

## Effects of COVID-19 on Student's mental health: a systematic review

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### ABSTRACT

**Background and Objectives:** The outbreak of coronavirus in late 2019 has led to the closure of universities in most countries. The results of studies in this field show that the pandemic of Covid-19 and subsequent home quarantine has increased the level of stress and depression among students. Therefore, the aim of this review was to investigate the effect of Covid-19 on student's mental health and related factors.

**Methods:** Systematic review of databases including PubMed, Scopus, Web of Science, Google Scholar and Science Direct from the beginning of the COVID-19 pandemic until March 2021 was performed according to PRISMA guidelines. Based on the inclusion criteria, finally 8 articles were selected and evaluated quantitatively and qualitatively. Qualitative evaluation of articles was performed according to the Newcastle-Ottawa Scale (NOS).

**Results:** The results of the present study showed that a high percentage of students affected by the COVID-19 pandemic show mild to severe levels of stress, anxiety and depression. The most important factors affecting the level of mental health of students during home quarantine are student gender, financial status, living with family and educational level.

**Conclusion:** The results of this study show that it is necessary to pay attention to the mental health of students during the Covid-19 epidemic and especially during the home quarantine by the university management and specialists.

**Keywords:** Covid-19, Mental health, Stress, Anxiety, Depression, Students

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### INTRODUCTION

In December 2019, unusual patients with symptoms of pneumonia were observed in Wuhan Province, China, which the causative agent was identified as the Coronavirus (Covid-19). The disease was declared an epidemic on March 11, 2020 by the World Health Organization (WHO) [1]. In studies, the causative agent of Covid-19 disease was identified as a new strain of coronavirus, which was about 79% genetically similar to the causative agent of SARS-COV in 2003 and has a higher pathogenicity, spread rate and transmission. [2]. According to statistics provided by the WHO, until July 22, 2020, more than 15 million people have been infected with the virus worldwide and more than 600,000 people have died due to this disease [1]. Therefore, public places including universities, were closed in many countries, in order to implement the physical and social distancing to reduce and cut the virus transmission chain. Many universities offer their curricula as online after quarantine around the world [3]. The United Nations Educational, Scientific and Cultural Organization (UNESCO) reported in 2020 that the closure of higher education institutions has affected more than 87% of the world's student population [4]. According to studies conducted during the outbreak of Covid-19, the implementation of physical distance and quarantine has significantly increased anxiety, frustration, uncertainty, depressive symptoms and stress among people [5]. Students are vulnerable to mental disorders, so that one out of every 5 students shows a recognizable mental disorder [6]. According to the annual report of the US Center for Psychological Assessment Counseling in 2019, anxiety disorders are one of the most common mental health problems among graduate students [7]. Home

quarantine, stress and anxiety caused by the virus, worries about evaluating projects and exams, have led to psychological disorders such as feelings of insecurity, stress and depression among students [8,9]. In addition, fear of not finding a suitable job due to poor economic situation has increased the negative effect of pandemic on student's mental health [3]. Therefore it seems necessary to pay attention to the mental health of students in the epidemic period more than ever [10].

A review of the literature showed that decreased sleep quality, increased scores of fear, worry, anxiety and stress, and the occurrence of depressive symptoms from mild to severe among students were significantly affected by the prevalence of Covid-19 [11-17]. The results of this research show that the mental health of students in different countries with different economic, cultural and social status can be affected by Covid-19 epidemic [9]. It is important to identify and assess the extent of mental disorders among students affected by the epidemic in order to provide appropriate solutions to control and reduce them by psychiatrists. Therefore, the current systematic review study aimed at investigating the results obtained in different countries on the effect of Covid-19 epidemic on the incidence of mental disorders including stress, anxiety, depression and suicidal thoughts among students. The findings of this study can help the management of universities and the health organization to play an effective role in managing and treating student's psychological problems during the epidemic.

### METHODS

This systematic review was formatted according to the Preferred Reporting Items for Systematic Reviews and

Meta-Analyses (PRISMA) statement [18]. Different databases such as PubMed, Scopus, Web of Science, Google Scholar, and Science Direct were used for systematic literature search from the inception of the epidemic outbreak to Mar 2021. Covid-19, Sars-Cov-2, mental health, psychological health, anxiety, depression, fear, stress, post-traumatic stress disorder, suicidal thoughts, sleep quality, university and student were used in combination as the search terms. Eligibility criteria comprise studies that include: 1) cross-sectional study design, 2) assessment of the mental health status of the university students, 3) assessment and measurement of the mental health status by standardized and validated scales. Exclusion criteria were: 1) Studies published that written in non-English languages, 2) studies that focused on non-students, 3) studies that include student with pre-existing mental health problems. Data from studies were extracted as standardized form, and the final data items included for data extraction were: first name of author/year and journal, study design, study location, sample size, study design, component assessed and tool assessment, findings, and suggestion. The quality of the cross-sectional studies was evaluated using the Newcastle-Ottawa Scale (NOS) [19], which consists of 3 parts including selection, comparability, and outcome. The NOS examines studies in terms of the selection process (representativeness of the sample, sample size, No respondents, and measurement tools), comparability (based on study design and analysis), and the outcome (assessment and statistical analysis). According to the NOS, a study that can get at least 7 out of 9 possible stars is known as a high quality study, and a study that can get a maximum of 4 stars is known as a poor quality study.

## RESULTS

**Study characteristics:** A total of 230 articles were initially identified, of which 47 articles were removed in the initial screening. In the next step, 58 articles were removed from the review list due to duplication. 87 articles were removed from the list of initially selected articles for various reasons, including the study of non-student groups and the lack of use of standard tools in estimating parameters related to student's mental health. Finally, out of the remaining 38 articles, 8 articles were selected and reviewed which met the inclusion criteria (Figure 1). A summary of the basic characteristics and general findings of the 8 articles reviewed is presented in Table 1. Sample size in selected articles ranged from 291 to 14,698. The age range of the participants in these 8 articles was reported to be about 18 to 28 years (except for one article that was 18-75 years). All selected studies were cross-sectional. Countries were China (n = 2), France (n = 2), the United States (n = 1), Poland (n = 1), Bangladesh (n = 1), and Italy (n = 1). Psychopathological symptoms were evaluated in this study, in which depressive symptoms were evaluated in four articles, level of anxiety in six articles, level of stress in three articles, and suicidal thoughts in one article.

**Quality assessment:** The results of the qualitative evaluation of selected studies based on the Newcastle Ottawa scale (NOS) are shown in Table 2. The overall quality of the studies was average (scoring 5 to 7). Based

on this criterion, two articles were assigned 5 stars, one article 6 stars and 5 articles 7 stars.

**Measurement tools :** Assessment of different adverse psychological symptoms were carried out by the variety scales. Psychopathological symptoms measured by the General Health Questionnaire (GHQ-28). Assessment and measurement of anxiety and depressive symptoms status were conducted by Generalized Anxiety Disorder 7-item (GAD-7) and Mental Health Inventory Five-Item Scale (MHI-5) respectively. Severity of posttraumatic stress reactions was measured by The 17-item Post-Traumatic Stress Disorder Symptom Checklist – Civilian version (PCL-C). The 9-item Patient Health Questionnaire (PHQ-9) was used for measuring depressive status. In the study conducted by Meda et al. (2021), the symptoms of depression was assessed by the Beck Depression Inventory – 2 (BDI-2), the Beck Anxiety Inventory (BAI), the Obsessive-Compulsive Inventory – Revised (OCI-R), the Eating Habits Questionnaire (EHQ), and the Eating Disorder Inventory-3 (EDI-3).

**Symptoms of depression:** anxiety, and stress and its associated factors Wang et al. [9] reported that about 81% of participants showed some degree of depression, according to the completed PHQ-9 questionnaire, of which 32.4% had mild depression, 24.7% had moderate depression, and 15.8% had severe depression. PHQ-9 score was significantly higher in women than men and in elementary students compared to higher levels (PhD) ( $P < 0.001$  and  $P = 0.004$ , respectively). According to item 9 of the PHQ-9 questionnaire, about 18% of the participants reported that suicidal thoughts occur to them every day or every few days [9]. A meta-analysis of the 2014 completed GAD-7 questionnaire shows that 28.2% of these students showed minimal anxiety and 71.6% of participating students showed severe anxiety with varying degrees (33.2% with mild grade, 23.6% with moderate grade and 14.8% with severe grade) [9]. The results of statistical tests showed that the GAD-7 score was significantly higher in female students than in the male group and in elementary students compared to higher levels (PhD) ( $P < 0.001$ ), [9]. Wang et al. [9] also reported that 7.2% of the students had higher stress levels, 26.3% of the participants had same stress levels and 5.5% had lower stress levels than before the pandemic. Concerns about the quality of online classes and the negative impact on their final grades, delays in their graduation process, uncertainty about their future job and financial problems, and finally home quarantine mentioned as reasons for the increase in stress and anxiety of students during the Covid-19 pandemic [9]. In contrast, stress levels were reduced in a lower percentage of students than before the epidemic, which can be attributed to more time to exercise at home [9].

According to Beck Depression Inventory-2 (BDI-2) questionnaire, Meda et al. [20] stated that the mean score of student's depression was significantly higher in the Covid-19 quarantine period than after the quarantine period ( $p = 0.005$ ). The results of their research show that the BDI-2 questionnaire can be significantly effective in controlling and predicting the mental health status of students without a history of mental disorders in the epidemic period [20]. In the study of Meda et al. [20] Student's anxiety was measured by Beck Anxiety Inventory (BAI). Their results

show that the anxiety score of students at home quarantine time due to Covid-19 epidemic was significantly higher than time without home quarantine ( $P = 0.001$ ). Also, the mean score of anxiety at home quarantine in female students was significantly higher than the male group ( $P < 0.0001$ ) [20]. Meda et al. [20] reported that other mental disorders, such as sleep and eating disorders assessed by the EDI-3 standard and the EHQ questionnaire, were not affected by home quarantine during epidemic. Based on the results of Faisal et al. [21], the majority of participating students showed high scores of anxiety and depression following the epidemic of Covid-19. According to their report, 40.2% of participants had moderate to severe anxiety and 72.1% of them had depressive symptoms. Concern about the negative effects of Covid-19 is a significant predictor of anxiety symptoms in students ( $P < 0.004$ ). There was also a significant and positive correlation between anxiety related to Covid-19 and the onset of depressive symptoms ( $\beta = 0.32$ ,  $P < 0.004$ ) [21]. In the research of Wieczorek et al. [22], using the GHQ-28 questionnaire to assess the mental health status of students, reported that the total GHQ score was 38.8 and the mean score in the subscales was 8.76, 11.4, and 7.41 for physical health symptoms, anxiety and insomnia, and the severe depression, respectively. Overall, 77% of study participants had a total GHQ score of 24, indicating an increased risk of psychological trauma affected by the epidemic compared to previous studies [22]. Home quarantine due to the Covid-19 epidemic caused a significant increase in the total GHQ score and scores of subscales including social dysfunction and depression in students [22]. In a study by Wieczorek et al. [22] it was reported that the GHQ score was high for subscales of factors such as dropout thoughts of students in epidemic conditions. In the study of Li et al. [23] female students showed a higher degree of anxiety, depression and acute stress than male students ( $P < 0.001$ ). Students who experienced early life adversity (ELA) showed more stress, anxiety, and depressive symptoms during the epidemic of Covid-19 than those who did not experience ELA ( $P < 0.001$ ). The results of this study showed that students who had previously undergone sexual harassment had more severe symptoms of anxiety (AOR = 1.387, 95% CI = 1.202-1.600,  $P < 0.001$ ), and depression (AOR = 1.958, 95% CI = 1.371-2.796,  $P < 0.001$ ), and acute stresses (AOR = 2.728, 95% CI = 1.473- 5.050,  $P = 0.001$ ) during the pandemic period [23]. In the research of Bourion-B'ed'es et al. [24] the mean scores of GAD-7 and MSPSS were obtained 6.7 and 5.5, respectively. In 61% of students, anxiety symptoms were observed with varying degrees from mild to severe [24]. Anxiety symptoms were significantly higher among female students than male students ( $P < 0.0001$ ). Delayed exams and reduced face-to-face learning time were among the factors that increased student's anxiety ( $P = 0.03$ ) [24]. In home quarantine conditions, increased conflict with family members, smoking and making noise at home were introduced as important causes of anxiety among students ( $P < 0.0001$ ). In contrast, studying was more effective than other factors in significantly reducing the incidence of anxiety symptoms in students ( $P < 0.0001$ ) [24]. In the study of Fu et al. [25] Symptoms of anxiety were observed in 41% of students participating in the study. There was a significant

interaction between anxiety symptoms and factors such as age, university degree and financial status ( $P < 0.0001$ ). Anxiety symptoms were significantly lower in older students, better financial status and higher grade universities ( $P < 0.0001$ ). Concern about Covid-19 was one of the most important factors in increasing stress among students ( $P < 0.05$ ) [25]. In multivariate logistic regression analysis, female students were more prone to anxiety symptoms than male students (OR = 1.073, 95% CI: 1.044-1.104). Also, the perception that Covid-19 can have a negative effect on a student's life increases the incidence of anxiety symptoms (OR = 0.562, 95% CI: 0.544-0.579) [25]. In the study of Huskyet et al. [26] the anxiety levels of students who lived with their families was significantly lower than students who lived alone during the epidemic quarantine ( $P < 0.01$ ). Although mild to severe stress was observed in 61.6% of the students in the study, the level of stress was lower in students living with their families than in the group who lived alone in quarantined home (50.5 vs. 71.6%,  $P < 0.001$ ). Also, being away from family due to the epidemic increased the stress caused by the financial problem and finally increased the degree of stress in the student ( $P < 0.05$ ) [26].

## DISCUSSION

The outbreak of Covid-19 pandemic have closed and quarantined various public centers and venues, including stadiums, universities, schools and other places around the world. This was done to reduce the transmission and disrupt the virus transmission chain. Fear of getting disease as well as problems created following quarantine has increased the risk of psychological harm to society. As predicted from the beginning of the disease outbreak, students can be more affected by the psychological burden of the disease due to their sensitive and emotional age. Home quarantine can increase the incidence of anxiety and depression symptoms in students, especially in students who are living alone at home [27]. In most of the studies investigated in this review, a high percentage of students showed a high level of depression and anxiety under the influence of epidemics [9, 21, 22, 25]. Liu et al. [28], Moccia et al. [29], Ahmad et al. [30], Cao et al. [31] reported that the prevalence of Covid-19 pandemic increased the levels of stress and anxiety among a high percentage of students [9]. Decreased physical activity, fear of disease and poor financial status are among the reasons for the increase in anxiety and depression during the epidemic [27]. In contrast, in some studies, a lower percentage of students showed epidemic-induced depression [32-36]. In the study of Wang et al. [9] suicidal ideation was reported in 20% of students which was consistent with the results of a previous study about investigating the effect of Covid-19 epidemic [37]. In contrast, in one study, suicidal ideation among students was reported to be about 3 to 7% during a pandemic [38]. The occurrence of suicidal ideation among 20% of students, as an alarm should pay more attention to the mental health of students during the epidemic. In most studies, female students were more vulnerable than men during the epidemic and show higher levels of depression and anxiety which these results are consistent with the results of previous studies [1, 39]. In contrast, Islam et al. [40] observed that men experience higher levels of



psychological damage caused by Covid-19. Vulnerability of women's mental health in comparison with the group of men during the epidemic of Covid-19 can be due to the biological and social factors in women [41]. Poor level of family financial support of the student has been introduced as an effective factor in increasing the level of student anxiety [41]. Consistent with these results, Ashar et al. [39] reported that inadequate financial support for students could increase student's levels of anxiety and depression. Having a garden in the backyard reduces the symptoms of anxiety and depression in students, which is consistent with the results of previous studies [31, 42]. According to the results of Bourion-B'ed'es et al. [24] smoking increased anxiety among students during the epidemic. The stressful effects of nicotine and the negative indoctrination of the user, increase the level of anxiety in the smoker [9]. According to this review study, undergraduate students showed lower levels of anxiety than postgraduate students during an epidemic. Students who have a practical and research unit are more exposed to anxiety due to the stress of practical course [43].

## CONCLUSION

The results of this review study indicated that the rate of stress, anxiety and depression of students in different countries has increased due to the Covid-19 epidemic. Therefore, it is necessary to implement timely and appropriate psychological interventions during the epidemic for students in order to prevent greater damage to their mental health. In this regard, the role of university management, health officials and parents in providing appropriate psychological counseling to students can reduce the negative effects of Covid-19 on their mental health.

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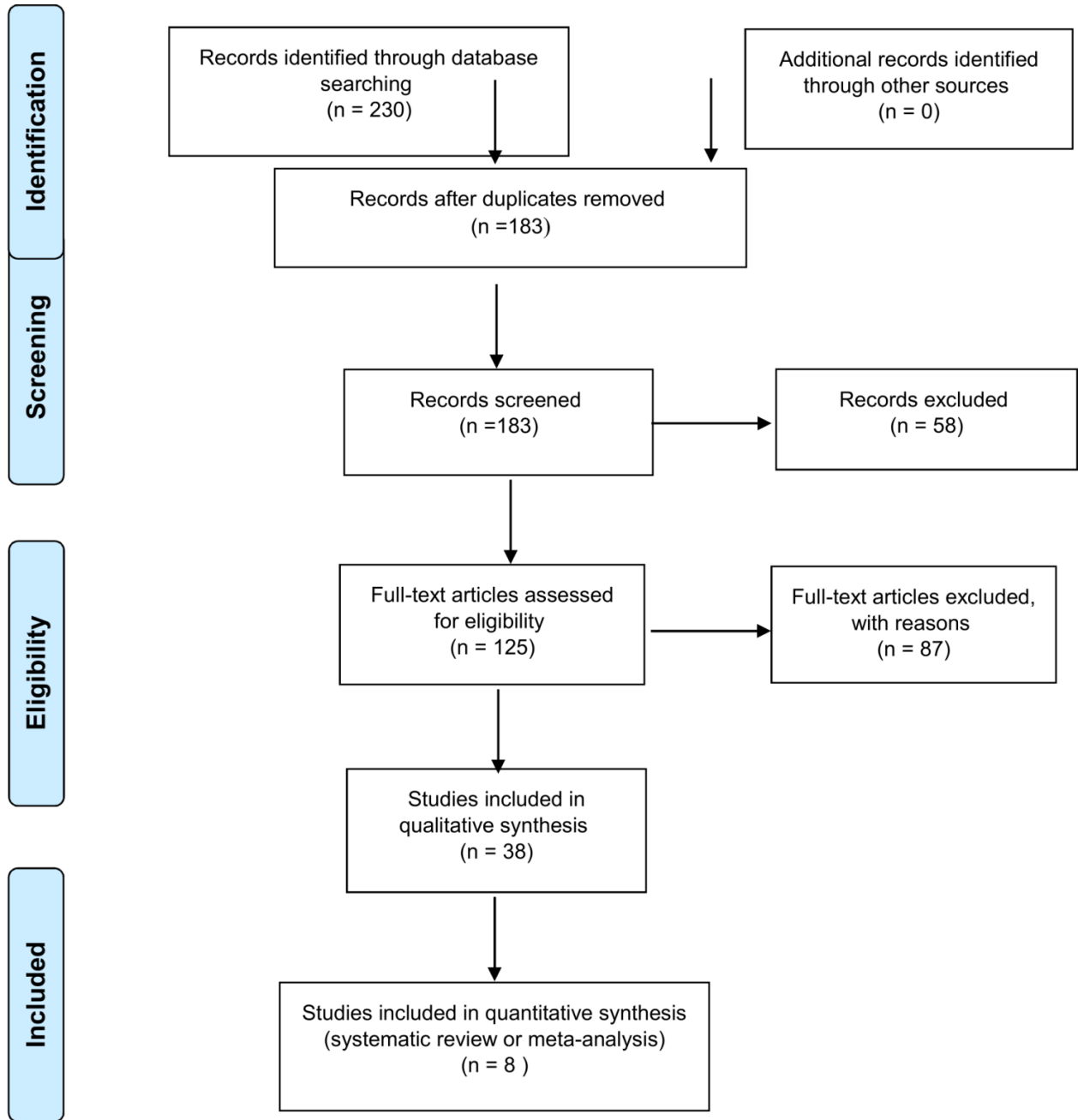


Figure 1: PRISMA flow-chart of the study selection process

Table 1: Summary of the baseline characteristics and findings of the reviewed articles.						
Author, year & journal.	Study design	Study location	Sample size	Component assessed & tool assessment	Findings	Suggestion
Husky et al., 2020. <i>Comprehensive Psychiatry</i>	Online cross sectional, questionnaire	France	N= 291	Anxiety, Stress	Almost students experienced anxiety as well as moderate to severe stress because of confinement.	Avoid being alone or away from family during the pandemic
Li et al. ., 2021. <i>Journal of Affective Disorders</i>	Online cross sectional, questionnaire	China	N= 14698	Acute stress reaction using PCL-C, anxiety status using GAD-7, and depression status Using PHQ-9.	The experience of early life adversity (ELA), is associated with acute stress reactions, anxiety and depression in students	There is need for attention to the mental health in young adults with ELA, under this epidemic.
Meda et al., 2021. <i>Journal of Psychiatric Research</i>	Online cross sectional, questionnaire	Italy	N= 1182	the Beck Depression Inventory – 2 (BDI-2), the Beck Anxiety Inventory (BAI), the Obsessive-Compulsive Inventory – Revised (OCI-R)	This study showed that the regression models predict that 86.2%of students not experience a clinically significant worsening of symptoms.	It is recommended that a possible aggravation of depressive symptoms should cautiously consider in students during lockdown phases, independently from a history of mental disorder by mental health workers
Fu et al., 2021. <i>Journal of Affective Disorders</i>	Online cross sectional, questionnaire	China	N= 89588	Anxiety symptoms were measured by the Generalized Anxiety Disorder 7-Item Scale (GAD-7).	About 42% of Chinese college students reported anxiety symptoms during the COVID-19 epidemic.	It is recommended appropriate psychological interventions for college students to reduce the psychological harm caused by this epidemic.
Bourion-B'ed'es et al., 2021. <i>Psychiatry Research</i>	Online cross sectional, questionnaire	France	N= 3936	anxiety and influencing factors	About 16 % and 10 % of students experienced moderate anxiety and severe anxiety respectively. Female gender and having relatives or from their housing hospitalized for COVID-19 were the main risk factors for anxiety.	There is need to focus on students mental health especially those that living with someone hospitalized with COVID-19 epidemics.
Wang et al., 2020. <i>Journal of medical internet research</i>	Online cross sectional, questionnaire	USA	N= 2031	Evaluate of depression and anxiety by the patient health questionnaire-9 and the general anxiety disorder-7	About 49%, 39% and 19% of students had a moderate-to-severe level of depression, anxiety and suicidal thoughts respectively.	There is need for attention to students' mental health, because of high prevalence of depression during the covid-19 epidemic
Faisal et al., 2021. <i>International Journal of Mental Health and Addiction</i>	Online cross sectional, questionnaire	Bangladesh	N= 874	Anxiety, depressive symptoms, and mental health	40% of the students had moderate to severe anxiety, 72% had depressive symptoms and 53% had moderate to poor mental health status.	Result of study can be helpful to mental adjustment of students during the pandemic's progression.

Wieczorek et al., 2021. <i>Int. J. Environ. Res. Public Health</i>	Online cross sectional, questionnaire	Poland	N= 1123	Measurement of psychopathological symptoms by the General Health Questionnaire (GHQ-28)	The result of study shows students' worsened mental health due to the COVID-19 pandemic.	it is strongly advised to early psychosocial interventions among students due to the COVID-19 pandemic and the shifts in academic life it caused.
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Study	Selection			measurement tools	Comparability	Outcome		Total score
	Representativeness of the sample	Sample size	No respondents			Assessment of outcome	Statistical test	
Husky et al., 2020.	*			*	*	*	*	5
Li et al., 2021.	*	*		*	**	*	*	7
Meda et al., 2021.	*	*		*	**	*	*	7
Fu et al., 2021.	*	*		*	**	*	*	7
Bourion-Bédés et al., 2021.	*	*		*	*	*	*	6
Wang et al., 2020.	*	*		*	**	*	*	7
Faisal et al., 2021.	*			*	*	*	*	5
Wieczorek et al., 2021.	*	*		*	**	*	*	7