Psychological sequelae within different populations during the COVID-19 pandemic: a rapid review of extant evidence

Xin Jie Jordon Tng1,*, BSocSci(Hons), Qian Hui Chew1,2, BSocSci(Hons), Kang Sim2, MBBS, MMED

ABSTRACT The rapid spread of COVID-19 has had a potentially significant impact on not only physical health but also psychological well-being. To the best of our knowledge, no review thus far has consolidated the psychological impact of COVID-19 across different subpopulations. A systematic search of the literature until 15 June 2020 found 150 empirical papers pertinent to the mental health consequences of the pandemic. The majority (87.3%) were from China (45.3%), the rest of Asia (22.0%) and Europe (20.0%), and mostly examined the general population (37.3%), healthcare workers (31.3%) and those with pre-existing mental and physical illnesses (14.7%). The most common psychological responses across these subpopulations were anxiety (overall range 24.8%–49.5%), depression (overall range 18.6%–42.6%) and traumatic stress symptoms (overall range 12.7%–31.6%). Healthcare workers and those with pre-existing physical and mental illnesses were more severely affected. Future studies are needed on underexamined subgroups such as the elderly and patients who recovered from COVID-19.

Keywords: healthcare workers, infectious diseases, psychological responses, vulnerable populations

INTRODUCTION

The severity and rapid spread of COVID-19 has had a significant impact on not only the physical health of communities worldwide but also their psychological well-being. This issue is of particular concern as the battle against this pandemic becomes increasingly long-drawn and strict infection control measures have been implemented. These measures will be eased at different rates around the world but may be reinstated with new waves of infection. As of 15 June 2020, COVID-19 had infected more than eight million people across 213 countries and territories; more than 435,000 people had died from the disease and over 4.1 million had recovered.1)

Previous studies on the psychological impact of infectious diseases have commonly reported responses in the general population such as anxiety/fear, depression, anger, guilt, grief and loss, post-traumatic stress and stigmatisation. However, there is also a greater sense of empowerment and compassion towards others.2) Healthcare workers at the forefront of the fight against infectious diseases experience various stressors such as the fear of getting infected, losing control of the spread of the virus, and passing the virus on to their family and friends.3) Based on these past experiences, the potential mental health repercussions of infectious disease outbreaks are increasingly being recognised and acknowledged during the current COVID-19 pandemic.

To date, although there have been various international studies on the psychosocial responses related to COVID-19, no review thus far has consolidated the extant psychological impact on the different subpopulations, such as the general population, healthcare workers and vulnerable populations, including patients with pre-existing physical or psychiatric illnesses. Hence, we aimed to examine and summarise existing studies to date regarding the psychological impact of COVID-19 on various populations through a rapid review. Understanding the psychological ramifications of this pandemic could inform healthcare systems to target policy decisions for specific populations, and to anticipate and prepare for a protracted battle against COVID-19, in the face of globally dysynchronous and varied infection control measures.

METHODS

We performed a systematic search of the available literature using PubMed and MEDLINE (Ovid). The following search strategy was used ((‘Betacoronavirus’[Mesh] OR ‘Coronavirus Infections’[MH] OR ‘Spike Glycoprotein, COVID-19 Virus’[NM] OR ‘COVID-19’[NM] OR ‘Coronavirus’[MH] OR ‘Severe Acute Respiratory Syndrome Coronavirus 2’[NM] OR 2019nCoV[ALL] OR Betacoronavirus*[ALL] OR Corona Virus*[ALL] OR Coronavirus*[ALL] OR Coronavirus*[ALL] OR CoV2[ALL] OR COVID[ALL] OR COVID19[ALL] OR COVID-19[ALL] OR HCoV-19[ALL] OR nCoV[ALL] OR ‘SARS CoV 2’[ALL] OR SARS2[ALL] OR SARS-CoV[ALL] OR SARS-CoV[ALL] OR SARS-CoV-2[ALL] OR Severe Acute Respiratory Syndrome CoV*[ALL]) AND (mental health OR psychiatric OR psychological)) based on recommendations.4) Papers that were published from database inception to 15 June 2020 were considered for inclusion. Only empirical studies in the English language and papers from peer-reviewed journals that reported the psychological impact of COVID-19 on one or more populations were included. Case studies, reviews, qualitative studies and dissertations were excluded. Studies that did not

1 Research Department, *West Region, Institute of Mental Health, Singapore
2 These two authors contributed equally as first authors in this work.
Correspondence: A/Prof Kang Sim, Senior Consultant, West Region, Institute of Mental Health, 10 Buangkok View, Singapore 539747. kang_sim@imh.com.sg

229
report the rates or prevalence of psychological responses were also excluded. A PRISMA flow diagram depicting how articles were selected is presented in Fig. 1.

RESULTS
The majority of the 150 included papers originated from Asia (67.3%, n = 101), Europe (20.0%, n = 30) and North America (9.3%, n = 14). Anxiety, depression and traumatic distress were the three commonest reported psychological responses across all papers, with prevalence rates ranging from 2.7% to 72.8%, 0.9% to 83.6% and 1.9% to 96.2%, respectively. Detailed prevalence rates are reported in the Appendix. Out of the 150 studies, 56 (37.3%) explored psychological responses in the general population, while 47 (31.3%) reported them within healthcare workers. Only 22 (14.7%) studies examined psychological responses in patients with pre-existing mental and physical conditions. In the general population, the prevalence of anxiety ranged from 2.7% to 62.5%, while that of depression ranged from 0.9% to 40.3% and that of post-traumatic stress symptoms ranged from 1.9% to 33.0%. Among healthcare workers, the prevalence of anxiety ranged from 5.7% to 61.0%, that of depression ranged from 8.9% to 64.7% and that of post-traumatic stress symptoms ranged from 3.8% to 49.4%. Among patients with pre-existing mental illnesses, the prevalence of anxiety was 23.6% to 50.0% and that of depression was 10.8% to 64.3%, while only one paper reported the prevalence of post-traumatic stress symptoms to be 31.6%. Among patients with pre-existing physical conditions, the prevalence of anxiety ranged from 42.0% to 72.8%, while that of depression ranged from 9.7% to 83.6%. There were relatively fewer reports on younger persons (children and youths), quarantined subgroups and COVID-19 patients. Available data suggests that the younger subgroup reported substantial rates of depression ranging from 2.7% to 45.5%, 24% depression ranging from 9% to 48.4% and traumatic stress ranging from 2.7% to 31.8%. Those who were quarantined reported anxiety ranging from 10.2% to 50.3%, depression ranging from 9.0% to 22.4% and traumatic stress ranging from 2.7%. Patients suffering from COVID-19 infection reported anxiety ranging from 2.4% to 55.3%, depression ranging from 12.2% to 60.2% and traumatic stress ranging from 1% to 96.2%. Table 1 summarizes the overall prevalence rates of COVID-19-related psychological responses among the different populations.

Measures proposed to address the mental health repercussions of the pandemic could be grouped into individual and collective measures. A total of 16 papers proposed measures that an individual could take, including ensuring adequate rest and exercise, increasing one’s self-awareness of emerging psychological stressors and mental health issues, and boosting one’s sense of control. Collective measures proposed by 129 papers include regular crisis communications in order to ensure that accurate information is disseminated in a timely manner. False information should also be filtered out and corrected as soon as possible. There is a need to continually assess and

DISCUSSION
Our rapid review sought to capture an overview of psychological responses to date in various populations during the COVID-19 pandemic. We found that most studies focused on the general adult population, healthcare workers and the vulnerable (defined as those with pre-existing physical and psychiatric illnesses), and anxiety, depression and traumatic stress were the more commonly reported responses across studies.

By geographical region, the majority of the studies conducted were from Asia (101 papers, 67.3%), especially China (68 papers, 45.3%), followed by Europe (30 papers, 20.0%). This is likely because China was the first country to discover and experience the rapid spread of COVID-19, followed by countries in Europe. Other countries may learn from the experiences of Asia (such as China) and Europe to better plan to serve mental healthcare needs in response to changes in the respective epidemic curves over time.

In terms of prevalence rate, healthcare workers tended to report higher rates of anxiety (overall 33.0%, 4,866/14,728) but lower rates of traumatic stress (overall 14.6%, 3,256/22,320) compared with the general population (overall 24.8%, 16,825/67,773 for anxiety and 20.8%, 2,163/10,380 for traumatic stress). The higher anxiety in healthcare workers could be related
to the high infectivity of COVID-19 with the resultant sharp rise in infected cases and mortality seen and managed by frontline healthcare workers, especially at the start of the pandemic when little was known about its natural history.\(^{(13,14)}\) The relatively lower rate of traumatic stress in healthcare workers could be related to the better preparedness in terms of protective equipment and strict infection control measures within healthcare facilities in managing the outbreak.\(^{(49)}\) Compared with past epidemics such as the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) outbreaks, the rates of anxiety (up to 96% in MERS vs. overall 33% in COVID-19\(^{(15,16)}\)) and traumatic stress (25.5% in SARS vs. overall 14.6% in COVID-19\(^{(19,157)}\)) in healthcare workers were lower during the current pandemic. This likely reflects progressive improvements in infection control measures and infrastructure that have translated to better psychological well-being since earlier outbreaks such as SARS, especially in Asia, which bore the brunt of the infection and fatality.\(^{(15,16)}\) Of note, there were relatively substantial psychological responses within subgroups, such as among those with pre-existing physical and psychiatric illnesses (overall anxiety 26%–49.5%, overall depression 18.6%–42.6% and overall traumatic stress symptoms of 12.7%–31.6%).\(^{(5,6,8,20,22,44,50-65)}\)

Although less studied, psychological sequelae were noted in younger individuals such as children and youths (overall anxiety 31.0%, overall depression 34.2% and traumatic stress symptoms 11%).\(^{(23-27,37,41,46-49)}\) individuals who were quarantined (overall anxiety 28.2%, overall depression 14.7%, overall traumatic stress symptoms 2.7%\(^{(24,25,28,30,67,70,71)}\)) and patients who were infected with COVID-19 (overall anxiety 32.2%, overall depression 39.9%, overall traumatic stress symptoms 80.7%).\(^{(9,12,28,31,72,73)}\) This highlights the need for active monitoring, early detection and attention to these psychological issues within the different subpopulations.

Practical implications include individual and institutional measures to address and ameliorate the psychological impact. At the institutional and governance level, useful considerations are: commitment for the long haul; timely communication about the local epidemic curve; enabling access to timely, accurate COVID-19-related information and resources for psychological help among the population and subgroups; constant review of implemented measures; and early identification of those in need of psychological help.\(^{22}\) At the individual level, an emphasis on self-care and a healthy balance between work and rest, nutrition, sleep, and social connectivity\(^{22}\) are crucial.

Several limitations were observed in this study. First, timely publication of appropriate reports from other affected countries worldwide would provide a better representation of the nature and scale of the psychological impact. Second, examination of the psychological sequelae in specific subgroups such as the elderly, those who have recovered from COVID-19, and patients with multiple physical and psychiatric comorbidities is warranted. Third, some specific psychosocial responses are less examined but have been observed in past infectious disease outbreaks, including stigmatisation, grief and positive growth. Fourth, a better understanding of how digitalisation has helped or hindered psychological well-being would inform measures to enhance psychological support. Fifth, there is a need to consider longitudinal studies to ascertain the longer-term psychological sequelae within the different subgroups.

In conclusion, extant studies at this juncture suggest that there are substantial COVID-19 psychological sequelae among healthcare workers and the general population, including vulnerable subgroups. Further work is needed to better understand the psychological impact on under-examined subgroups, especially prospectively, in order to optimise psychological support for them globally.

**SUPPLEMENTARY MATERIAL**
The Appendix is available online at https://doi.org/10.11622/smedj.20210111.

**REFERENCES**

1. Worldometer. COVID-19 coronavirus pandemic. Available at: https://www.worldometers.info/coronavirus/. Accessed June 15, 2020.

2. Chew QH, Wei KC, Vasoo S, Chua HC, Sim K. Narrative synthesis of psychological and coping responses towards emerging infectious disease outbreaks in the general population: practical considerations for the COVID-19 pandemic. Singapore Med J 2020 Apr 3. https://doi.org/10.11622/smedj.2020046. [Epub ahead of print]

3. Sim K, Chong PN, Chan YH, Soon WS. Severe acute respiratory syndrome-related psychiatric and post-traumatic morbidities and coping responses in medical staff within a primary health care setting in Singapore. J Clin Psychiatry 2004; 65:1120-7.

4. Shokraneh F. Keeping up with studies on COVID-19: systematic search strategies and resources. BMJ 2020; 369:m1601.

5. Hao F, Tan W, Jiang L, et al. Do psychiatric patients experience more psychiatric symptoms during COVID-19 pandemic and lockdown? A case-control study with service and research implications for immunopsychiatry. Brain Behav Immun 2020; 87:100-6.

6. Almandoz JP, Xie L, Schellinger JN, et al. Impact of COVID-19 stay-at-home orders on weight-related behaviors among patients with obesity. Clin Obes 2020 Jun 9. https://doi.org/10.1111/cob.12386. [Epub ahead of print]

7. Cao J, Wei J, Zhu H, et al. A study of basic needs and psychological wellbeing of medical workers in the fever clinic of a tertiary general hospital in Beijing during the COVID-19 outbreak. Psychother Psychosom 2020 Mar 30.
27. Liu CH, Zhang E, Wong GTF, Hyun S, Hahm HC. Factors associated with COVID-19 in China. Psychol Med 2020 Mar 27. https://doi.org/10.1017/S0033291720000999. [Epub ahead of print]

26. Tan SY, Tan CS, Loh CL, et al. Psychosocial impact of the COVID-19 pandemic on medical workers. J Psychiatr Pract 2020 Apr 22. https://doi.org/10.1097/00002454-00000078. [Epub ahead of print]

25. Wang Q, Peng Q, Liu M, et al. Psychological impact of the COVID-19 pandemic on mental health care workers. Psychiatry Res 2020 Jun 11. https://doi.org/10.1016/j.psychres.2020.113131. [Epub ahead of print]

24. Guo Q, Zhang Y, Shi J, et al. Immediate psychological distress in quarantine patients with COVID-19 and its association with peripheral inflammation: a mixed-method study. Brain Behav Immun 2020 May 19. https://doi.org/10.1016/j.bbi.2020.05.038. [Epub ahead of print]

23. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 outbreak and lockdown among students in China. Psychiatr Res 2020 Jun 11. https://doi.org/10.1016/j.psychres.2020.113131. [Epub ahead of print]

22. Ng DWL, Chan FHF, Barry TJ, et al. Psychological distress during the 2019 coronavirus disease (COVID-19) pandemic among the elderly population in China. Int J Environ Res Public Health 2020; 17:1729. https://doi.org/10.3390/ijerph17061729.

21. Yuan R, Xu QH, Xia CC, et al. Psychological status of parents of hospitalized children during the COVID-19 epidemic in China. Psychiatry Res 2020; 288:112953. https://doi.org/10.1016/j.psychres.2020.112953.

20. Forlenza OV, Stella F, Misrai V, et al. COVID-19 pandemic: looking after the mental health of health professionals. J Clin Psychiatry 2020 Apr 20. https://doi.org/10.4088/JCP.20m14699. [Epub ahead of print]

19. Lwin MO, Lu J, Sheldenker A, et al. Global sentiments surrounding the COVID-19 pandemic on Twitter: analysis of Twitter trends. JMIR Public Health Surveill 2020; 6:e19447.

18. Yin Q, Sun Z, Liu T, et al. Posttraumatic stress symptoms of health care workers in the early stage of the COVID-19 pandemic: impact of the way of Angela Merkel on psychological distress, behaviour and risk perception. J Public Health (Oxf) 2020 May 12. https://doi.org/10.1093/pubmed/fdaa060. [Epub ahead of print]

17. Elhay RY, Kurtulmuş A, Arpacıoğlu S, Karadere E. Depression, anxiety, stress levels of physicians and associated factors in COVID-19 pandemic. Psychiatry Res 2020 May 27. https://doi.org/10.1016/j.psychres.2020.113130. [Epub ahead of print]

16. Liu S, Zhang H, Wang J, et al. Mental health characteristics associated with dysfunctional coronavirus anxiety. Psychol Med 2020 Apr 16. https://doi.org/10.1017/S003329172000112X. [Epub ahead of print]

15. Choudhury T, Debski M, Wiper A, et al. COVID-19 pandemic: looking after the mental health of healthcare workers during COVID-19 outbreak. Psychiatr Res 2020 May 19. https://doi.org/10.1016/j.psychres.2020.113108. [Epub ahead of print]

14. Chew NWS, Lee GKH, Tan BYQ, et al. A multinational, multicentre study on the psychological effects of the COVID-19 outbreak and lockdown among students in the United States. Psychiatry Res 2020 May 19. https://doi.org/10.1016/j.psychres.2020.113108. [Epub ahead of print]

13. Fekih-Romdhane F, Ghraissi F, Abbassi B, Cherif W, Cheour M. Prevalence and predictors of PTSD during the COVID-19 pandemic: findings from a Tunisian multicentre study. Transl Psychiatry 2020; 10:e341. https://doi.org/10.1038/s41398-020-0701-x.

12. Guo Q, Zhang Y, Shi J, et al. Immediate psychological distress in quarantine patients with COVID-19 and its association with peripheral inflammation: a mixed-method study. Brain Behav Immun 2020 May 19. https://doi.org/10.1016/j.bbi.2020.05.038. [Epub ahead of print]

11. Lee SA, Jube Kay MC, Mathis AA. Mental health characteristics associated with dysfunctional coronavirus anxiety. Psychol Med 2020 Apr 16. https://doi.org/10.1017/S003329172000121X. [Epub ahead of print]

10. Balkhi F, Nasir A, Zehra A, Riaz R. Psychological and behavioral response to the COVID-19 outbreak. Psychiatry Res 2020; 27:384-95.

9. Rohde C, Hougaard Jefsen O, Nørremark B, Aalkjær Danielsen A, Dinesen Østergaard S. Psychiatric symptoms related to the COVID-19 pandemic. Acta Psychiatr Scand 2020; 131:483-93. https://doi.org/10.1111/pcn.13081. [Epub ahead of print]

8. Abdessater M, Rouprêt M, Misrai V, et al. COVID-19 outbreak situation and its psychological impact among surgeons in training in France. World J Urol 2020 Apr 24. https://doi.org/10.1007/s00345-020-03207-x. [Epub ahead of print]

7. Li Y, Wang Y, Jiang J, et al. Psychological distress among health professional students during the COVID-19 outbreak. Psychiatr Res 2020 May 11. https://doi.org/10.1016/j.psychres.2020.113130. [Epub ahead of print]

6. Li J, Yang Z, Qiu H, et al. Anxiety and depression among general population during the COVID-19 epidemic in China. Brain Behav Immun 2020; 27:184-95.

5. Ross R, Socci V, Paciti F, et al. Mental health outcomes along frontline and second-line health care workers during the coronavirus disease 2019 (COVID-19) pandemic in Italy. JAMA Netw Open 2020; 3:e2010185.

4. Forlenza OV, Stella F. LIM-27 Psychogeriatric Clinic HCFMUSP. Impact of the SARS-CoV-2 pandemic on mental health in the elderly: perspective from a psychogeriatric clinic at a tertiary hospital in Sao Paulo, Brazil. Int Psychogeriatr 2020 Jun 11. https://doi.org/10.1017/ipg.2020.180. [Epub ahead of print]

3. Meng H, Xu Y, Dai J, et al. Analyze the psychological impact of COVID-19 pandemic on mental health in the elderly: perspective from a psychogeriatric clinic at a tertiary hospital in Sao Paulo, Brazil. Int Psychogeriatr 2020 Jun 11. https://doi.org/10.1017/ipg.2020.180. [Epub ahead of print]

2. Wu K, Wei X. Analysis of psychological and sleep status and exercise to prevent stress during COVID-19 outbreak. Psychiatry Res 2020; 288:112953. https://doi.org/10.1016/j.psychres.2020.112953.

1. Qi R, Chen W, Liu S, et al. Psychological morbidity and fatigues in patients with confirmed COVID-19 during disease outbreak: prevalence and associated biopsychosocial risk factors. medRxiv 2020 May 11. https://doi.org/10.1101/2020.05.08.20031666. Preprint.
prices of the COVID-19 crisis. Brain Behav Immun 2020 Apr 29. https://doi.org/10.1016/j.bbi.2020.04.045. [Epub ahead of print].

74. Gupta MA. Spontaneous reporting of onset of disturbing dreams and nightmares related to early life traumatic experiences during the COVID-19 pandemic by patients with posttraumatic stress disorder in remission. J Clin Sleep Med 2020 May 12. https://doi.org/10.5664/jcsm.8562. [Epub ahead of print].

75. Xue Z, Lin L, Zhang S, et al. Sleep problems and medical isolation during the COVID-19 outbreak in Hubei. China Epidemiol 2020; 61:1166-73.

76. Siniscalchi M, Zingone F, Savarino EV, D’Odorico A, Ciacci C. COVID-19 pandemic in Iraqi Kurdistan: online questionnaire study. J Med Internet Res 2020; 22:e19556. [Epub ahead of print].

77. Amerio A, Bianchi D, Santi F, et al. COVID-19 pandemic impact on mental health: a web-based cross-sectional survey on a sample of Italian general practitioners. Acta Biomed 2020; 91:83-6.

78. Barbato M, Thomas J. Far from the eyes, close to the heart: psychological impact of COVID-19 in a sample of Italian foreign workers. Psychiatr Res 2020 May 19. https://doi.org/10.1016/j.psychres.2020.113113. [Epub ahead of print].

79. Barello S, Palamenghi L, Graffigna G. Burnout and somatic symptoms among frontline healthcare professionals at the peak of the Italian COVID-19 pandemic. Psychiatr Res 2020 May 27. https://doi.org/10.1016/j.psychres.2020.113119. [Epub ahead of print].

80. Bünzli J, Klein M, Keinik C, et al. Oncology services in corona times: a flash interview among German cancer patients and their physicians. J Cancer Res Clin Oncol 2020 May 15. https://doi.org/10.1007/s00432-020-03249-z. [Epub ahead of print].

81. Buonanno D, Cinobica B, Raffaelli F, Sollena P, Iodice F. Social consequences of COVID-19 in a low resource setting in Sierra Leone, West Africa. Int J Infect Dis 2020 Jun 1. https://doi.org/10.1016/j.ijid.2020.05.104. [Epub ahead of print].

82. Cai W, Liu B, Song X, et al. A cross-sectional study on mental health among health care workers during the outbreak of coronavirus disease 2019. Asian J Psychiatr 2020 Apr 24. https://doi.org/10.1016/j.ajp.2020.102111. [Epub ahead of print].

83. Chen Y, Zhou H, Zhou Y, Zhou F. Prevalence of self-reported depression and anxiety among pediatric medical staff members during the COVID-19 outbreak in Guiyang, China. Psychiatr Res 2020; 288:113005.

84. Choi EP1, Hui BW, Wan EF. Depression and anxiety in Hong Kong during COVID-19. Int J Environ Res Public Health 2020; 17:3740.

85. Cottro PMA, Byrnes Y, Chilian WM. Mental health among otolaryngology resident and attending physicians during the COVID-19 pandemic: national study. Head Neck 2020 Jun 4. https://doi.org/10.1002/hed.26292. [Epub ahead of print].

86. Consolo U, Belini P, Bencivenni D, Iani C, Cecchini V. Epidemiological aspects and psychological reactions to COVID-19 of dental practitioners in the Northern Italy districts of Modena and Reggio Emilia. Int J Environ Res Public Health 2020; 17:3459.

87. Dixit A, Marthoensens M, Afaral SMY, Sharma P, Kar SK. Binge watching behavior during COVID-19 pandemic: a cross-sectional, cross-national online survey. Psychiatry Res with dopar 2020 May 13. https://doi.org/10.1016/j.psychres.2020.113089. [Epub ahead of print].

88. Du J, Dong L, Wang T, et al. Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. Gen Hosp Psychiatry 2020 Apr 3. https://doi.org/10.1016/j.genhosppsych.2020.03.011. [Epub ahead of print].

89. Durukan F, Aslu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. J Matern Fetal Neonatal Med 2020 May 18. https://doi.org/10.1080/14767058.2020.176946. [Epub ahead of print].

90. El-Zoghby SM, Soltan EM, Salama HM. Impact of the COVID-19 pandemic on mental health and social support among adult Egyptians. J Community Health 2020 May 26. https://doi.org/10.1007/s10900-020-00853-5. [Epub ahead of print].

91. Forte G, Favieri F, Tambelli R, Casagrande M. COVID-19 pandemic in the Italian population: validation of a post-traumatic stress disorder questionnaire and prevalence of PTSD symptomatology. Int J Environ Res Public Health 2020; 17:74151.

92. Forte G, Favieri F, Tambelli R, Casagrande M. The enemy which sealed the world: effects of COVID-19 diffusion on the psychological state of the Italian population. J Clin Med 2020; 9:E1802.

93. Gómez-Salgado J, Andrés-Villas M, Domínguez-Salas S, Díaz-Milanés D, Ruiz-Frutos C. Related health factors of psychological distress during the COVID-19 pandemic in Spain. J Environ Res Public Health 2020; 17:E9347.

94. González-Sanguino C, Ausín B, Castellanos MA, et al. Mental health consequences during the initial stage of the 2020 coronavirus pandemic (COVID-19) in Spain. Brain Behav Immun 2020 May 13. https://doi.org/10.1016/j.bbi.2020.05.040. [Epub ahead of print].

95. Hou T, Zhang T, Cai W, et al. Social support and mental health among healthcare workers during coronavirus disease 2019 outbreak: a Chinese experience. Head Neck 2020 Jun 4. https://doi.org/10.1002/hed.26292. [Epub ahead of print].

96. Huang Y, Zhao N. Mental health burden for the public affected by the COVID-19 outbreak in China: who will be the high-risk group? Psychol Health Med 2020:61:1166-73.

97. Huang Y, Zhao N. Mental health burden for the public affected by the COVID-19 outbreak in China: who will be the high-risk group? Psychol Health Med 2020:61:1166-73.

98. Kang L, Ma S, Chen M, et al. Impact on mental health and perceptions of COVID-19 in a cross-sectional, cross-national online survey. Psychiatry Res with dopar 2020 May 13. https://doi.org/10.1016/j.psychres.2020.113089. [Epub ahead of print].

99. Khanna RC, Honavar SG, Metla AL, Bhattacharya A, Maulik PK. Psychological impact of COVID-19 on ophthalmologists-in-training and practising ophthalmologists in India. Indian J Ophthalmol 2020; 68:994-8.

100. Kilgore WDS, Clonan SA, Taylor EC, Dailey NS. Loneliness: a signature...
mental health concern in the era of COVID-19. Psychiatry Res 2020 May 23. https://doi.org/10.1016/j.psychres.2020.113117. [Epub ahead of print]

101. Killgore WDS, Cloonan SA, Taylor EC, et al. Suicidal ideation during the COVID-19 pandemic: the role of insomnia. Psychiatry Res 2020 May 27. https://doi.org/10.1016/j.psychres.2020.113114. [Epub ahead of print]

102. Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among healthcare workers exposed to coronavirus disease 2019. JAMA Netw Open 2020; 3:e2003976.

103. Lee M, You M. Psychological and behavioral responses in South Korea during the early stages of coronavirus disease 2019 (COVID-19). Int J Environ Res Public Health 2020; 17:2977.

104. Li G, Mao L, Wang Y, et al. Psychological impact on women health workers involved in COVID-19 outbreak in Wuhan: a cross-sectional study. J Neurol Neurosurg Psychiatry 2020 May 4. https://doi.org/10.1136/jnnp-2020-332134. [Epub ahead of print]

105. Li Y, Qin Q, Sun Q, et al. Insomnia and psychological reactions during the COVID-19 outbreak, in China. J Clin Sleep Med 2020 Apr 30. https://doi.org/10.5666/jcsm.8524. [Epub ahead of print]

106. Li X, Yu H, Bian G, et al. Prevalence, risk factors, and clinical correlates of insomnia in volunteer and at home medical staff during the COVID-19. Brain Behav Immun 2020 May 5. https://doi.org/10.1016/j.bbi.2020.05.008. [Epub ahead of print]

107. Liu CY, Yang YZ, Zhang XM, et al. The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. Epidemiol Infect 2020; 148:e68.

108. Liu X, Lu Y, Li Y, et al. Psychological status and change behaviors of the public during the COVID-19 epidemic in China. Infect Dis Poverty 2020; 9:58.

109. Liu N, Zhang F, Wei C, et al. Prevalence and predictors of PTSD during COVID-19 outbreak in China hardest-hit areas: gender differences matter. Psychiatry Res 2020; 287:112921.

110. Ma Y, Cai C, Rieh B, Biondi S, et al. A nationwide psychological distress among Italian people during the COVID-19 pandemic: immediate psychological responses and associated factors. Int J Environ Res Public Health 2020; 17:3165.

111. Mo Y, Deng L, Zhang L, et al. Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic. J Nurs Manag 2020 Apr 7. https://doi.org/10.1111/jomm.13014. [Epub ahead of print]

112. Moccia L, Janiri D, Pepe M, et al. Affective temperament, attachment style, and the psychological impact of the COVID-19 outbreak: an early report on the Italian general population. Brain Behav Immun 2020 Apr 20. https://doi.org/10.1016/j.bbi.2020.04.048. [Epub ahead of print]

113. Morganti LA, Naha U, Wang H, et al. Factors contributing to healthcare professional burnout during the COVID-19 pandemic: a rapid turnaround global survey. medRxiv 2020 May 22. https://doi.org/10.1101/2020.05.17.2009195. Preprint.

114. Ni MY, Yang L, Leung CMC, et al. Mental health, risk factors, and social media use during the COVID-19 epidemic and cordon sanitaire among the community and health professionals in Wuhan, China: cross-sectional survey. JMH Ment Health 2020; 7:e19009.

115. Özdemir S, Özdemir SY. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: the importance of gender. Int J Soc Psychiatry 2020 May 8. https://doi.org/10.1177/0020764020927051. [Epub ahead of print]

116. Padala PR, Jemdo AM, Gauss CH, et al. Participant and caregiver perspectives on clinical research during COVID-19 pandemic. J Am Geriatr Soc 2020; 68:E14-8.

117. Pedrozo-Pupo JC, Pedrozo-Cortés MJ, Campo-Arias A. Perceived stress associated with COVID-19 epidemic in Colombia: an online survey. Cad Saude Publica 2020; 36:e00095020.

118. Poddar I, Agarwal K, Datta S. Comparative analysis of perceived stress in dermatologists and other physicians during home-quarantine and COVID-19 pandemic with exploration of possible risk factors: a web-based cross-sectional study from Eastern India. Dermatol Ther 2020 Jun 7. https://doi.org/10.1111/dth.13788. [Epub ahead of print]

119. Qiu J, Shen B, Zhao M, et al. A nationwide survey of psychological distress among Chinese adults caused by COVID-19 epidemic: implications and policy recommendations. Gen Psychiatr 2020; 33:e001021.

120. Ren Y, Zhou Y, Qian W, et al. Letter to the Editor “A longitudinal study on the mental health of general population during the COVID-19 epidemic in China”. Brain Behav Immun 2020 May 6. https://doi.org/10.1016/j.bbi.2020.05.004. [Epub ahead of print]

121. Roy D, Tripathy S, Kar SK, et al. Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. Asian J Psychiatr Apr 8. https://doi.org/10.1016/j.ajp.2020.102083. [Epub ahead of print]

122. Saccone G, Florio A, Aiello F, et al. Psychological impact of COVID-19 in pregnant women. Am J Obstet Gynecol 2020 May 7. https://doi.org/10.1016/j.ajog.2020.05.003. [Epub ahead of print]

123. Sahu D, Agrawal T, Rathod V, Bagaria V. Impact of COVID 19 lockdown on orthopaedic surgeons in India: a survey. J Clin Orthop Trauma 2020 May 12. https://doi.org/10.1016/j.jcot.2020.05.007. [Epub ahead of print]

124. Shacham M, Hamamas-Raz Y, Kolomen R, et al. COVID-19 factors and psychological factors associated with elevated psychological distress among dentists and dental hygienists in Israel. Int J Environ Res Public Health 2020; 17:2900.

125. Shapiro E, Levine L, Kay A. Mental health stressors in Israel during the coronavirus pandemic. Psychol Trauma 2020 Jun 11. https://doi.org/10.1037/traa0000864. [Epub ahead of print]

126. Shen X, Zou X, Zhong X, Yan J, Li L. Psychological stress of ICU nurses in the time of COVID-19. Crit Care 2020; 24:200.

127. Simpson SA, Dumas A, McDowell AK, Westmoreland P. Novel coronavirus and related public health interventions are negatively impacting mental health services. Psychosomatics 2020 Apr 9. https://doi.org/10.1016/j.psym.2020.04.004. [Epub ahead of print]

128. Somma A, Gialdi G, Krueger RF, et al. Dysfunctional personality features, non-scientifically supported causal beliefs, and emotional problems during the first month of the COVID-19 pandemic in Italy. Pers Individ Differ 2020; 165:110139.

129. Sønderskov KM, Dinesen PT, Santini ZI, Ostergaard SD. The depressive state of the COVID-19 pandemic in a Greek population. Psychiatry Res 2020 May 12. https://doi.org/10.1016/j.psychres.2020.113076. [Epub ahead of print]

130. Sørensen T, Christensen S, Sørensen H, et al. The psychological impact of COVID-19 on health care workers in a MERS-CoV endemic country. J Infect Public Health 2020; 13:877-82.

131. Tian F, Li H, Tian S, et al. Psychological symptoms of ordinary Chinese citizens based on SCL-90 during the level I emergency response to COVID-19. Psychiatry Res 2020; 288:112992.

132. Uvais N, Nakalath M, Shihabdeen P, et al. Psychological distress among COVID-19 among Malayalam-speaking Indian expats in the middle east. Indian J Public Health 2020; 64(Suppl):S249-50.

133. Varshney M, Parel JT, Raizada N, Sarin SK. Initial psychological impact of the COVID-19 pandemic in a Greek population. Psychiatry Res 2020 May 17. https://doi.org/10.1016/j.psychres.2020.113134. [Epub ahead of print]

134. Wang S, Xie L, Jiang H, et al. Prevalence of mental health concern in the era of COVID-19. Psychiatry Res 2020 May 23. https://doi.org/10.1016/j.psychres.2020.113076. [Epub ahead of print]

135. Wang S, Xie L, Jiang H, et al. Prevalence of mental health concern in the era of COVID-19. Psychiatry Res 2020 May 23. https://doi.org/10.1016/j.psychres.2020.113076. [Epub ahead of print]

136. Wang Y, Di Y, Ye J, Wu W, Liu X, et al. Mental health status of medical staff in emergency departments during the coronavirus disease 2019 epidemic in China. Brain Behav Immun 2020 Jun 5. https://doi.org/10.1016/j.bbi.2020.06.002. [Epub ahead of print]

137. Xiao J, Zou M, Biou M, et al. Preparedness of frontline doctors in Jordan healthcare facilities to COVID-19 outbreak. Int J Environ Res Public Health 2020; 17:3181.

138. Xing J, Sun N, Xu J, Geng S, Li Y. Study of the mental health status of medical personnel dealing with new coronavirus pneumonia. PLoS One 2020; 15:e0233145.
148. Yang S, Kwak SG, Ko EJ, Chang MC. The mental health burden of the COVID-19 pandemic on physical therapists. Int J Environ Res Public Health 2020; 17:3723.

149. Yassa M, Birol P, Yirmibes C, et al. Near-term pregnant women’s attitude toward, concern about and knowledge of the COVID-19 pandemic. J Matern Fetal Neonatal Med 2020 May 19. https://doi.org/10.1080/14767058.2020.1763947. [Epub ahead of print]

150. Zanardo V, Manghina V, Giliberti L, et al. Psychological impact of COVID-19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period. Int J Gynaecol Obstet 2020 May 31. https://doi.org/10.1002/ijgo.13249. [Epub ahead of print]

151. Zhang Y, Ma ZF. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. Int J Environ Res Public Health 2020; 17:2381.

152. Zhang SX, Liu J, Abkar Jahanshahi A, et al. At the height of the storm: healthcare staff’s health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. Brain Behav Immun 2020 May 5. https://doi.org/10.1016/j.bbi.2020.05.010. [Epub ahead of print]

153. Zhang C, Yang L, Liu S, et al. Survey of insomnia and related social psychological factors among medical staff involved in the 2019 novel coronavirus disease outbreak. Front Psychiatry 2020; 11:306.

154. Zhao X, Lan M, Li H, Yang J. Perceived stress and sleep quality among the non-diseased general public in China during the 2019 coronavirus disease: a moderated mediation model. Sleep Med 2020 May 21. https://doi.org/10.1016/j.sleep.2020.05.021. [Epub ahead of print]

155. Zhang X, Tan Y, Ling Y, et al. Viral and host factors related to the clinical outcome of COVID-19. Nature 2020 May 20. https://doi.org/10.1038/s41586-020-2355-0. [Epub ahead of print]

156. Khalid I, Khalid TJ, Qabajah MR, Barnard AG, Qushmaq IA. Healthcare workers emotions, perceived stressors and coping strategies during a MERS-CoV outbreak. Clin Med Res 2016; 14:7-14.

157. Maunder R. The experience of the 2003 SARS outbreak as a traumatic stress among frontline healthcare workers in Toronto: lessons learned. Philos Trans R Soc Lond B Biol Sci 2004; 359:1117-25.

158. Shannon GW, Willoughby J. Severe acute respiratory syndrome (SARS) in Asia: a medical geographic perspective. Eurasian Geogr Econ 2004; 45:359-81.
APPENDIX

Studies in 2020 reporting prevalence rates of psychological responses to COVID-19.

| Author; country | Population | Scale | Main findings |
|-----------------|------------|-------|---------------|
| Hao et al; China | Psychiatric patients n = 76 Age 32.8 ± 11.8 yr 37.1% female Healthy controls n = 109 Age 33.1 ± 11.2 yr 62.4% female | IES-R, DASS-21, ISI | Psychiatric patients vs. healthy controls: 31.6% vs. 13.8% PTSD 23.6% vs. 2.7% anxiety 22.4% vs. 0.9% depression 17.0% vs. 0.9% stress 27.6% vs. 0.9% insomnia |
| Almendoz et al; USA | Patients with obesity n = 123 Age 51.2 ± 13.0 yr 87.0% female | QIDS-SR – self-designed (lifestyle behaviours, COVID-19, employment) | 72.8% anxiety 83.6% depression 61.2% stress eating |
| Cao et al; China | Medical staff n = 37 Age 32.8 ± 9.6 yr 78.3% female 43.2% doctors; 51.3% nurses; 5.5% clinical technicians | PHQ-9, MBI | Doctors: 6.3% depression Nurses: 31.6% depression Entire sample: 18.9% depression |
| Rohde et al; Denmark | Case notes of patients under psychiatric services in Central Denmark Region n = 1,357 case notes from 918 patients Age (female) 36.3 ± 14.3 yr Age (male) 40.9 ± 13.8 yr 67.6% female | – | 39.7% anxiety 12.8% unspecific stress 10.8% depression 11.0% delusions 0.019% PTSD symptoms 0.063% obsessive-compulsive symptoms |
| Bo et al; China | COVID-19 patients n = 714 Age 50.2 ± 12.9 yr 50.9% female | PCL-C | 96.2% significant PTSS 49.8% considered psycho-educational services helpful |
| Balkhi et al; Pakistan | General population in Karachi, Pakistan n = 600 50.0% female | Self-designed (psychological impact of COVID-19) | 62.5% anxious on a daily basis |
| Lee et al; USA | Adults n = 1,237 45% female | CAS, GAD-7, PHQ, WSAS | 25.4% coronavirus anxiety 36.0% generalised anxiety 40.3% depression 35.0% functional impairment |
| Guo et al; China | COVID-19 patients n = 103 Age 42.5 ± 12.5 yr 42.7% female Matched controls n = 103 Age 42.5 ± 13.1 yr 47.6% female | PHQ-9, GAD-7, PSS-10, PCL-5 | Patients: 60.2% depression (17.5% moderate to severe) 55.3% anxiety (6.8% moderate to severe) 1.0% PTSD |
| Fekih-Romdhane et al; Tunisia | Tunisia general population n = 603 Age 29.2 ± 10.4 yr 74.0% female | IES-R, MSPSS, self-designed (COVID-19 knowledge and behaviour) | 33.0% reported PTSD symptoms |
| Chew et al; Singapore, India | Healthcare workers from major hospitals in Singapore and India n = 906 53.0% Singapore, 47.0% India 64.3% female 39.2% nurses; 29.6% physicians; 10.6% allied healthcare professionals | DASS-21, IES-R | 5.7% anxiety, 10.6% depression, 5.2% stressed, 7.4% PTSD Most commonly reported physical symptoms: 31.9% headache 33.6% throat pain 26.7% anxiety 26.6% lethargy 21.0% insomnia |
| Study                        | Participants                                                                 | Methods                                                                 | Findings                                                                 |
|------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Choudhury et al. (15)         | Staff at a tertiary cardiac centre in the northwest of England, n = 106, 67% female | Self-designed (COVID-19 knowledge and behaviour), PHQ-9, PSS-4, GAD-7   | 53.0% depression, 61.0% anxiety                                         |
| Tan et al. (16)               | Medical personnel, n = 296, 67% female                                         | DASS-21, IES-R                                                          | Medical personnel: 10.8% anxiety, 8.1% depression, 6.4% stress, 5.7% PTSD |
| England                      | Non-medical personnel, n = 174, 66% female                                    |                                                                        | Non-medical personnel: 20.7% anxiety, 10.3% depression, 6.9% stress, 10.9% PTSD |
| Elbay et al. (17)             | HCWs, n = 442, Age 36.05 ± 8.69 yr, 56.8% female                            | DASS-21                                                                 | 64.7% depression, 51.6% anxiety, 41.2% stress                           |
| Turkey                       |                                                                             |                                                                        |                                                                         |
| Elbay et al. (17)             | HCWs, n = 371, Age 35.3 ± 9.5 yr, 61.6% female                              | PCL-5, PSQI                                                             | 3.8% PTSS                                                               |
| China                        |                                                                             |                                                                        |                                                                         |
| Forlenza & Stella (20)       | Outpatients attending a psychogeriatric clinic, n = 72, 77.2% female         | HADS, NPI-Q                                                            | 37.7% exacerbation of pre-existing symptoms, 20.8% report new mental health symptoms, 60.0% psychiatric or psychological distress, 57.0% sleep complaints, 64.3% depression/dysphoria, 50.0% anxiety, 65.7% apathy, 60.0% irritability, 67.1% nocturnal behaviours, 58.6% appetite/eating behaviours, 23.0% paranoid symptoms |
| China                        |                                                                             |                                                                        |                                                                         |
| Yuan et al. (21)             | Parents with children hospitalised during COVID-19, n = 50, 62% female       | HADS, VDAS, SF-36                                                      | During COVID-19 period: 42.0% anxiety, 48.0% depression Non-COVID-19 periods: 8.0% anxiety, 8.0% depression |
| China                        | Parents with children hospitalised during other periods, n = 50, 52% female   |                                                                        |                                                                         |
| Hong Kong                    | Cancer survivors, n = 72, Age 52.96 ± 8.34 yr                                 | HADS, Brief COPE, SHAI, PCS                                           | Cancer survivors: 8.3% borderline anxiety, 9.7% borderline depression, 4.2% clinical anxiety, 5.6% clinical depression Healthy controls: 6.7% borderline anxiety, 4.4% borderline depression, 6.7% clinical anxiety, 6.7% clinical depression |
| Cao et al. (23)              | Undergraduates of Changzhi Medical College, n = 7,143, 67% female            | Self-designed (COVID-19 knowledge and behaviour), GAD-7               | 24.9% anxiety                                                          |
| Study | Country | Participants | Measures | Findings |
|-------|---------|--------------|----------|---------|
| Zhang et al (24) | China | College students practising social distancing at home (n = 66) Age 20.70 ± 2.11 yr 62% female | DASS-21, BPAQ, self-designed (COVID-19 knowledge and behaviour) | 28.79% stress 45.45% anxiety 22.73% depression 84.85% worried or very concerned about COVID-19 |
| Tang et al (25) | China | Home quarantined university students (n = 2,485) Age 20.70 ± 2.11 yr 62% female | PCL-C, PHQ-9 | 2.7% probable PTSD 9.0% depression |
| Odriozola-González et al (26) | Spain | Members of university (n = 2,530) Age 27.9 ± 12.4 yr 66.1% female | DASS-21, IES | 35.2% anxiety 48.1% depression 40.3% stress 50.4% moderate to severe impact of outbreak |
| Liu et al (27) | USA | Young adults aged 18–30 yr (n = 898) Age 24.5 yr 81.3% female | CD-RISC-10, Distress Tolerance Scale, MSPSS, Two-Way Social Support Scale, UCLA-3 Short Form, Self-designed (COVID-19 related worry), PHQ-8, GAD-7, PCL-C | 61.5% high loneliness 72.0% low resilience 74.1% low distress tolerance 43.3% high levels of depression 45.4% high anxiety scores 31.8% high PTSD symptoms |
| Zhang et al (28) | China | Patients with COVID-19 (n = 57) Age 46.9 ± 15.4 yr 49.1% female | PHQ-9, GAD-7 | 29.2% depression 20.8% anxiety Under quarantine: 9.8% depression 10.2% anxiety General public: 34.7% depression 19.6% anxiety |
| Madani et al (29) | Algeria | Internet users living through first confinement (n = 678) Age 24.5 yr 48.2% female | Self-designed (COVID-19 impact) | 50.3% reported feeling anxious 48.2% reported feeling stress |
| Lei et al (30) | China | Chinese population (n = 3,593) Age 32.3 ± 9.8 yr 61.3% female AFFECTED BY QUARANTINE: n = 420 UNAFFECTED BY QUARANTINE: n = 1,173 | Self-designed (COVID-19 knowledge and behaviour), SAS, SDS | 8.3% anxiety 14.6% depression Under quarantine: 12.9% anxiety 22.4% depression Not under quarantine: 6.7% anxiety 11.9% depression |
| Qi et al (31) | China | COVID-19 patients (n = 41) 58.5% female | GHQ-12, PCL-C, SAS, SDS, FS-14, SSRS, SCSEQ | 43.9% general mental health problems 12.2% PTSD symptoms 12.2% both anxiety and depression 12.2% only depression 2.4% only anxiety 53.6% chronic fatigue |
| Wu & Wei (32) | China | Frontline medical staff from a designated hospital for COVID-19 (n = 60) Age 33.5 ± 12.4 yr 73.3% female | SCL-90, SDS, SAS, PSQI, PCL-C | Designated hospital staff: 26.7% severe insomnia (Total PSQI 17–21) |
| Study | Country | Description | Methodology | Findings |
|-------|---------|-------------|-------------|----------|
| Xu et al. | China | Surgical medical staff, n = 120 | SF-36 | • 46.7% anxiety  
• 40.0% depression |
| Zhang et al. | China | Persons in China, n = 2,182  
64.2% female  
42.4% medical health workers | ISI, SCL-90-R, PHQ-4  
(GAD-2 and PHQ-2) | Non-medical health workers vs. medical health workers:  
• 30.5% vs. 38.4% insomnia  
• 8.5% vs. 13.0% anxiety  
• 9.5% vs. 12.2% depression  
• 0.4% vs. 1.6% somatisation  
• 2.2% vs. 5.3% obsessive-compulsive symptoms |
| Yang & Ma | China | General population in China  
Before outbreak (end-December 2019)  
Average age 37.78  
48% female  
During outbreak (mid-February 2020)  
Average age 34.7 yr  
50% female | Emotional Well-being Scale | 74% decline in emotional well-being after the outbreak |
| Abdessater et al. | France | Members of the French Association of Urologists in Training, n = 275  
Age 29.5 ± 0.5 yr  
30% female | Self-designed (COVID-19 knowledge and behaviour) | 92.0% stressed |
| Lwin et al. | NA | > 20 million social media (Twitter) posts | – | Change in proportion of daily tweets from January to April:  
• Fear: > 50% to < 30%  
• Anger: ~10% to > 20%  
• Joy: ~10% to ~30%  
• Sadness: Maintained at < 10% but still doubled over the course of time |
| Teufel et al. | Germany | People in Germany, n = 12,244 | GAD-7, PHQ-2 | • 11.9% depression  
• 10.0% generalised anxiety |
| Zhou et al. | China | Junior and senior high school students in China, n = 8,079 | Self-designed (COVID-19 knowledge and behaviour), PHQ-9, GAD-7 | • 43.7% depression  
• 37.4% anxiety  
• 31.3% comorbid anxiety and depression |
| Gao et al. | China | Chinese citizens, n = 4,872  
Age 32.3 ± 10.0 yr  
67.6% female | Self-designed (social media exposure), WHO-5, GAD-7 | • 48.3% depression  
• 22.6% anxiety  
• 19.4% combined depression and anxiety |
| Li et al. | China | Health professional students, n = 1,442 | K6, IES-R | • 26.6% clinically significant psychological distress  
• 11.1% probable ASR  
• 9.1% both distress and ASR |
| Wang et al. | China | General Chinese population, n = 1,210  
67.3% female | Self-designed (COVID-19 knowledge and behaviour), IES-R, DASS-21 | • 16.5% moderate to severe depressive symptoms  
• 28.8% moderate to severe anxiety symptoms  
• 8.1% moderate to severe stress |
| Meng et al. | China | Seniors in China, n = 1,556  
61.3% female | PHQ-9, GAD-7 | 37.1% depression and anxiety |
| Jiang et al. | China | Patients in Wuhan undergoing the methadone maintenance treatment programme, n = 17 | PHQ-9, GAD-7 | Average number of visits decreased from 127 persons per day to 109 persons per day |
| Authors          | Study Details                                                                 | Measures                                                                 | Findings                                                                 |
|------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Li et al.        | General population of Chinese residents n = 5,033                           | GAD-7, PHQ-9                                                              | 20.4% anxiety or depression or both                                       |
| Mamun & Ullah    | Suicide data from press reports                                               | –                                                                         | 16/29 suicide reports were related to COVID-19 issues:                   |
| Wang et al.      | General Chinese population n = 1,738                                         | Self-designed (COVID-19 knowledge and behaviour), IES-R, DASS-21           | • 8.1% moderate to severe stress                                         |
| Zhou et al.      | Frontline healthcare workers n = 1,001                                        | SCL-90, PSQI, CPSS                                                      | • 16.5% moderate to severe depression                                    |
| Cai et al.       | Doctors, nurses, and other hospital staff throughout Hunan province n = 534  | Self-designed (COVID-19 knowledge and behaviour)                          | 40.6% moderately or very nervous or frightened in the ward               |
| Brown et al.     | Affected hip and knee arthroplasty patients n = 360                          | Self-designed (COVID-19 knowledge and behaviour)                          | • 60.0% moderately to severely anxious about not knowing when the procedure would be rescheduled |
| Colizzi et al.   | Parents and guardians of individuals with autism spectrum disorder n = 527   | –                                                                         | 35.5% reported more intense behavioural problems during outbreak         |
| Colle et al.     | Patients from the psychiatric department n = 376                            | –                                                                         | 41.5% reported more frequent behavioural problems during outbreak        |
| Frank et al.     | Patients with mental illnesses treated in Technische Universität München, München, Germany n = 196 | CGI                                                                       | • Patients from all groups: > 50% felt that they had to endure much more mental distress due to the pandemic |
| Gupta            | Patients with primary PTSD diagnosis n = 20                               | –                                                                         | • Patients with affective disorders: 1 in 4 reported increased difficulties sleeping |
| Hao et al.       | Patients with epilepsy n = 252                                               | K6                                                                        | 55.0% recent onset of difficulty falling asleep                         |

**Notes:**
- GAD-7: Generalized Anxiety Disorder-7
- PHQ-9: Patient Health Questionnaire-9
- IES-R: Impact of Event Scale-Revised
- DASS-21: Depression Anxiety Stress Scales-21
- SCL-90: Symptom Check List-90
- PSQI: Pittsburgh Sleep Quality Index
- CPSS: Connor-Davidson Perfectionism Scale
- CGI: Clinical Global Impression
- K6: Psychological Distress Scale

**Source:** Singapore Med J 2022; 63(5)
| Study Authors & Year | Country | Sample Characteristics | Measure(s) | Findings |
|----------------------|---------|------------------------|------------|----------|
| Plunkett et al; (56)  | Ireland | Patients attending community mental health team for anxiety disorder | BAI, HAMA, CGI-Severity, GAF, Y-BOCS, CGI-Improvement | • 50.0% reported deleterious effect of COVID-19 on mental health  
• 40.0% reported deleterious effect of COVID-19 on anxiety  
• 26.7% patients had disimprovement in symptoms, as reported by clinician  
• 46.7% patients had improvement in symptoms as reported by clinician |
| Prasad et al; (57)    | India   | Patients with Parkinson’s Disease | Self-designed (COVID-19 knowledge and behaviour) | Patients:  
• 8.0% perceived a higher risk of contracting COVID-19  
• 11.0% reported or perceived a worsening of or new symptoms following the onset of the COVID-19 pandemic  
Caregivers:  
• 4.0% perceived a higher risk of contracting COVID-19  
• 10.0% reported or perceived a worsening of or new symptoms following the onset of the COVID-19 pandemic |
| Rivetti & Barruscotti; (58) | Italy | Female patients with diagnosed telogen effluvium of at least 4–24 mth duration | – |  
• 8.0% required psychological counselling due to worry  
• 56.0% perceived a worsening of their medical condition |
| Shalash et al; (59)   | Egypt   | Parkinson’s Disease (PD) patients and controls | DASS-21, International Physical Activity Questionnaire, PD Questionnaire | PD patients vs. healthy controls:  
• 60.5% vs. 30.0% depression  
• 60.5% vs. 25.0% anxiety  
• 52.6% vs. 25.0% stress |
| Siniscalchi et al; (60) | Italy | Adults with celiac disease who had been on a gluten-free diet for at least 6 months | CD-QOL |  
• 60.1% worried about pandemic  
• 39.4% disturbed/tense thinking about COVID-19 |
| Sun et al; (61)       | China   | People living with HIV in China | – |  
• 60.8% depression  
• 49.8% anxiety  
• 38.5% recent insomnia |
| Termorshuizen et al; (62) | USA, Netherlands | People with eating disorders | Self-designed (COVID-19 impact on eating disorders), GAD-7 | Eating disorder behaviour in past 2 weeks USA sample:  
• 23.0% binge eating  
• 48.0% restriction  
• 35.0% compensatory behaviours  
• 57.0% anxiety about being unable to exercise Netherlands sample:  
• 14.0% binge eating  
• 39.0% restriction  
• 38.0% compensatory behaviours |
| Umucu & Lee; (63)     | USA     | People with self-reported chronic conditions and disabilities | PSQ-8, Brief COPE, PERMA-Profiler (Well-being), PHQ-4 | Moderate level of stress, depression and anxiety based on mean scores reported. Acceptance and self-distraction were the most frequent coping strategies used. Denial was the least commonly used strategy, followed by substance use as the second least. |
| Study                          | Population Characteristics                                                                 | Measures                                                                 | Findings                                                                                                                                                                                                 |
|-------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zhao et al; [64] China        | Post-transplant patients residing in Wuhan during the outbreak n = 492                        | GAD-7, PHQ-9, ISI                                                        | Entire sample:  
  - 69.7% fear  
  - 11.0% depression  
 Patients with pre-existing psychiatric disorders:  
  - 20.9% reported deterioration of their mental health condition related to the pandemic  
  - 22.0% could not receive routine psychiatric care due to suspended hospital visits  
  - 18.1% have self-reduced medication dosages  
  - 17.2% have stopped taking their medication due to lack of access to prescriptions  
  - 7.4% sought online help for medical care  
 New patients  
  - 24.5% could not receive timely diagnoses and treatment |
| Zhou et al; [65] China        | Psychiatric outpatients n = 2,065  
 71.5% patients with pre-existing psychiatric disorders; 28.5% new patients          | GAD-7, PHQ-9, ISI                                                        | 71.5% patients with pre-existing psychiatric disorders; 28.5% new patients  
  - 31.3% perceived discrimination from the local community  
  - 58.2% perceived discrimination from the media  
  - 72.0% afraid of being infected  
  - 73.1% afraid of family/friends being infected |
| Ma & Miller; [66] various     | Chinese students studying abroad n = 182  
 Age 26.5 ± 4.9 yr 57.0% female                                                       | STAI, self-designed (discrimination, fear, living conditions), PSSS       | 57.0% female  
  - 31.3% perceived discrimination from the local community  
  - 58.2% perceived discrimination from the media  
  - 72.0% afraid of being infected  
  - 73.1% afraid of family/friends being infected |
| Saurabh & Ranjan; [67] India  | Quarantined children and adolescents n = 122  
 Age 15.4 yr 43.3% female                                                              | CDI-S                                                                 | 43.3% female  
  - 22.6% depressive symptoms  
  - 18.9% anxiety symptoms |
| Xie et al; [68] China         | Primary school students in Hubei n = 1,784  
 Age 15.4 yr 43.3% female                                                              | CDI-S                                                                 | 43.3% female  
  - 22.6% depressive symptoms  
  - 18.9% anxiety symptoms |
| Liang et al; [69] China       | Chinese youths (aged 14–35 yr) n = 584  
 61.2% female                                                                         | CDI-S                                                                 | CDI-S  
  - 40.4% prone to psychological problems  
  - 14.4% PTSD symptoms |
| Xue et al; [70] China         | General population in China who were medically isolated n = 707                           | SRQ-20, GAD-7, PHQ-9                                                     | 707  
  - Medically isolated: 76.7% difficulty falling asleep at least once in past week  
  - Under self-isolation: 51.0% difficulty falling asleep at least once in past week  
  - The prevalence of sleep problems was high during the first 2 weeks of medical isolation and decreased thereafter |
| Zhu et al; [71] China         | Under quarantine n = 1,443, 59.5% female  
 Not under quarantine n = 836, 60.0% female                                             | SRQ-20, GAD-7, PHQ-9                                                     | 1,443, 59.5% female  
  - 15.0% general psychological symptoms  
  - 22.2% anxiety  
  - 22.1% depression  
  - Not under quarantine  
  - 13.4% general psychological symptoms  
  - 20.8% anxiety  
  - 20.8% depression |
| Zarghami et al; [72] Iran     | COVID-19 patients n = 82 (32 inpatients, 50 outpatients)  
 Age of inpatients 40.3 ± 14.4 yr  
 Age of outpatients 43.6 ± 15.8 yr  
 61.0% female                                                                       | PHQ-9, GAD-7, PSS-14                                                     | 82 (32 inpatients, 50 outpatients)  
  - 15.9% adjustment disorder  
  - 29.3% insomnia  
  - 3.7% major depressive disorder  
  - 6.1% generalised anxiety disorder  
  - 15.9% had 2 psychiatric illnesses  
  - 37.3% depression (PHQ-9)  
  - 28.9% anxiety (GAD-7)  
  - Those with hospital admission (n = 30): 60.0% incidence of mental illness |

*Note: SRQ-20 = 20-item self-report ques**
| Study | Country | Group | Description | Mental Health Outcomes |
|-------|---------|-------|-------------|------------------------|
| Zhou et al. (2020) | China | Suspected COVID-19 patients | n = 63, Age: 33.9 yr, 52.3% female | HADS, 23.8% reported hospital anxiety and/or depression |
| Ahmad et al. (2021) | Iraq | Social media users in Iraq | n = 516, 43% female | Self-designed, 38.6% psychologically affected |
| Ahmed et al. (2021) | 30 different countries | Dentists | n = 650, 75% female | Self-designed (COVID-19 knowledge and behaviour), 87.0% afraid of getting infected with COVID-19 from either a patient or co-worker, 90.0% anxious when treating a coughing patient or patient suspected to be infected with COVID-19, 92.0% afraid of carrying the infection from dental practice to their families |
| Md Hazir et al. (2021) | China | Chinese people | n = 1,074, Age 33.5 ± 11.1 yr, 46.8% female | BAI, BDI, AUDIT, WEMWBS, 29.0% anxiety (12.9% severe), 37.1% depression, 32.2% hazardous drinking or worse |
| Amerio et al. (2021) | Italy | Italian general practitioners | n = 131, Age 52.3 ± 12.2 yr, 49.1% female | Self-designed (COVID-19 knowledge and behaviour), PHQ-9, GAD-7, ISI, SF-12, 22.9% at least moderate depressive symptoms |
| Barbato & Thomas (2021) | United Arab Emirates | Italian foreign workers in United Arab Emirates | n = 148, Age 42.4 ± 7.7 yr, 76% female | IES-R, PHQ-8, GAD-7, 22.3% PTSD, 20% depressive symptoms, 23% anxiety |
| Barello et al. (2021) | Italy | HCWs assisting COVID-19 patients | n = 376, Age 40 ± 11 yr | MBI, 37.0% high emotional exhaustion, 24.7% high depersonalisation, 45% high frequency of physical symptoms |
| Büntzel et al. (2021) | Germany | Oncologists | n = 47, Patients n = 146 | Self-designed (COVID-19 knowledge and behaviour), MBI, 37.0% high emotional exhaustion, 24.7% high depersonalisation, 45% high frequency of physical symptoms |
| Buonsenso et al. (2021) | Sierra Leone | Householders | n = 78, 21.8% female | Self-designed (COVID-19 knowledge, impact and behaviour), 57.7% anxiety, 82% difficulty providing food for family |
| Cai et al. (2021) | China | HCWs treating COVID-19 | n = 1,521, 75.5% female | SCL-90, CD-RISC, SSRS, 14.1% psychological abnormality |
| Chen et al. (2021) | China | Paediatric medical staff in Guiyang, China | n = 105, Age 32.6 ± 6.5 yr, 90.5% female | SAS, SDS, 18.1% anxiety, 29.5% depression |
| Choi et al. (2021) | Hong Kong | Hong Kong general population | n = 500, Age 47.26 ± 15.82 yr, 54.80% female | PHQ-9, GAD-7, Global Rating of Change Scale, 19.8% depression, 14.0% anxiety, 25.4% deterioration in mental health |
| Civantos et al. (2021) | USA | Otolaryngology physicians | n = 349, 39.3% female | Mini-Z Burnout Assessment, GAD-7, IES, PHQ-2, 21.8% burnout, 47.9% anxiety, 60.2% distress, 10.6% depression |
| Study | Country | Sample | Description | Findings |
|-------|---------|--------|-------------|----------|
| Consolo et al. (86) | Italy | Dental practitioners n = 356 | 39.6% female | Self-designed (COVID-19 knowledge and behaviour), GAD-7 | 4.2% experienced fear intensely; 42.7% minimal anxiety; 33.3% mild anxiety; 15.2% moderate anxiety; 8.7% severe anxiety |
| Dixit et al. (87) | Bangladesh, India, Indonesia, Nepal | General population in Bangladesh, India, Indonesia and Nepal n = 548 | 61.3% India; 22.3% Nepal; 10.2% Bangladesh; 6.2% Indonesia | Self-designed (binge watching) | 73.7% had considerable increase in binge watching |
| Dong et al. (88) | China | Hospital staff n = 4,618 | 86.7% female | Self-designed (COVID-19 knowledge, behaviour and impact), HEI | 24.2% high levels of anxiety and/or depressive symptoms; 14.9% mild negative emotions; 5.5% moderate negative emotions; 3.8% severe negative emotions |
| Du et al. (89) | China | Frontline HCWs from two Wuhan-based hospitals n = 60 | 68.3% female | HCWs in the outreach team n = 74 | Fear of self and colleagues getting infected ranked as the top source of stress and anxiety |
| Durankuş & Aksu (90) | Turkey | Pregnant women n = 260 | EPDS, BDI, BAI | 35.4% at risk of depression |
| El-Zoghby et al. (91) | Egypt | Adult Egyptians n = 510 | 65.9% female | IES-R, self-designed (COVID-19 knowledge and behaviour) | 41.4% severe impact; 34.1% stress from work; 55.7% financial stress; 62.7% stress from home; 53.9% horrified; 52.0% helpless; 66.3% apprehensive; 64.7% increased care for family members' feelings |
| Forte et al. (92) | Italy | Italian general population n = 2,286 | 74.0% female | Self-designed (COVID-19 PTSD), IES-R, SCL-90, PSQI, STAI-Y | 9.0% PTSD |
| Forte et al. (93) | Italy | Italian general population n = 2,291 | 74.6% female | Self-designed (mood scales), IES-R, SCL-90, STAI-Y | 31.4% psychopathological symptoms; 37.2% anxiety; 27.7% PTSD symptoms |
| Gómez-Salgado et al. (94) | Spain | General Spanish population n = 4,180 | 74.0% female | GHQ-12 | 72.0% psychological distress |
| González-Sanguino et al. (95) | Spain | General Spanish population n = 4,380 | 75.6% female | PHQ-2, GAD-2, PCL-C-2, InDi-D, UCLA-3 | 18.7% depression; 21.6% anxiety; 15.8% moderate to extreme PTSS |
| Hou et al. (96) | China | HCWs n = 4,472 | 76.5% female | SSR5, CD-RISC, SCL-90 | 7% psychological abnormality |
| Huang & Zhao (97) | China | Chinese public n = 7,236 | 54.6% female | GAD-7, CES-D, PSQI | 35.1% anxiety; 20.4% depression; 18.2% poor sleep quality |
| Kang et al. (98) | China | Doctors and nurses in Wuhan n = 994 | 85.6% female | Self-designed (COVID-19 knowledge and impact) | 34.4% mild disturbances (on all scales); 22.4% moderate disturbances (on all scales); 6.2% severe disturbances (on all scales) |
| Study | Country | Sample | Methods | Results |
|-------|---------|--------|---------|---------|
| Khanna et al. (20) | India | Ophthalmologists and ophthalmology trainees, n = 2,355 | PHQ-9 | 32.6% some degree of depression, 6.9% moderate depression, 4.3% severe depression |
| Killgore et al. (21) | USA | USA adults, n = 5,013 | UCLA-3, PHQ-9 | 43% reported high loneliness, 54.7% of lonely participants reported moderate to significant depression |
| Killgore et al. (22) | USA | General USA population, n = 2,355 | PHQ-9, COVID-19 pandemic worry scale, ISI | 56.0% insomnia, 19.8% moderate range, 5.2% severe range |
| Lai et al. (23) | China | HCWs treating COVID-19 patients, n = 1,257 | PHQ-9, GAD-7, ISI, IES-R | 50.4% depressive symptoms, 44.6% anxiety symptoms, 34.0% insomnia symptoms, 71.5% distress symptoms |
| Lee & You (24) | Korea | Korean residents, n = 973 | Self-designed (COVID-19 knowledge and behaviour) | 51.3% perceived neither high nor low risk related to COVID-19, 48.6% high, 19.9% very high, 67.8% reported practising hand hygiene, 63.2% reported always wearing a face mask outside |
| Li et al. (25) | China | Female HCWs, n = 4,369 | PHQ-9, GAD-7, IES-R | 14.2% depression, 25.2% anxiety, 31.6% acute stress symptoms |
| Li et al. (26) | China | Chinese residents, n = 3,637 | ISI, GAD-7, PHQ-9, IES-R | 12.5% developed new-onset insomnia and worsened insomnia symptoms, 27.6% had COVID-19 related stress, Anxiety increased from 16.1% to 27.5%, Depression increased from 22.7% to 32.2% |
| Li et al. (27) | China | Medical staff personnel in Wuhan, n = 219 | AIS, SRO-20 | Staff in Wuhan: 58.9% insomnia, Staff in Ningbo: 25.0% insomnia |
| Liu et al. (28) | China | Medical staff, n = 512 | Self-designed (COVID-19 knowledge and behaviour), SAS | 12.5% anxiety (10.35% mild) |
| Liu et al. (29) | China | General public in China, n = 608 | STAI, SDS, SCL-90 | 15.8% state anxiety, 4.0% trait anxiety, 27.1% depression, 7.7% psychological abnormalities |
| Liu et al. (30) | China | Residents in Wuhan and surrounding cities, n = 285 | PTSD Checklist for DSM-5 (PCL-5), PSQI | 7.0% PTSS |
| Mazza et al. (31) | Italy | General Italian population, n = 2,766 | DASS-21, PID-5-BF | Depression (17% high), Anxiety (7.2% high), Stress (14.6% high) |
| Mo et al. (32) | China | Nurses treating COVID-19, n = 180 | SOS, SAS | 14.4% not good or bad sleep quality, 39.9% score rate for total stress load, 22.2% scored > 50 |
| Study | Group | Country | Sample Size | Gender | Assessment | Findings |
|-------|-------|---------|-------------|--------|------------|----------|
| Moccia et al; (112) | General Italian population | Italy | n = 500 | 59.6% female | K10, TEMPS-A, ASQ | 38.0% psychological distress (19.4% mild likelihood) 18.6% moderate to severe likelihood |
| Morgantini et al; (113) | Healthcare professionals from 60 countries | various | n = 2,707 | | -- | 51.4% burnout |
| Ni et al; (114) | Community-based adults in Wuhan | China | n = 1,577 | | GAD-2, PHQ-2, MOS-SSS | Community-based adults: 23.84% probable anxiety 19.21% probable depression Health professionals: 22.0% probable anxiety 19.2% probable depression |
| O’zdin et al; (115) | Turkish people | Turkey | n = 343 | | HADS, HAI | 23.6% depression 45.1% anxiety |
| Padala et al; (116) | Participants from ongoing geriatric clinical research studies | USA | n = 51 | Age 37.2 ± 10.3 yr 49.2% female | Self-designed (COVID-19 knowledge and behaviour) | 78.0% felt safe or very safe attending the scheduled research appointment 86.0% felt that the general public was panicked or very panicked about the pandemic |
| Pedrozo-Pupo et al; (117) | Columbian adults | Columbia | n = 406 | Age 43.9 ± 12.4 yr 61.8% female | PSS-10 | 14.3% high perceived stress |
| Podder et al; (118) | Doctors in India | India | n = 384 (144 dermatologists, 240 non-dermatologists) | Age of dermatologists 33.7 ± 9.3 yr 52.4% female Age of non-dermatologists 30.8 ± 7.8 yr 40.0% female | PSS-10, self-designed (risk factors of stress) | Dermatologists: 9.7% high stress Non-dermatologists: 12.5% high stress |
| Qiu et al; (119) | General Chinese population | China | n = 52,370 | 64.73% female | CPDI | 35.0% psychological distress |
| Ren et al; (120) | General Chinese public | China | n = 1,172 | | PHQ-9, GAD-7, SCL-90 (somatisation), PSS-10, CD-RISC-10, MINI-SD, ISI, PCL-5 | 18.8% depression 13.3% anxiety 2.8% high risk of suicidal behaviour 7.2% clinical insomnia 7.0% clinical PTSD symptoms 67.9% moderate to high perceived stress |
| Roy et al; (121) | Residents in India | India | n = 662 | Age 29.09 ± 8.83 yr 51.2% female | Self-designed (COVID-19 knowledge and behaviour) | 82.2% preoccupied with thinking about the COVID-19 pandemic over the past week 12.5% had difficulty sleeping as they were worried about the pandemic 36.4% affected by posts on social media about the pandemic 46.1% affected by news about the pandemic 83.5% felt it would be beneficial if mental health professionals help people in dealing with the current pandemic 82.9% would suggest for others to obtain mental health help if they were highly affected by the pandemic |
| Saccone et al; (122) | Pregnant women | Italy | n = 100 | | IES-R, STAI (short form), Visual analogue scale for anxiety | 68.0% anxiety |
| Sahu et al; (123) | Orthopaedic surgeons from India | India | n = 611 | | Self-designed (COVID-19 knowledge and behaviour) | 22.5% definitely stressed |
| Authors                  | Location | Participants                                                                 | Questionnaires/Assessment Tools                                                                 | Findings/Results                                                                 |
|-------------------------|----------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Shacham et al.          | Israel   | Dentists and dental hygienists in Israel: n = 338 Age 46.39 ± 11.2 yr 58.6% female, 58.6% dentists | COVID-19-related factors questionnaire, Demands Scale - Short Version, General Self-Efficacy Scale, K6 | 11.5% at risk of elevated psychological distress                                |
| Shapiro et al.          | Israel   | General population of Israelis: n = 593 Age 47.0 yr 61.0% female, 61.0% dentists | PHQ-2                                                                                            | 24.1% high or very high anxiety levels                                          |
| Shen et al.             | China    | Nurses in ICU ward in Wuhan: n = 85                                           |                                                   | 5.0% difficulty sleeping                                                         |
| Simpson et al.          | USA      | Board-eligible or board-certified psychiatrists in the United States: n = 101 |                                                   | 76.0% worried about contracting COVID-19                                           |
| Somma et al.            | Italy    | General Italian population: n = 1,043 Age 32.8 ± 12.7 yr 81.5% female          | SDQ EPS, PID-5-SF, CBQ                                                                         | 13.2% emotional problems                                                        |
| Sønderskov et al.       | Denmark  | Denmark residents: n = 2,458 Age 49.1 yr 15.1% female                          | WHO-5 (wellbeing), questionnaire (anxiety and depression)                                      | Entire sample: 25.4% probable depression                                           |
| Song et al.             | China    | Medical staff working in emergency department of hospitals with COVID-19 wards: n = 14,825 Age 34.0 ± 8.2 yr 64.3% female | PSSS, CES-D, PCL-5                                                                            | 25.2% depressive symptoms                                                        |
| Suleiman et al.         | Jordan   | Jordanian doctors who might be in first contact with COVID-19 patients: n = 308 Age 30.3 ± 5.8 yr 36.9% female | Self-designed (COVID-19 knowledge and behaviour)                                                 | 90.0% anxious about possibility of spread of COVID-19 and increase in number of positive patients |
| Sun et al.              | China    | Those working in a hospital in China: n = 442 Age 28.2 ± 9.2 yr 83.3% female    | 2019-nCOV impact questionnaire, IES                                                           | 10.8% PTSD                                                                       |
| Sun et al.              | China    | General Chinese population: n = 6,416 Age 28.2 ± 9.2 yr 53.0% female           | Self-designed (COVID-19 impact on addictive behaviours)                                         | 46.8% increased dependence on internet use                                        |
| Suzuki                  | Japan    | Postnatal mothers who gave birth to singleton healthy babies: Controls: n = 248 Age 28.2 ± 9.2 yr 100.0% female | EPDS, Mother-to-Infant Bonding Scale Japanese version                                         | 46.8% vs. healthy controls: 14.4% vs. 14.9% depression                            |
| Tan et al.              | China    | Members of the workforce living in Chongqing: n = 673 Age 30.8 ± 7.4 yr 25.6% female | IES-R, DASS-21, ISI                                                                           | 10.8% PTSD                                                                       |
| Study | Country | Population | Sample Size | Age (Mean ± SD) | Gender (%) | Measures | Findings |
|-------|---------|------------|-------------|----------------|------------|----------|----------|
| Taylor et al. (2016) | Canada, USA | General public in Canada and America | 5,854 | 49.8 ± 16.2 yr | 57.7% USA; 42.3% Canada | Self-designed (COVID-19 knowledge and behaviour), PHQ-4, SHAI, OCI-R, XS, MCSD-SF | 18.1% management/executive staff | 2.3% insomnia |
| Temsah et al. (2017) | Saudi Arabia | Healthcare workers | 582 | 36.0 ± 8.5 yr | 75.1% female | Self-designed (COVID-19 and MERS-CoV), GAD-7 | 11.0% moderate high or high anxiety |
| Tian et al. (2017) | China | Ordinary Chinese citizens | 1,060 | 35.01 ± 12.8 yr | 48.2% female | SCL-90 | 28.0% elevated anxiety, 22.0% depressive symptoms |
| Uvais et al. (2017) | Gulf Cooperation Council countries | Malayalam-speaking expats in Gulf Cooperation Council countries | 157 | 41.82 ± 13.85 yr | 24.8% female | PHQ-9, GAD-7 | 22.4% anxiety, 29.7% depression |
|  | | General population recruited during COVID-19 | 673 | 44.8 ± 14.7 yr | 65.0% female | DASS-21, MHC-SF, Satisfaction With Life Scale, Brief Resilience Scale | COVID-19 cohort: 79.0% had problematic mental health outcomes |
|  | | General population recruited during non-COVID-19 period | 1,624 | 42.7 ± 11.4 yr | 46.0% female | | General population: 52.0% had problematic mental health outcomes |
|  | | General population help-seeking group recruited during non-COVID-19 period | 340 | 42.6 ± 11.8 yr | 58.0% female | | General population help-seeking: 58.0% had problematic mental health outcomes |
| Varshney et al. (2017) | India | India residents | 653 | 41.82 ± 13.85 yr | 24.8% female | IES-R | 33.2% reported significant psychological impact |
|  | | Greek general population | 3,263 | 35.01 ± 12.8 yr | 52.2% female | AIS, IUS-12, De Jong Gierveld Loneliness Scale, PHQ-2, self-designed (COVID-19 negative attitudes) | 37.6% insomnia |
| Wang et al. (2017) | China | HCWs in Wuhan | 123 | 33.8 ± 8.4 yr | 90.0% female | PSQI, SAS, SDS | 38.0% sleep disturbances, 7.0% anxiety, 25.0% depression |
|  | | General population in China | 600 | 34 ± 12 yr | 55.5% female | SAS, SDS | 6.3% anxiety, 17.2% depression |
| Wu et al. (2020) | China | Pregnant women in their third trimester of pregnancy | 2,839 | 36.0 ± 6.2 yr | 100.0% female | EPDS | Group 1: 26.0% depression, Group 2: 29.6% depression, Overall: 26.0% vs. 34.2% (before 21 January 2020 vs. between 5 and 9 February 2020) |
| Authors | Source | Study Design | Sample Characteristics | Instruments | Findings |
|---------|--------|--------------|------------------------|-------------|----------|
| Wu et al. | China | Post-discharged COVID-19 survivors | n = 370; Age 50.5 ± 13.1 yr; 45.4% female | GAD-7, PHQ-9 | 13.5% anxiety; 10.8% depression; 6.2% comorbid anxiety and depression; 29.5% sleeping disorders; 39.2% feeling nervous, anxious or on edge; 1.1% suicidal thoughts |
| Xing et al. | China | Medical personnel with at least 1 year of work experience | n = 548; 72.1% female | SCL-90 | 33.0% somatisation; 37.2% obsessive-compulsive; 29.7% depression; 34.1% anxiety; 33.6% hostility; 40.0% phobic anxiety; 32.3% psychoticism; 32.7% overall average |
| Yang et al. | Korea | Physical therapists | n = 65; 47.6% female | Self-designed COVID-19 knowledge and behaviour | 32.3% anxiety; 18.5% depression |
| Yassa et al. | Turkey | Non-infected women with a confirmed pregnancy over 30th gestational week | n = 172; Age 27.5 ± 5.3 yr; 100.0% female | – | 80.2% were concerned about the coronavirus outbreak; 51.7% felt more vulnerable/weak during the outbreak because they were pregnant |
| Zanardo et al. | Italy | Mothers who gave birth during COVID-19 | n = 91; Age 33.7 ± 5.01 yr | EPDS | 28.6% postpartum depression |
| Zhang & Ma | China | Chinese residents in Liaoning Province | n = 263; Age 37.7 ± 14.0 yr; 59.7% female | Self-designed COVID-19 knowledge and behaviour, IES | 7.6% moderate to severe traumatic stress |
| Zhang et al. | Iran | Healthcare staff | n = 304; Age 35.1 ± 9.1 yr; 58.6% female | SF-12, PHQ-4, K6 | 20.1% distress; 20.6% depression; 28.0% anxiety |
| Zhang et al. | China | Medical staff | n = 1,563; 82.7% female | ISI, PHQ-9, GAD-7, IES-R | 36.1% insomnia; 50.7% depression; 44.7% anxiety; 73.4% stress |
| Zhao et al. | China | General public in China | n = 1,590; Age 29.17 ± 10.58 yr | PSS, PSQI, SAS, RSE | 36.38% were poor sleepers |

AIS: Athens Insomnia Scale; ASQ: Attachment Style Questionnaire; ASR: acute stress reaction; AUDIT: Alcohol Use Disorder Identification Test; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; BPAQ: Buss-Berry Aggression Questionnaire; CAPE-42: Community Assessment of Psychic Experiences-42; CAS: Coronavirus Anxiety Scale; CBQ: COVID-19 Causal Belief Questionnaire; CD-RISC: Connor-Davidson Resilience Scale; CD-RISC-10: Connor-Davidson Resilience Scale-10; CDIS: Children's Depression Inventory – Short Form; CD-OLQ: Celiac Disease Quality of Life Measure; CES-D: Center for Epidemiological Studies Depression Scale; CGI: Clinical Global Impression; COPE: Coping Orientation to Problems Experienced; CPDI: COVID-19 Peritraumatic Distress Index; CPSS: Chinese Perceived Stress Scale; CSDC: Child Stress Disorders Checklist; DASS-21: Depression, Anxiety and Stress Scale; DES-II: Dissociative Experiences Scale; DSM: Diagnostic and Statistical Manual of Mental Disorders; EPDS: Edinburgh Postpartum Depression Scale; FCV-15S: Fear of COVID-19 Scale; FS-14: Fatigue Scale-14; GAD-2: Generalized Anxiety Disorder-2; GAD-7: Generalized Anxiety Disorder-7; GAF: Global Assessment of Functioning; GHO-21: General Health Questionnaire-21; GHO-28: General Health Questionnaire-28; GPS: Global Psychotrauma Screen; GSES: General Self-Efficacy Scale; HADS: Hospital Anxiety and Depression Scale; HAI: Health Anxiety Inventory; HAMA: Hamilton Anxiety Scale; HAMD: Hamilton Depression Scale; HAM: Hamilton Anxiety Scale; HCW: healthcare worker; HEI: Huaxi Emotional-Distress Index; IES: Impact of Event Scale; IES-R: Impact of Event Scale-Revised; InDi-D: Day-to-Day Discrimination Index; ISI: Insomnia Severity Index; IUS: Intolerance of Uncertainty Scale; K10: Kessler Psychological Distress Scale-10; K6: Kessler Psychological Distress Scale-6; MBI: Maslach Burnout Inventory; MCSDS-SF: Marlowe-Crowne Social Desirability Scale Short Form; MERS-CoV: Middle East respiratory syndrome coronavirus; MHC-SF: Mental Health Continuum – Short Form; MINI: Mini International Neuropsychiatric Interview for...
