVID-19 cases, and deaths in those countries (Wang et al., 2021).

Our results also show that the Eastern Mediterranean Region, African Region, Southeast Asia Region, and European Region are respectively most vulnerable in terms of the prevalence of depression (44.90%), anxiety (49.60%), stress (40.49%), and insomnia (31.18%) (Table 3).

Devastating scenarios such as poor food accessibility, lack of safe shelter, losing employment in several countries led to a higher likelihood of depression (Moradi, 2020). The prolonged period of isolation, poorer life quality, limited mobility, unstable treatment, and financial condition may lead the higher stress among the general population in the Southeast Asia region (Gopal et al., 2020; Kazmi et al., 2020). The literature shows that the history of medical issues, longer quarantine, and financial and health uncertainty were also the reasons for higher stress and insomnia during the pandemic (Agberotimi et al. 2020; Sigdel et al. 2020).

The prevalence of psychological morbidities also varies with different assessment tools. The highest pooled prevalence of depression of 29.10%, anxiety of 31.93%, stress of 37.30%, and insomnia of 26.35% was for PHQ-9, DASS-21, PSS, and PSQL, respectively (Fig. 6). A meta-analysis and sytemetic review (Mahmud et al., 2021a) showed that HADS, HADS, PSS, and ISI respectively provide the highest prevalence of depression of 47.02%, anxiety of 58.06%,

stress of 69.46%, and insomnia of 46.58% among health care workers during the pandemic.

To our knowledge, this study is the most comprehensive systematic review and meta-analysis in investigating mental health difficulties among the general population during the COVID-19 pandemic. While other systematic reviews and meta-analyses were performed on some of the psychological morbidities, this study stands out in its use of comprehensive searches on four psychological issues, namely depression, anxiety, stress, and insomnia. This study also found out a large number of articles from all over the world, but other studies covered only two or three territories of the world. Besides, for the first time, we have observed periodic changes in the prevalence of depression, anxiety, stress, as well as insomnia by conducting subgroup analysis based on study durations.

These types of studies are inevitable for supporting public health globally and reducing the knowledge gap in the care of mental health disorders (Javadi et al., 2017). The funding bodies and governments can use this study as a tool to ensure sustainable development in mental health by supporting the prioritization and allocation of funds for mental health.

This study has some limitations. All of the studies included in this meta-analysis are cross-sectional and some of them are preprints. There are several assessment methods and cutoff points that were utilized for the same population screening in several studies. Even different cutoff points were considered for the same test in different studies. The prevalence estimates for some of the groups in subgroup analysis for depression, anxiety, stress, and insomnia based on both periods and assessment methods are estimated from few studies. In addition, there is a weak side to the omission of non-English papers and the exclusion of studies with low or moderate quality.

In conclusion, this systematic review provides a timely analysis of existing pieces of evidence that demonstrates a high prevalence of depression, anxiety, stress, and insomnia compared to normal time. If goes unnoticed for a long time, in severe cases, people may develop suicidal and self-destructive tendencies. This illustrates the significance of early detection and intervention for mental health problems in general people during the COVID-19 pandemic. The findings from subgroup analysis indicate that the prevalence of all four clinical symptoms is downward among the general population. However, this trend might change depending on the way the pandemic evolves. If the pandemic stays for a long time, the mental health of people might worsen further due to confinement, fear of infection, disruption in studies, financial crises, etc. Also, the prevalence might be different in individuals or different communities. Now, it is crucial to identify the most vulnerable group or individuals with psychological disorders from the general population. It is necessary to ascertain a holistic action plan to ensure strong mental health. In addition to medical facilities, psychological resources should also be established, adopted, and sustained. And thus, government and policymakers can apply the established strategies and interventions to prevent psychological adversities and enhance overall mental health in the general population.

Author Contribution SM and AM conducted the searches. They also completed the screening text, extraction, and analysis of the data with the input from ND. MM and SM wrote the first draft of the manuscript with input from ND. ND, AM, and MM provided critical feedback. All authors discussed the results and contributed to the final manuscript.

Data Availability Datasets are available through the corresponding author upon reasonable request.

Materials and Code Availability Materials and Code are also available through the corresponding author.

Declarations

Ethics Approval Not applicable.

Consent to Participate Not applicable.

Consent for Publication Not applicable.

Conflict of Interest The authors declare no competing interests.

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