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Mental Health and COVID-19 Infection: Systematic Review in Human Cross-Sectional Studies

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Abstract

Background: The outbreak of the new coronavirus (COVID-19) is the most recent global emergency declared by the World Health Organization, which may directly affect patients' mental health. The aim of this systematic review was to analyze the main impacts caused by the current COVID-19 pandemic scenario on mental health outcomes.

Methods: Pubmed, Lilacs and, BVS from January to March 2020 were systematically researched for related published articles. In electronic databases, the following search strategy using the keywords: "Nervousness or Social Anxiety or Anxieties, Social or Anxiety, Social or Social Anxieties or Anxiety AND Depressions or Depressive Symptoms or Depressive Symptom or Symptom, Depressive or Symptoms, Depressive or Emotional Depression or Depression, Emotional or Depressions, Emotional or Emotional Depressions and Health, Mental or Mental Hygiene or Hygiene, Mental and COVID 19 or Coronavirus. In five articles found, there was a higher incidence of symptoms of anxiety and depression, associated with exposure to COVID-19.

Results: Two studies demonstrated an increase in insomnia. Furthermore, symptoms related to increased stress, sensitivity to social risks, and the sensation of horror were also observed. When stratified by the psychiatric impact, high rates of moderate or severe psychological impact. COVID-19 pandemic scenario, directly impacting the mental health of the population affected by COVID-19.

Conclusions: Nevertheless, strategies related to lifestyle, associated with psychological care can be fundamental to improve the mental health of these individuals.

Keywords: Coronavirus; Depression; Anxiety; Stress; Acute infections

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Introduction

The outbreak of the new coronavirus (COVID-19) is the most recent global emergency declared by the World Health Organization (WHO) [1-26]. This occurs after infection by the SARS-CoV-2 virus, which has a primary vector still uncertain [23]. Similar to other outbreaks caused by the coronavirus group, such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), signs of infection appear after an average incubation period of five days [13,27-29]. In severe cases, pneumonia, acute respiratory distress syndrome, multiple organ failure and thousands of deaths around the world are observed [3].

In addition to changes related to physical health, uncertainty, low predictability and the imminent risk of transmission and mortality by COVID-19 has caused changes in mental health [10]. Individuals who have family members belonging to the risk group, as well as frontline health professionals are more susceptible to the development of mental health complications [5,8]. Some studies have shown that the threat and alert state against COVID-19 has triggered negative emotions such as acute stress, anxiety, social disgust, dissatisfaction with life, and depression [24]

These long-term behavioral and emotional changes can cause psychological consequences during the COVID-19 pandemic that could compromise the state of health and quality of life. However it is not clear the impacts of the COVID-19 mental health scenario [11]. Thus, the aim of this systematic review was to analyze the main impacts caused by the current COVID-19 pandemic scenario on mental health outcomes.

Methods and Materials

This systematic review was performed following the guideline of the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [16]. The review protocol was not previously registered.

Search strategy

The search for studies in the scientific literature began in January 2020 to March 2020, using the following databases: PubMed (Medline), Lilacs, and Virtual Health Library (BVS). The following terms: "Nervousness or Social Anxiety or Anxieties, Social or Anxiety, Social or Social Anxieties or Anxiety and Depressions or Depressive Symptoms or Depressive Symptom or Symptom, Depressive or Symptoms, Depressive or Emotional Depression or Depression, Emotional or Depressions, Emotional or Emotional Depressions and Health, Mental or Mental Hygiene or Hygiene, Mental and COVID 19 or Coronavirus, through Medical Subject Headings (MESH), which consists of a nomenclature based on the indexing of articles in the field of health sciences. Articles were included if they fulfilled the following PICOS criteria [20] (Population: COVID-19 patients, Interventions/exposure: COVID-19/coronavirus; Comparisons: no COVID-19/coronavirus patients, Outcomes: mental health Study Design: Cross-sectional studies). Reference lists of all included studies were also reviewed for potentially eligible articles

Eligibility and inclusion criteria

Two reviewers selected the articles according to the following inclusion criteria: 1) written in English, 2) between the years 2015 and 2020, involving studies 3) COVID-19/coronavirus, 4) Mental health, performed in human's studies. Articles were included if they fulfilled the following PICOS criteria (Participants, Interventions, Comparisons, Outcomes). In the next step of study made the comparison their findings at the end, searched the database, using the terms, and evaluated titles and abstracts in agreement to the eligibility criteria. The abstracts were submitted to second phase of analysis, in which two other independent researchers reviewed the articles completely and, by consensus, excluded articles that did not meet the criteria. Articles considered eligible, data were extracted regarding characteristics of the sample, methodology, and the main results found. There were triple combinations of these terms during the searches, being chosen as inclusion criteria. Were excluded: Reviews, opinions, letters, other languages, and animal's studies.

Extract data

The reviewers extracted the data studies on pre-established database. The third reviewer was consulted when occurs differences between reviewers. The data were described into a table according to its outcome, being mental health outcomes.

Quality assessment

The included studies were analyzed using a methodological quality assessment (MQA) adapted from the Downs and Black Quality Index [4]. This version consists of eight objective questions **(Table 1).** Each study was allocated a "1" for "yes" or a "0" for "no" for each question, and responses were summed for a total of eight. A total score ≥6 indicated a high-quality study, a total score of 3-5 indicated moderate quality, and a score<3 indicated low quality. Our analysis of the quality of the articles included demonstrated that all of them had a moderate quality (score=5).

Risk of bias analysis

The risk of bias was established through of a critical analysis of authors using seven criteria of a methodological judgment of included studies supplied by software Revman 5.3.0 program the Cochrane Handbook [2], developed for systematic reviews and available for free download (http//ims.cochrane.org/ revman/ download) were used. Among the criteria that structure the bias assessment are (1) Random sequence generation, (2) Allocation concealment, (3) Blinding of participants and personnel, (4) Blinding of outcome assessment, (5) Incomplete outcome data, (6) Selective reporting and (7) Other bias. The criteria for risk of bias are described in Figure 2 and 3 **(Figures 1-3).**

Table 1 Methodological quality assessment scores of the included studies.

Study	Questions								Total
	1.Clear objective	2.Sample Description	3. Interventions of interest clearly described	4. Methods to assess clearly described	5. Adverse events	6. Sample loss	7.Results Confounders	8.Statistical Power	
Gao et al [4]	1	1	1	1	0	1	0	0	5
Huang [9]	1	1	1	1	0	1	0	0	5
Lai et al [12]	1	1	1	1	0	1	0	0	5
Li et al [14]	1	1	1	1	0	1	0	0	5
Wang et al [24]	1	1	1	1	0	1	0	0	5
Zhang [30]	1	1	1	1	0	1	0	0	5

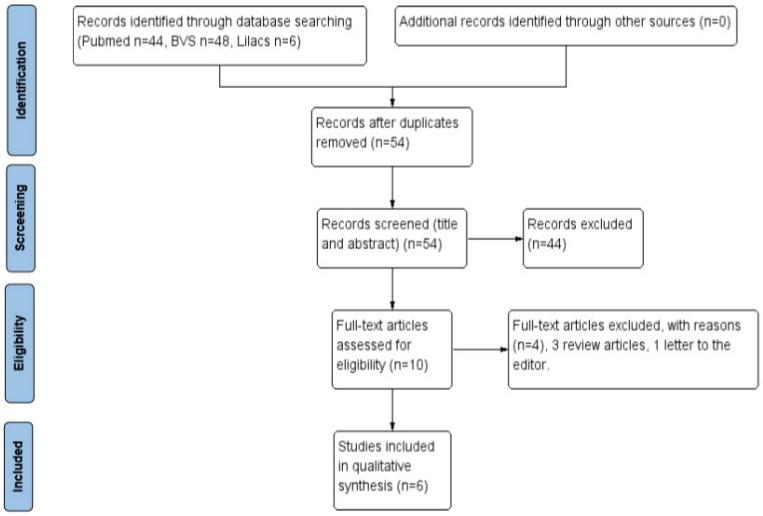

Figure 1 Study flow diagram.

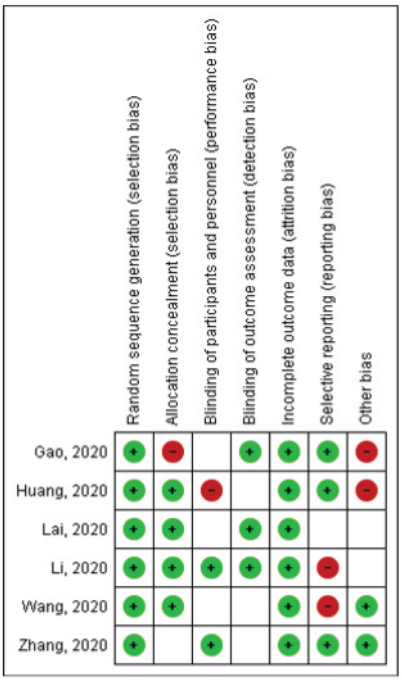

Figure 2 Risk of bias summary: review authors' judgment's about each risk of bias item for each included study.

Results

The flowchart demonstrated the successive steps taken to select studies in present systematic review (**Figure 1**). We found 98 studies in databases: Pubmed (44), BVS (48) and Lilacs (6). Then, 44 studies were excluded because they did not meet the inclusion criteria. Next, 10 articles remained, of which 3 review articles were excluded and, 1 letter to the editor. At the end of process, 6 studies were included. **Table 2** shows the summary of these studies in the mental health outcomes in the COVID-19 period. All six cross-sectional studies were carried out in the Chinese population, with ages ranging from 9 to 59 years of age.

Regarding the different manifestations in mental health observed in this COVID-19 pandemic scenario. Five studies demonstrate a higher incidence of depression state and anxiety symptoms [6,9,12,14,24].

In the other hand, two studies [9,12], demonstrated negative effects on sleep quality/insomnia during the COVID-19 scenario. Symptoms related to increased stress [12,24,30], sensitivity to social risks [14], and the sensation of horror were also observed [30]. When stratified by the psychiatric impact, high rates of

moderate or severe psychological impact (53.8%) were observed [24].To assess to these different of mental health outcomes and its association with the COVID-19 pandemic, were evaluated by strategies. Gao et al [6] analyzed the current health well-being, through the questionnaire through the Five Well-Being Index (WHO-5) and, anxiety by the generalized anxiety disorder scale (GAD-7), both in the Chinese version.

In addition, Huang et al [9] he also used the GAD-7 scale to assess anxiety symptoms and the Center for Epidemiology Scale for Depression (CES-D) to analyze the depressive state. In this sense, Lai et al [12] also carried out the assessment of anxiety using the GAD-7 scale, insomnia questionnaire, and depression by the Impact of event scale revised (IES-R). Zhang et al [30] they also used IES-R in their respective studies, to analyze others psychological impacts (impact of event, stress, anxiety). Moreover, in the Wang et al [24] assessed mental health status through Depression, Anxiety, and Stress Scale (DASS-21). However, Li et al [14] analyzed the word frequency, scores of emotional indicators (e.g., anxiety, depression, indignation, and Oxford happiness) and cognitive indicators (e.g., social risk judgment and life satisfaction.

Discussion

In the present study, we found that the significant impact of the COVID-19 pandemic on mental health outcomes. So, all included

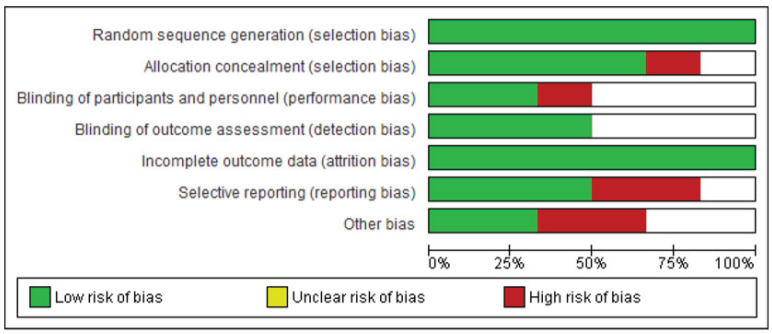

Figure 3 Risk of bias graph: review authors' judgment's about each risk of bias item presented as percentages across all included studies.

Table 2 Description of the main methodological protocols and results.

Author, year	Country	Objective	Type of Study	Sample description	Study Design	Mental health Manisfestations
Gao et al [6]	China	The current study aims to describe the prevalence and distribution of two major mental disorders (anxiety and depression) among the Chinese population and examine their associations with social media exposure during COVID-19 outbreak.	Cross sectional	4872 Chinese participants aged 18 years or over from 31 provinces and autonomous regions were evaluated.	Demographics and (SME) characteristics were evaluated, in addition, depression was assessed by The Chinese version of (WHO-5) and anxiety was assessed by the Chinese version of (GAD-7).	A prevalence of depression, anxiety, and a (CDA) was found to be 48.3% (95% CI: 46.9% -49.7%), 22.6% (95% CI: 21.4% -23.8%) and 19.4% (95% CI:18.3% -20.6%) during COVID-19 out broke in Wuhan, China. After controlling for covariates, frequently SME was positively associated with high odds of anxiety (OR=1.72, 95% CI: 1.31–2.26) and CDA (OR=1.91, 95% CI: 1.52–2.41) compared with less SME.
Huang [9]	China	To assess the mental health burden of the public during the COVID-19 outbreak and to identify the high-risk group.	Cross sectional	7,236 Chinese men and women participated in the study [3,284 (45.4%) male and 3,952 (54.6%) female] and the average age (standard deviation) of the participants was 35.3 ± 5, 6 years. They were divided into two groups by age at ≤ 35 years and ≥ 35 years.	Within the design of the study a web-based approach to data collection avoided any risk of the spread of SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus was used. This web-based survey of the COVID-19 was broadcasted on the Internet through the WeChat public platform and the mainstream media. All Chinese public using WeChat, Weibo, or others. For anxiety symptoms, Chinese version of generalized anxiety disorder-7 (GAD-7) scale, and for depressive symptoms analysis was used CES-D in Chinese version.	The prevalence of anxiety symptoms, depressive symptoms, and poor sleep quality was 35.1%, 20.1%, and 18.2%, respectively. No statistically significant difference was found in the prevalence of mental health burden by gender (p>0.05). The prevalence of anxiety symptoms and depressive symptoms was significantly higher in participants younger than 35 years than in participants aged 35 years or older (p<0.001).

Author, year	Country	Objective	Type of Study	Sample description	Study Design	Mental health Manisfestations
Lai et al [12]	China	To assess the magnitude of mental health outcomes and associated factors among health care workers treating patients exposed to COVID-19 in China.	Cross sectional	1257 health care workers in 34 hospitals from China.	From 29 January to 3 February 2020, was compared the interregional differences of mental health outcomes among health care workers in China, samples were stratified by their geographic location (i.e., Wuhan, other regions inside Hubei province, and regions outside Hubei province). Were evaluated a total of 20 hospitals in Wuhan, 7 hospitals in other regions of Hubei province, and 7 hospitals from 7 other provinces with a high incidence of COVID-19 (1 hospital from each province) were included. In total, 34 hospitals were involved. Anxiety symptoms was analyzed through GAD-7 scale, patient health questionnaire, insomnia index, and IES-R for depression state.	Health care workers reported symptoms of depression (n=634 [50.4%]), anxiety (n=560 [44.6%]), insomnia (n=427 [34.0%]), and distress (n=899 [71.5%]). Nurses, the frontline workers, reported experiencing more severe symptom levels of depression, anxiety, insomnia, and distress (eg, severe depression among physicians vs. nurses: 24 [4.9%] vs. 54 [7.1%];p = .01; severe anxiety between men vs. women: 10 [3.4%] vs. 56 [5.8%]; p = .001; severe insomnia among frontline workers vs. second-line workers: 9 [1.7%] vs. 3 [0.4%]; p < .001; severe distress among workers in Wuhan vs. Hubei outside Wuhan and outside Hubei: 96 [12.6%] vs. 19 [7.2%] among those in Hubei outside Wuhan and 17 [7.2%] among those outside Hubei; p <.001).
Li et al [14]	China	To explore the impacts of COVID-19 on people's mental health, to assist policymakers to develop actionable policies, and help clinical practitioners (social workers, psychiatrists, and psychologists) provide timely services to affected populations.	Cross sectional	Were analyzed the Weibo posts from 17,865 active Weibo users using the approach of (OER) based on several machine-learning predictive models. Age ranging from 9 to 40.1 years old	Was calculated the word frequency, scores of emotional indicators (e.g., anxiety, depression, indignation, and Oxford happiness) and cognitive indicators (e.g., social risk judgment and life satisfaction) from the collected data.	The results showed the increase of negative emotions (e.g., anxiety (p<0.000), depression (p<0.000), and indignation (p<0.000) and sensitivity to social risks increased, while the scores of positive emotions (eg, Oxford happiness) and life satisfaction decreased (p<0.0002), as a result of the COVID-19 pandemic.
Wang et al [24]	China	To survey the general public in China to better understand their levels of psychological impact, anxiety, depression, and stress during the initial stage of the COVID-19 outbreak.	Cross sectional	1210 respondents from 194 cities in China were assessed. The majority of respondents were women (67.3%), aged between 21.4 and 30.8 years (53.1%).	From 31 January to 2 February 2020, was conducted an online survey using snowball sampling techniques. The online survey collected information on demographic data, physical symptoms in the past 14 days, contact history with COVID-19, knowledge, and concerns about COVID-19, precautionary measures against COVID-19, and additional information required with respect to COVID-19. The psychological impact was assessed by the Impact of Event Scale-Revised (IES-R), and mental health status was assessed by DASS-21.	Among the individuals evaluated, it was observed that 296 (24.5%) reported minimal psychological impact levels (score<23); 263 (21.7%) rated mild psychological impact (scores 24-32); and 651 (53.8%) reported moderate or severe psychological impact (score>33). Regarding depression, 167 (13.8%) were considered to suffer from mild depression (score: 10–12); 148 (12.2%) were considered moderate depression (score: 13-20); and 52 (4.3%) were considered to be severe sufferers and extremely severe depression (score: 21-42). For the anxiety, 91 (7.5%) were considered to have mild anxiety (score: 7-9); 247 (20.4%) were considered to have moderate anxiety (score: 10-14); and 102 (8.4%) were considered suffer from severe and extremely severe anxiety (score: 15–42). For stress, 292 (24.1%) were considered to suffer from stress (score: 11-18); 66 (5.5%) were considered to have moderate stress (score: 19–26); and 31 (2.6%) were considered to have severe and extremely severe stress (score: 27-42).

Author, year	Country	Objective	Type of Study	Sample description	Study Design	Mental health Manisfestations
Zhang [30]	China	To investigate the immediate impact of the COVID-19 pandemic on mental health and quality of life among local Chinese residents aged ≥ 18 years in Liaoning Province, mainland China	Cross sectional	The study included 263 Chinese participants (106 men and 157 women) with an average age of participants between 18 and 30 years old.	The study was conducted from January 28, 2020 to February 5, 2020. Participants complete an online sociodemographic questionnaire via WeChat and telephone interviews using a modified and validated questionnaire that investigates the impact of the COVID-19 pandemic on lifestyle changes related to mental health (IER-S).	A slight stressful impact was observed, with no gender differences [p=0.173]. Only the average intrusive score in men was significantly higher than in women (13.0 vs. 12.3) [P=0.027]. A total of 74.5% of participants reported that they did not experience increased stress at home. There was a significant association between different age groups and some of the responses including feeling horrified due to the COVID-19 pandemic [p=0.002]; Feeling apprehensive due to COVID-19 pandemic [p=0.001]; and feeling helpless due to the COVID-19 pandemic [P=0.049].

studies carried out a diversified assessment of mental health using financially viable instruments (questionnaires, websites). In this perspective, anxiety and depression were the mental disorders that had a higher incidence in the general population and health professionals [15]. Collaborating with this, studies show that there are several factors (physiological, biochemical, behavioral) that influence the genesis of these two disorders affecting the homeostasis of the human mind [1,21,25,27]. The social isolation needed to stem the progress of the COVID-19 pandemic, can lead to adverse emotional and mental disorders, such as anxiety, depression, stress [7]. These changes occur due to the reduction of neuronal metabolism and neuroplasticity in hippocampus, medial prefrontal cortex, ventral tegmental area, and accumbens nucleus shell, associated with a high rate of chronic diseases and mortality [18,31]. Moreover, hospitalization for treatment of COVID-19 and its complications such as SARS contribute to increased levels of insomnia and stress, causing dysfunctions in the immune system [19].

This is in line with our findings, which demonstrate that exposure to COVID-19 provided increased levels of insomnia, social risk and stress associated with reduced mental health because of the impact of traumatic exposure to the pandemic. In this sense, studies demonstrate that prolonged exposure to stress, provides an increase in the levels of the hormone cortisol, reducing the activity of the components of the immune system (immunoglobulin A, neutrophils, anti-inflammatory cytokines), leading to a greater susceptibility to associated infection [19,22]. However, there is a need for further investigation of the mechanisms associated with mental health and its health outcomes for patients and health professionals affected by the COVID-19 pandemic.

Conclusion

Finally, the COVID-19 pandemic scenario is concluded, directly impacting the quality of mental health of the population and their health professionals. Nevertheless, strategies related to lifestyle (nutrition and physical activity), associated with psychological care can be fundamental to improve the mental health of these individuals.

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Conflict of interest

The Authors declares that there is no conflict of interest.

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