BMJ Open

Burden and factors associated with perceived stress amidst COVID-19: a population web-based study in Pakistan

Maryam Pyar Ali Lakhdir, Ghazal Peerwani, Syed Iqbal Azam, Apsara Ali Nathwani, Romaina Iqbal, Nargis Asad

ABSTRACT

Objective This study aims to determine the burden and factors associated with perceived stress in the Pakistani population amidst the COVID-19 pandemic.

Setting A web-based cross-sectional survey was conducted from April to August 2020.

Population This survey was broadcasted on the web using a Google form link and 1654 Pakistani residents had completed this survey. Individuals belonging to any province, city, village, or district of Pakistan irrespective of any age, having internet access and a link of Google form, with English/Urdu competency, consent to participate, and currently residing in Pakistan were eligible to participate.

Outcome measure Perceived stress was measured using a validated tool of perceived stress scale-10. Multiple ordinal regression was used, and an adjusted OR along with a 95% CI are reported.

Results The mean score of perceived stress was 19.32 (SD ±6.67). Most of the participants screened positive for moderate (69%) and high levels (14%) of stress, respectively. The odds of high-perceived stress among severely anxious participants were 44.67 (95% CI: 21.33 to 93.53) times than participants with no/minimal generalised anxiety during the complete lockdown. However, the odds of high levels of perceived stress among moderately anxious respondents were 15.79 (95% CI: 10.19 to 24.28) times compared with participants with no/minimal anxiety during the smart lockdown.

Conclusion This study evidence that the pandemic was highly distressing for the Pakistani population causing the maximum level of perceived stress in more than half of the population. Adequate and timely interventions are needed before high-stress levels culminate into psychological disorders.

INTRODUCTION

The COVID-19 pandemic, initiated by an outbreak of atypical pneumonia in Wuhan, China, soon turned into a unique global crisis never experienced before in modern history. COVID-19 is characterised by acute respiratory infection progressing to alveolar damage and respiratory failure leading to mechanical ventilation dependence and death in the severely affected population. The scale of this crisis has upsurged over time, claiming countless lives and affecting millions of people around the globe. In Pakistan, the first case of COVID-19 was identified on 26 February 2020, and since then, there has been a constant battle to contain the spread of the virus. As it is being written (10 January 2021), there have been 502,416 cases of COVID-19 in Pakistan, out of which 4,569 have recovered, whereas 10,644 have died. These numbers are inclusive of the second wave of the COVID-19. Amidst the first extremely fatal wave of COVID-19, 6,795 lives were lost, and 632 were left dependent on mechanical ventilation.

The Government of Pakistan has taken stringent measures and drastic efforts over the span of time to limit the spread of the virus in the first wave of COVID-19. Four weeks into the outbreak, the Government took an extreme step of ‘complete lockdown’ defined as the nationwide restriction on movement and interaction of every type to prevent people from leaving a given area (must stay where you are and not exit or enter a building or the given area). This scenario usually allows for essential supplies. All non-essential activities including businesses, malls, prayer places, and so on remain shut for the entire period, resulting in confinement in

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This was a web-based cross-sectional survey conducted between April and August 2020 (COVID-19 peak time in Pakistan).
⇒ Rapid and efficient data collection via a web-based approach, suitable for public health emergencies.
⇒ We have used validated tools for screening perceived stress and generalised anxiety in the local language.
⇒ Inherent biases in online self-reporting surveys along with limited generalisability to only internet users.
⇒ The inherent limitation of the study design was stress levels which were not measured over the period of time.
different provinces and cities, affecting more than 50 million people. As Pakistan is a low/middle-income country where a substantial proportion of the population is impoverished and living on daily wages, to cater to people’s financial constraints, complete lockdowns were released after a certain time, and ‘smart lockdowns’ were implemented, defined as imposing restrictions to the hot spots (areas with the high number of cases) across the country while the other areas were functional to the certain limit. These lockdowns caused significant social disruption and panic among people, causing a significant shortage of medical masks, sanitizers, medicines and other necessities, including food items, due to hoarding. Other than that, immense pressure on hospitals and medical staff was also reported due to the growing number of cases and a shortage of healthcare facilities and equipment. The fear of facing a shortage of essential medical and food supplies, the fatality associated with the pandemic and the frustration of being quarantined/self-isolated could have caused a lot of distress and panic among the mass populace. Moreover, the economic impact was also seen to be different with the different types of restrictions imposed by governments. A study conducted in Africa reported that the effect of COVID-19-related worries and their impact on economic status was rising with the increase in the level of restrictions imposed by the government.

Multiple studies worldwide evidenced extremely high and alarming levels of perceived stress in people due to COVID-19. Perceived stress is ‘the feelings or thoughts of an individual about how much they are under stress at a given point in time’. It is a multi-dynamic concept with a range of causative and conducive factors. The perceptions leading to stress can depend on medical, psychological, physical, psychosocial or cultural contexts. Internationally, in Italy, 21.8% of the general population were found to have extremely high-perceived stress levels, whereas, in Paraguay, almost 78% of the study subjects were suffering from moderate to high-perceived stress levels. Other international studies from Australia and Columbia depicted similar findings as a substantial proportion of the general population had high levels of stress. Regionally, a survey of the Chinese population showed an increased prevalence of moderate to severe stress during the COVID-19 pandemic’s early stages (8.1%). Similarly, in Nepal, almost three-quarters of the study participants perceived moderate to severe stress. One of the factors that might have caused distress in children could be distance learning as a study indicated increased restlessness in 69.1% and aggressiveness in 33.3% of students having online classes. Healthcare workers were also severely affected by the pandemic as an Italian study suggested 60% burnout and higher scores of stress and anxiety in healthcare workers during the second wave of the pandemic. The multitude of other factors found to influence perceived stress status during the pandemic, included gender, socioeconomic status, worry about getting infected after a sudden rise in cases or deaths, knowledge about the outbreak, conspiracy theories, exposure to news, uncertainty of the situation, existing comorbidities, level of confidence on government and healthcare services, level of confidence on infection control measures, preparedness to handle crisis and contact history with the infected persons. In Pakistan, most of the studies are conducted on healthcare workers, medical students and patients infected with COVID-19. In one such study, almost 68.5% of healthcare workers dealing with patients with COVID-19 reported moderate to severe stress. Nearly 53.5% of dental students were suffering from severe stress in another study. To the best of our knowledge, there is hardly any literature available to evidence perceived stress levels of the general population of Pakistan amidst the first wave of COVID-19, however, considering alarming levels of moderate to severe stress in students and healthcare professionals, it is likely to speculate high levels of stress in the general population as well.

Pakistan, a resource-limited country, is undergoing a major medical crisis as the second wave of COVID-19 has hit the nation. The impact of the first wave of COVID-19, including economic instability, social disruptions, ceasing of international trade, unemployment and shortage of essential amenities have not been subdued. About 39% of the Pakistani population were below the poverty line before COVID-19, and the pandemic has made things much worse. In Pakistan, the mental health infrastructure is already not well established, and the psychological impact of COVID-19 has burdened it further. The long-term consequences of high-stress levels are highly detrimental, including established psychological disorders, disabilities, suicidal tendencies, loss of productivity and physical morbidity. Hence, it should be a priority to proactively tackle the stress levels and their associated factors in the general population before they become unmanageable. There is also a need for an evidence base that depicts the psychological impact and its influencing factors to curate relevant policies. Thus, the present study aims to estimate the prevalence of perceived stress levels in the general population amidst COVID-19 crises and determine the factors associated with it.

**METHODS**

**Study design**

A web-based cross-sectional survey was conducted between April and August 2020 to determine the status of perceived stress in the general population amidst the first wave of the COVID-19 pandemic in Pakistan. The web-based survey questionnaire was broadcasted on the Internet through Google form. Participants were able to access this form through a link generated to permit access to this form. This link was made available to the general population using different social media platforms (Facebook, Instagram and Twitter), emails, SMS and messages on cellular phone applications (WhatsApp).

---

Lakhdir MPA, et al. BMJ Open 2022;12:e058234. doi:10.1136/bmjopen-2021-058234
Study population
The study population included residents of Pakistan of ages 18 years and above, had access to social media (Facebook, WhatsApp, Twitter, email and so on) and were able to read and write in English/Urdu. Exclusion criteria included residents who were out of Pakistan during the study period and lack of consent to participate.

Measures
Outcome
Perceived stress
Perceived stress scale-10 was used to assess the perceived stress status of study participants. This scale was a self-reported instrument that assessed how unpredictable and uncontrollable respondents find their lives. This tool contained six positively constructed and four negatively constructed questions. Respondents had to choose from options on a 5-point Likert scale, from 0=never to 4=very often. All responses were taken based on the past month. Questions from this tool included upset due to something unexpected, unable to control important things in life, feeling nervous or stressed, confidence about handling personal problems, feeling things going your way, unable to cope with stressful things, able to control irritations in life, thought that you were on top of things, angered because something happened out of your control and felt difficulties piling up to the extent of being uncontrollable. The range of this tool was 0–40, the highest score indicating a higher level of perceived stress. This variable was considered ordinal based on the given cutoffs. The cut-off scores of this tool were 0–13 indicating low stress, 14–26 representing moderate stress and 27–40 suggesting high stress. The internal consistency of this tool was good, with a Cronbach alpha of 0.78–0.89. The reliability of this tool was also considered good, with an intra-class correlation of ≥0.70. This tool was previously used and validated in our settings. Moreover, this tool was also used to assess perceived stress in the general population and in pandemic situations. This tool has been translated and used in Urdu in previous studies.

Covariates
Generalised anxiety disorder
Generalised anxiety disorder (GAD) was assessed by the GAD-7 tool. This tool comprised seven questions answered by choosing an option from a Likert scale with 4 options from 0=not sure at all to 3 nearly every day. All responses were taken based on the past 2 weeks. The questions of this tool included being nervous, anxious, or on edge, not being able to stop worrying, worrying too much about different things, having trouble relaxing, being restless, becoming easily annoyed and feeling afraid that something wrong will happen. The range of this tool was from 0 to 21. The highest the score, the greater the severity of GAD. This variable was considered ordinal representing no or minimal anxiety (score <5), mild anxiety (scores 5–9), moderate anxiety (scores 10–14) and severe anxiety (scores ≥15). The sensitivity of this tool is 89%, whereas specificity is 82%. The internal consistency of this tool is excellent, with a Cronbach alpha of 0.92, whereas the reliability with an intra-class correlation of 0.83 indicates good reliability. This tool was validated for use in the general population and was previously used and validated in our settings. Moreover, this tool was also previously used to assess GAD in the general population in pandemic situations. This tool was translated and previously used in the Urdu language.

Other covariates
Other covariates were divided into sociodemographic characteristics including variables like age, gender, province, city, marital status, educational status, employment/occupation status, number of family members living in the same home as well as the number of elders (60 years or above) and children (younger than 5 years) living in the same home with the participant. Worries, fears and opinions about the current COVID-19 pandemic including individual history of psychiatric illness, family history of psychiatric illness, presence of chronic illness, worry of getting infected from COVID-19 after first definite case was reported in Pakistan, worry of getting infected from COVID-19 after first death due to this virus in Pakistan, worry of getting infected when number of COVID-19 cases continued to increase in Pakistan, worry of imposition of lockdown, worry about shortage of essential supplies, fear of self-isolation, fear of getting infected, fear of family members getting infected, opinion about government measures, opinion about health authorities, feelings about quarantine and infection control of individuals and indulgence into physical and recreational activities and knowledge about COVID-19 including knowledge items related to symptoms of COVID-19, preventive actions, when to visit a doctor, current health status and contact history with infected patient.

Sample size and sampling strategy
To determine the burden of perceived stress, a minimum sample of 1535 individuals was required for the estimation of the prevalence of moderate to severe stress levels assuming an anticipated prevalence of moderate to severe stress levels ranging between 8.1% and 53.8% with 2.5% absolute precision and level of significance of 5%. Sample size based on factors associated with perceived stress was also calculated assuming that the anticipated prevalence of different sociodemographic factors, factors related to a pandemic like worry, fear and knowledge. Anticipated prevalence of various sociodemographic factors with items related ranged between 10% and 50%. The OR of 2 or more and the ratio between individuals with no mental disorder to individuals with mental disorders between 1 and 12 was assumed; 1248 was the sample size with these assumptions at 80% power and 5% level of significance. The sample size calculated based on prevalence was greater; hence 1535 was taken as a required sample size. As it was a web-based study, 10% of incomplete forms were anticipated. After catering to the anticipated 10% refusals

Lakhdir MPA, et al. BMJ Open 2022;12:e058234. doi:10.1136/bmjopen-2021-058234.
and incomplete forms, the required sample size was 1689. We managed to recruit 1654 participants for our study. Analysis was done on complete cases comprising 1654 participants. A non-probability purposive sampling technique was adopted to conduct this survey.

**Statistical analysis**
A descriptive analysis of all the variables was done. The outcome of perceived stress was measured on an ordinal scale. The frequency and percentages of all qualitative categorical variables were reported. Mean and SD when symmetric data and median along with IQR (where needed) when asymmetric data for continuous quantitative variables were reported. Crude and adjusted ORs and 95% CIs were reported using simple and multiple ordinal regression, respectively, to determine factors influencing perceived stress. As ordinal regression is used, cut 1 is the coefficient (constant) for comparison of low to moderate stress with severe stress and cut 2 is the coefficient (constant) for comparison of low stress with moderate to severe stress.

**Ethical considerations**
Electronic consent was obtained from all the participants before initiating the questionnaire. Participation was completely voluntary, and the subjects were free to leave the study or any question that they were not comfortable answering. The consent also had details of the study including the purpose, possible risks, benefits, confidentiality and procedures of the study. Screening results were sent to all the participants who provided their contact details. A referral list of relevant organisations providing counselling and therapies and motivational videos was also sent to participants.

**Patient and public involvement**
The general public of Pakistan was involved in this study as participants via a web-based survey. Dissemination of results of screening was shared at the end of the google survey including toll-free telephonic counselling services that were available at that time.

**RESULTS**
Participant enrolment began on 16 April 2020 and ended on 10 August 2020. Twenty-five percent of participants were recruited between 23 March and 12 June 2020 when the country was under a nationwide complete lockdown. Whereas 75% were enrolled during smart lockdown from 13 June 2020 to December 2020.

**Perceived stress status**
A total of 1654 participants were evaluated and analysed in this study. Among these participants, 14.15% (n=234) exhibited high levels of perceived stress, whereas 68.86% (n=1139) and 16.99% (n=281) had moderate and low levels of perceived stress, respectively. Overall, the mean perceived stress score of the participants was 19.28 (SD 6.68).

**Sociodemographic characteristics**
The study largely consisted of women (72.67%), individuals belonging to younger age groups of <40 years (86.76%) and having higher education degrees, ie, graduates/postgraduates (85.08%). Approximately 16% of the individuals of ages 18–24 years reported having high-stress levels. Similarly, a substantially larger proportion of students (87%), individuals with an intermediate level of education (88%) and unemployed participants (94%) demonstrated moderate to high levels of stress. Moreover, approximately 86% of those who participated in this study during smart lockdown had moderate to severe stress (table 1).

**Generalized anxiety disorder**
Approximately 18% of respondents in this study were screened positive for severe anxiety, whereas 22%, 39% and 21% were falling in moderate, mild and no/minimal anxiety categories, respectively. Among individuals with severe anxiety, 43.48% had severe stress and 54.85% had moderate stress; 95.81% of respondents screened positive for moderate anxiety, and 86.36% of individuals with mild anxiety were found to have moderate to severe stress (table 1).

**Medical and family history**
Almost 25% of the participating individuals were currently affected by any psychiatric illness. Among individuals with any current psychiatric illness, 92.61% had moderate to high levels of perceived stress. A small proportion (11.91%) of respondents reported having any chronic comorbidity. Among the patients with any chronic disease, 82.24% exhibited moderate to high levels of stress. 7.62% of the participants were either currently infected or recovered from COVID-19 infection, whereas 4% had at least one symptom of COVID-19. Victims of COVID-19 and those with COVID-19 symptoms were found to be more likely to suffer from moderate to severe stress (89.23%) (table 1).

**COVID-19-related fears, worries and perceptions**
Assessed via self-designed questions, 20% of the participants were worrying a lot when the first case of COVID-19 was reported in Pakistan, whereas 24% and 48% recalled immense worry when the first death due to COVID-19 was reported, and cases started surging in Pakistan. Among those who expressed extreme worry after reporting the first COVID-19 case, 22% had the highest stress level. Moreover, among individuals who were extremely worried when the first death due to COVID-19 occurred and cases started increasing, 21% and 18% were falling in the severe stress category. Respondents also reported immense worrying about the imposition of lockdown (48.55%), shortage of food (41.72%) and medical supplies (53.45%), 87.92%, 87.83% and 85.98% of those respondents who were worried about the imposition of lockdown, shortage of food or medical supplies demonstrated moderate to severe stress, respectively. Thirty-eight per
Table 1  Baseline characteristics of participants as per perceived stress status

| Characteristics                        | Total, 1654 | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------------------------|-------------|---------------------------|--------------------------------|----------------------------|
| Age                                    |             |                           |                                |                            |
| 18–24                                  | 594 (35.91) | 78 (13.13)                | 420 (70.71)                    | 96 (16.16)                 |
| 25–39                                  | 841 (50.85) | 139 (16.53)               | 582 (69.20)                    | 120 (14.27)                |
| 40–49                                  | 130 (7.86)  | 33 (25.38)                | 87 (66.92)                     | 10 (7.69)                  |
| 50 and above                           | 89 (5.38)   | 31 (34.83)                | 50 (56.18)                     | 8 (8.99)                   |
| Sex                                     |             |                           |                                |                            |
| Male                                   | 452 (27.33) | 99 (21.90)                | 314 (69.47)                    | 39 (8.63)                  |
| Female                                 | 1202 (72.67)| 182 (15.14)               | 825 (68.64)                    | 195 (16.22)                |
| Education status                       |             |                           |                                |                            |
| Up to intermediate                    | 245 (14.81) | 29 (11.84)                | 169 (68.98)                    | 47 (19.18)                 |
| Graduate                               | 726 (43.89) | 116 (15.98)               | 502 (69.15)                    | 108 (14.88)                |
| Postgraduate                           | 683 (41.29) | 136 (19.11)               | 468 (68.52)                    | 79 (11.57)                 |
| Working status                         |             |                           |                                |                            |
| Working from home                      | 512 (30.96) | 109 (21.29)               | 359 (70.12)                    | 44 (8.59)                  |
| Go to the office for work              | 264 (15.96) | 49 (18.56)                | 192 (72.73)                    | 23 (8.71)                  |
| I am relaxing                          | 106 (6.41)  | 25 (23.58)                | 68 (64.15)                     | 13 (12.26)                 |
| I am a student                         | 454 (27.45) | 60 (13.22)                | 313 (68.94)                    | 81 (17.84)                 |
| I am laid off from work                | 49 (2.96)   | 1 (2.04)                  | 32 (65.31)                     | 16 (32.65)                 |
| Doing household chores                 | 269 (16.26) | 37 (13.75)                | 175 (65.06)                    | 57 (21.19)                 |
| Time                                   |             |                           |                                |                            |
| Complete lockdown                      | 413 (24.97) | 101 (24.46)               | 272 (65.86)                    | 40 (9.69)                  |
| Smart lockdown                         | 1241 (75.03)| 180 (14.50)               | 867 (69.86)                    | 194 (15.63)                |
| Generalised anxiety disorder           |             |                           |                                |                            |
| No/minimal anxiety                     | 484 (29.26) | 191 (39.46)               | 290 (59.92)                    | 3 (0.62)                   |
| Mild anxiety                           | 513 (31.02) | 70 (13.65)                | 419 (81.68)                    | 24 (4.68)                  |
| Moderate anxiety                       | 358 (21.64) | 15 (4.19)                 | 266 (74.30)                    | 77 (21.51)                 |
| Severe anxiety                         | 299 (18.08) | 5 (1.67)                  | 164 (54.85)                    | 130 (43.48)                |
| Currently having any psychiatric illness|           |                           |                                |                            |
| Yes                                    | 406 (24.55) | 30 (7.39)                 | 262 (64.53)                    | 114 (28.08)                |
| No                                     | 915 (55.32) | 224 (24.48)               | 642 (70.16)                    | 49 (5.36)                  |
| Don’t know                             | 333 (20.13) | 27 (8.11)                 | 235 (70.57)                    | 71 (21.32)                 |
| Past history of chronic diseases       |             |                           |                                |                            |
| Yes                                    | 197 (11.91) | 35 (17.77)                | 127 (64.47)                    | 35 (17.77)                 |
| No                                     | 1457 (88.09)| 246 (16.88)               | 1012 (69.46)                   | 199 (13.66)                |
| Worried about getting infected when the first case confirmed | | | | |
| Worried a lot                          | 333 (20.13) | 29 (8.71)                 | 232 (69.33)                    | 72 (21.62)                 |
| Worried little bit                     | 502 (30.35) | 76 (15.14)                | 366 (72.91)                    | 60 (11.95)                 |
| Never thought about it                 | 819 (49.52) | 176 (21.49)               | 541 (66.06)                    | 102 (12.45)                |
| Worried about getting infected when cases started increasing | | | | |
| Worried a lot                          | 802 (48.49) | 100 (12.47)               | 556 (69.33)                    | 146 (18.20)                |
| Worried little bit                     | 489 (29.56) | 98 (20.04)                | 339 (69.33)                    | 52 (10.63)                 |
| Never thought about it                 | 363 (21.95) | 83 (22.87)                | 244 (67.22)                    | 36 (9.92)                  |
| Worried about the imposition of lockdown|            |                           |                                |                            |
| No                                     | 851 (51.45) | 184 (21.62)               | 551 (64.75)                    | 116 (13.63)                |

Continued
### Characteristics

| Characteristics | Total, 1654 | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------|-------------|---------------------------|-------------------------------|---------------------------|
| Yes            | 803 (48.55) | 97 (12.08)                | 588 (73.23)                   | 118 (14.69)               |
| No             | 964 (58.28) | 197 (20.44)               | 646 (67.01)                   | 121 (12.55)               |
| Yes            | 690 (41.72) | 84 (12.17)                | 493 (71.45)                   | 113 (16.38)               |

#### Fear of getting infected with COVID-19

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| No                   | 197 (25.00)               | 134 (59.82)                   | 34 (15.18)                |
| Slight fear          | 170 (21.36)               | 546 (68.59)                   | 80 (10.05)                |
| A lot of fear        | 55 (8.68)                 | 459 (72.40)                   | 120 (18.93)               |

#### Fear of loved ones getting infected with COVID-19

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| No                   | 21 (26.58)                | 53 (67.09)                    | 5 (6.33)                  |
| Slight fear          | 82 (26.54)                | 205 (66.34)                   | 22 (7.12)                 |
| A lot of fear        | 178 (14.06)               | 881 (69.59)                   | 207 (16.35)               |

#### Frequency of checking news

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| Frequently           | 65 (13.86)                | 329 (70.15)                   | 75 (15.99)                |
| Sometimes            | 110 (18.77)               | 404 (68.94)                   | 72 (12.29)                |
| Rarely               | 106 (17.70)               | 406 (67.78)                   | 87 (14.52)                |

#### Stressful self-isolation/quarantine

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| No                   | 101 (30.84)               | 191 (57.19)                   | 40 (11.98)                |
| Somewhat             | 141 (16.36)               | 623 (72.27)                   | 98 (11.37)                |
| Yes, a lot           | 37 (8.08)                 | 32 (70.96)                    | 96 (20.96)                |

#### Currently indulging in physical activities

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| No                   | 107 (13.14)               | 562 (69.04)                   | 145 (17.81)               |
| Yes                  | 175 (20.71)               | 590 (68.69)                   | 90 (10.60)                |

#### Confident with infection control practices by people around

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| No                   | 149 (14.68)               | 698 (68.77)                   | 168 (16.55)               |
| Yes                  | 132 (20.66)               | 441 (69.01)                   | 66 (10.33)                |

#### Anxious about the uncertainty of the situation

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| Not anxious          | 30 (21.74)                | 96 (69.57)                    | 12 (8.70)                 |
| Mildly anxious       | 147 (22.44)               | 460 (70.23)                   | 48 (7.33)                 |
| Moderately anxious   | 84 (14.12)                | 417 (70.08)                   | 94 (15.80)                |
| Severely anxious     | 20 (7.52)                 | 166 (62.41)                   | 80 (30.08)                |

#### Current health status

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| Infected or recovered from COVID-19 | 14 (11.11) | 93 (73.81) | 19 (15.08) |
| Currently one or more symptoms | 7 (10.77) | 44 (67.69) | 14 (21.54) |
| Currently no symptoms of COVID-19 | 260 (17.77) | 1002 (68.49) | 201 (13.74) |

#### Knowledge regarding symptoms

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| Poor                 | 42 (18.50)                | 166 (73.13)                   | 19 (8.37)                 |
| Satisfactory         | 166 (17.77)               | 629 (67.34)                   | 139 (14.88)               |
| Good                 | 73 (14.81)                | 344 (69.78)                   | 76 (15.42)                |

#### Knowledge regarding prevention

|                      | Low stress, 281 (16.99%) | Moderate stress, 1139 (68.86%) | High stress, 234 (14.15%) |
|----------------------|---------------------------|-------------------------------|---------------------------|
| Poor                 | 7 (7.69)                  | 77 (84.62)                    | 7 (7.69)                  |
| Satisfactory         | 110 (17.38)               | 424 (66.98)                   | 99 (15.64)                |
| Good                 | 164 (17.63)               | 638 (68.60)                   | 128 (13.76)               |
cent of the respondents reported extreme fear of getting infected, whereas approximately 77% were immensely scared of their loved ones getting infected from COVID-19. Eighty-six per cent of the respondents who were frequently checking COVID-related news (28.36%) exhibited moderate to high levels of stress. 27.69% of the participants found quarantine/social isolation very stressful, whereas 52% were somewhat affected. Ninety-two per cent of participants who found self-isolation extremely stressful were having moderate to severe stress. Approximately 61% of individuals were not satisfied with the infection control practices of people surrounding them, out of which 80% had moderate to severe stress. Forty-nine per cent of the participants were not indulging in any form of physical activity resulting in moderate to severe stress (86.85%) (table 1).

Table 2 reports the findings of bivariate and multivariable ordinal regression used to assess the association of perceived stress with the key predictors. Variables associated with perceived stress at a p value of <0.25 in the bivariate model were included in the multivariable model using a forward selection approach.35 The odds of participants having severe stress were twofold (OR=1.95, 95% CI=1.44 to 2.6) among those who were currently suffering from any psychiatric illness compared with those who had no current psychiatric morbidity. Likewise, respondents who were immensely strained and traumatised by quarantine were more likely to have a maximum level of stress (OR=1.46, 95% CI=1.03 to 2.06). The working status of the participants was influencing perceived stress status as the odds of participants having the highest stress levels were almost three times (OR=3.10, 95% CI=1.57 to 6.12) more likely to be among respondents who were laid off amidst the pandemic as compared with those who were employed. Similarly, the odds of respondents who reported having high-stress levels were more likely to be among those who indulged in household chores (OR=2.01, 95% CI=1.42 to 2.84). Additionally, students were more likely to have severe stress levels than participants working from home (OR=1.50, 95% CI=1.06 to 2.10).

This study catered to participants belonging to different age brackets. Age was significantly associated with the stress status of participants. The odds of severely stressed participants among youth (age 18–24) were twofold (OR=1.99, 95% CI=1.14 to 3.49) compared with elderly respondents. Furthermore, participants aged 25–39 years were 1.66 times (OR=1.66, 95% CI=1.01 to 2.78) more likely to have high-stress levels. Indulgence in the exercise was found to be a protective factor in reducing stress levels. The odds of respondents having high-stress levels among those respondents not indulging in any form of physical exercise were 1.30 times (OR=1.32, 95% CI=1.05 to 1.65) compared with regularly exercising individuals. Participants worrying about the shortage of food (OR=1.30, 95% CI=1.02 to 1.63) and the imposition of the lockdown (OR=1.23, 95% CI=1.00 to 1.55) were more likely to have severe stress. Additionally, confidence about infection control practices in the surroundings of the respondents was also significantly associated with stress levels. The odds of severely stressed participants among those respondents who were not confident about infection control practices in the surroundings were 1.27 times (OR=1.27, 95% CI=1.01 to 1.59) compared with respondents satisfied with infection restraining measures (table 2).

In the final model (table 2), a significant interaction was seen between generalised anxiety status and the phase of lockdown during which the participants were enrolled for this study (figure 1), indicating that during the complete lockdown, the odds of high-stress levels were 445.02 times (OR=45.02, 95% CI=21.47 to 94.40) among severely anxious respondents as compared with non/minimally anxious respondents. Furthermore, during the smart lockdown, the odds of maximum stress levels were 33 times (OR=33.58, 95% CI=20.54 to 54.57) among respondents with severe anxiety than participants with no/minimal anxiety. Likewise, participants with high stress were 15 times (OR=15.81, 95% CI=10.20 to 24.30) more likely to be screened positive for moderate anxiety during the smart lockdown. Among participants enrolled amidst smart lockdown, the odds of severe stress were three times (OR=3.48, 95% CI=2.40 to 5.06) in the mild anxiety category as opposed to no/minimal anxiety.

DISCUSSION

In the present study, rates of high and moderate perceived stress among the general population during the COVID-19 outbreak were 14% and 69%, respectively, comparable to the studies conducted in various parts of the world.15 16 36 37 Such high prevalence could be explained by several factors, including the financial circumstances of an individual, their current and previous psychological status, their perception of the measures taken by the general public and hospitals, and other sociodemographic variables.16 36

Working status was found to be one of the critical factors affecting the perceived stress of an individual during the pandemic situation. Those who were laid off from work had thrice the higher odds of perceived stress. As highlighted in the literature, losing a job itself is psychological trauma, and when it is experienced during such a crisis, it poses the individual with an immediate threat of survival and can further aggravate stress and other psychological symptoms.38 On the other hand, young individuals were also more likely to have high-perceived stress than the older population. This was consistent with previous literature.38 39 The individuals in the age cohort 18–24 years are primarily students or fresh graduates. A similar situation was reported during previous outbreaks like Ebola and MERS, where university-level students reported a considerably higher level of stress.40 41 The possible justification for higher stress could be the immediate requirement to adapt to the new online learning system or the higher
Table 2  Simple and multiple ordinal regression reporting crude and adjusted OR along with 95% CI for predictors associated with perceived stress levels

| Characteristics                                      | Crude OR | 95% CI       | Adjusted OR | 95% CI       |
|------------------------------------------------------|----------|--------------|-------------|--------------|
| **Participant's current psychiatric illness**        |          |              |             |              |
| Yes                                                  | 5.52     | 4.17 to 7.32 | 1.95*       | 1.44 to 2.66 |
| Don't know                                           | 4.01     | 2.98 to 5.38 | 1.84*       | 1.34 to 2.51 |
| **Stressful quarantine**                             |          |              |             |              |
| Somewhat                                             | 1.78     | 1.35 to 2.34 | 1.09        | 0.81 to 1.47 |
| Yes, a lot                                           | 3.59     | 2.62 to 4.89 | 1.46*       | 1.03 to 2.06 |
| **Working status of the participant**                |          |              |             |              |
| Student                                              | 1.97     | 1.50 to 2.59 | 1.50*       | 1.06 to 2.10 |
| Household chores                                     | 2.21     | 1.60 to 3.06 | 2.01*       | 1.42 to 2.84 |
| Going office for work                                | 1.12     | 0.82 to 1.53 | 1.28        | 0.91 to 1.80 |
| Laid off                                             | 5.05     | 2.80 to 9.13 | 3.10*       | 1.57 to 6.12 |
| Relaxing                                             | 1.04     | 0.66 to 1.62 | 1.14        | 0.71 to 1.84 |
| **Age**                                              |          |              |             |              |
| 18–24                                                | 3.07     | 1.93 to 4.89 | 1.99*       | 1.14 to 3.49 |
| 25–39                                                | 2.5      | 1.59 to 3.93 | 1.66*       | 1.01 to 2.78 |
| 40–49                                                | 1.39     | 0.80 to 2.42 | 1.24        | 0.69 to 2.33 |
| **Indulgence in exercise**                           |          |              |             |              |
| No                                                   | 1.77     | 1.43 to 2.18 | 1.32*       | 1.05 to 1.65 |
| **Worried about the shortage of food**               |          |              |             |              |
| Yes                                                  | 1.59     | 1.29 to 1.96 | 1.30*       | 1.02 to 1.63 |
| **Worried about the imposition of lockdown**         |          |              |             |              |
| Yes                                                  | 1.51     | 1.23 to 1.86 | 1.23*       | 1.00 to 1.55 |
| **Confident about inflectional control measures**    |          |              |             |              |
| No                                                   | 1.59     | 1.29 to 1.97 | 1.27*       | 1.01 to 1.59 |
| **Type of lockdown**                                 |          |              |             |              |
| Smart (partial) lockdown                             | 1.85     | 1.45 to 2.34 | –           | –            |
| Generalised anxiety disorder                         |          |              |             |              |
| Mild anxiety                                         | 4.08     | 3.04 to 5.47 | –           | –            |
| Moderate anxiety                                     | 20.01    | 13.40 to 29.88 | –       | –            |
| Severe anxiety                                       | 58.22    | 38.42 to 88.22 | –      | –            |
| **Complete lockdown**                                |          |              |             |              |
| No/minimal anxiety                                   | –        | –            | Reference   |              |
| Mild anxiety                                         | –        | –            | 2.45*       | 1.42 to 4.23 |
| Moderate anxiety                                     | –        | –            | 6.65*       | 3.27 to 13.51|
| Severe anxiety                                       | –        | –            | 45.02*      | 21.47 to 94.40|
| **Smart lockdown**                                   |          |              |             |              |
| No/minimal anxiety                                   | –        | –            | Reference   |              |
| Mild anxiety                                         | –        | –            | 3.48*       | 2.40 to 5.06 |
| Moderate anxiety                                     | –        | –            | 15.81*      | 10.20 to 24.30|
| Severe anxiety                                       | –        | –            | 33.58*      | 20.54 to 54.67|

Cut 1: 0.99; Cut 2: 6.05
Chisq: 652.12

*Significant (p value <0.05).
unemployment rates and hiring freeze worldwide to the COVID-19 outbreak.

Another significant variable was the persisting mental illnesses. Relative to other studies, psychologically ill individuals had greater odds of perceived stress.16 People with existing mental conditions are the most vulnerable population, especially during emergencies, as the symptoms of their pre-existing mental disorders worsen under such tense circumstances, leading to extreme levels of fear, stress and anxiety among them.42 43 As warned by WHO, individuals with pre-existing psychiatric disorders would need specific attention and interventions during and after the pandemic as the pandemic-related stressful events could exacerbate their symptoms and worsen their quality of life.16

The findings of our study further indicated a significant impact of fear regarding food shortage on an individual’s stress level. Food is the basic necessity of life, and the fear of not meeting or affording the most basic need could lead to heightened stress. Another probable reason could be the mass purchasing behaviour observed during COVID-19, which led to the decrease in the amount of food available in the market and the upsurge in prices.44 This could also explain the higher stress among those who were worried about the imposition of lockdown. It could lead to prevention and disruption in accessing workplaces, education institutes and the basic needs of an individual like food and medication.

Similarly, another key finding of our study was the interaction between phases of lockdown and generalised anxiety. Indicating that individuals with severe generalised anxiety during the complete and partial lockdown had high-perceived stress compared with those with minimal anxiety. Stress and anxiety, at times, go hand in hand. Anxiety can cause stress, and stress can trigger anxiety. Moreover, lockdown, whether partial or complete, causes widespread despair and uncertainty among people thus, resulting in high levels of stress and anxiety.45 Likewise, several other studies reported that quarantine amplifies the levels of stress and psychological distress among the general population.46 This could be explained by the lack of socialisation and infrequent social interactions during lockdown that often precipitates mental illnesses ranging from sleeplessness, reduced confidence and poor cognitive functioning to increased anxiety and suicidal ideation. It also affects physical health leading to reduced immune function and cardiovascular health.47

The present study highlighted new information on levels of perceived stress among the Pakistani population during the COVID-19 outbreak, which should be considered by health systems and experts alongside other aspects of infection prevention and control. Limitations of the study may include higher percentages of women and a young population. As the study was carried out online using different media platforms, which is why the results are only generalisable to social media users. Furthermore, the subjectivity of the outcome was another limitation of this study. Also, previous levels of perceived stress and anxiety were available from few studies so risen of perceived stress owing to COVID-19 only is limited. This was a cross-sectional study design as the stress levels were not measured over the period of time. Though the sample size of this study was powered, 1654 participants were not representing the entire population of Pakistan but are somewhat representative of a section of Pakistanis on social media.

Implications
As the findings of this study suggested that the presence of previous psychiatric illness might lead to worse stress levels, hence easily accessible mental health services via telemedicine and online counselling should be provided so that the vulnerable population gets timely attention before higher stress levels culminate into mental health crises. Utility of necessities and financial help should be provided by the government as shortage of food was one of the major factors triggering stress levels. Participants in the age bracket of 18–24 were most stressed probably because of online learning, hence convenience should be provided to them. Alarming levels of perceived stress along with generalised anxiety also necessitate timely intervention in terms of spreading awareness and providing affordable mental health services. Also, the destigmatisation of mental health illnesses should be considered a priority.

CONCLUSION
Overall, high levels of perceived stress were found in the Pakistani population, indicating that the first wave of COVID-19 was highly distressing specifically for young people, individuals with no jobs and those with pre-existing psychological conditions.

These findings warrant the need to monitor the psychological impact of COVID-19 before it substantiates a significant mental health crisis. Proper management and counselling of the high-risk groups regarding the preventive measures and assistance to control the psychological issues would help lower the rates of perceived stress. Also, other psychological interventional measures like toll-free counselling services, telehealth interventions via
calls, WhatsApp, zoom sessions, m-health, app base interventions and communication of positive motivational messages through media should be considered to cater to the increasing burden of pandemic-related psychological morbidities.

Contributors MPAL contributed to conceptualisation; SIA contributed to data curation; MPAL, GP and SIA contributed to formal analysis; MPAL, GP, AAN and RI contributed to methodology; MPAL and GP contributed to project administration; AAN and NA contributed to resources; GF contributed to supervision; SIA contributed to validation; GP contributed to visualisation; MPAL and GP contributed to writing—original draft; SIA, AAN, RI and NA contributed to writing—review & editing. MPAL & SIA contributed as a guarantor for this manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by ethical approval was taken from The Aga Khan University Ethical Review Committee (2020-3682-10205). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional committee. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The data that support the findings of this study are available on request from the corresponding author.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs Maryam Pyar Ali Lakhdir http://orcid.org/0000-0003-3053-2887
Ghazal Peerwani http://orcid.org/0000-0002-2327-8684
Apsara Ali Nathwani http://orcid.org/0000-0002-2899-1577
Nargis Asad http://orcid.org/0000-0001-7939-9031

REFERENCES
1. Beyrer C, Baral SD, van Griensven F, et al. Global epidemiology of HIV infection in women who have sex with men. The Lancet 2012;380:367–77.
2. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med 2020;8:475–81.
3. Coronavirus outbreak 2020. Available: https://www.worldometers.info/coronavirus/
4. Pakistan Go. Pakistan statistics 2020. Available: http://covid.gov.pk/
5. Pakistan Go. Corona virus in Pakistan 2020. Available: http://covid.gov.pk/
6. Constable P, Hussain S. Pakistan looks down Province, bars international flights as coronavirus spreads. Washington Post, 2020. 7. Gadit AA. Mental health in Pakistan: where do we stand? J Pak Med Assoc 2006;56:198–9.
8. Congress Lo. Pakistan: “Smart Lockdown” Imposed across Cities of Pakistan as Covid-19 Cases Grow Rapidly. Available: https://www.loc.gov/law/freelaw/news/article/pakistan-smart-lockdown-imposed-across-cities-of-pakistan-as-covid-19-cases-grow-rapidly/ [Accessed 25 June 2020].
9. Colbolt J. COVID-19: extending or relaxing distancing control measures. Lancet Public Health 2020;5:e236–7.
10. Wang C, Pan R, Wan X, et al. Immediate psychological responses and associated factors during the initial phase of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health 2020;17:1729.
11. Charwana-Kartun L, Arumugam-Menjiah F, Wamala-Larsson C, et al. COVID-19: from health crises to food security anxiety and policy implications. Ambio 2021;50:794–811.
12. Phillips AC. Stress P. Encyclopedia of behavioral medicine. Gellman MD, Turner JR. New York: Springer; 2013: 1453–4.
13. Moore KA, Cooper CL. Stress in mental health professionals: a theoretical overview. Int J Soc Psychiatric 1996;42:82–9.
14. Feizi A, Aliyari R, Roohafza H. Association of perceived stress with stressful life events, lifestyle and sociodemographic factors: a large-scale community-based study using logistic quantile regression. Comput Math Methods Med 2012;2012:151865.
15. Rossi R, Socci V, Talevi D, et al. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. Front Psychiatry 2020;11:1155.
16. Torales J, Rios-Gonzalez C, Barrios I, et al. Self-Perceived stress during the quarantine of COVID-19 pandemic in paraguay: an exploratory survey. Front Psychiatry 2020;11:1155.
17. Georgiou N, Delfabbro P, Balzan R. COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs. Pers Individ Dif 2020;166:110201.
18. Pedrozoo-Pupo JC, Pedrozo-Cortés MJ, Campo-Arias A, AjuCSP C-A. Perceived stress associated with COVID-19 epidemic in Colombia: an online survey. Cad Saude Publica 2020;36:e00090520.
19. Samadarsih SCA, Sharma S. JJEJoHD B. An online survey of factors associated with self-perceived stress during the initial stage of the COVID-19 outbreak in Nepal. Ethip J Health Dev 2020;34.
20. Scarpellini F, Segre G, Cartabia M, et al. Distance learning in Italian primary and middle school children during the COVID-19 pandemic: a national survey. BMC Public Health 2021;21:1035.
21. Stocchetti N, Segre G, Zanier EA, et al. Burnout in intensive care unit workers during the second wave of the COVID-19 pandemic: a single center cross-sectional Italian study. Int J Environ Res Public Health 2021;18:6102.
22. Huang Y, Zhao N, disorder Gxendie. Depressive symptoms and sleep quality during COVID-19 epidemic in China: a web-based cross-sectional survey. medRxiv 2020.
23. Ro J-S, Lee J-S, Kang S-C, et al. Worry experienced during the 2015 middle east respiratory syndrome (MERS) pandemic in Korea. PLoS One 2017;12:e0173234.
24. Qureshi MM, Khan TA, Mohsin S, Channa AAJPAFMJ. The price of Battling COVID-19: a cross-sectional survey.. Pak Armed Forces Med J 2020;70;S468–74.
25. Raja HZ, Saleem MN, Saleem T, et al. Perceived stress levels in Pakistani dental students during COVID-19 lockdown. EJDENT 2020;1.
26. Taylor JM. Psychometric analysis of the Ten-Item perceived stress scale. Psychol Assess 2015;27:90–101.
27. Lee E-H. Review of the psychometric evidence of the perceived stress scale. Asian Nurs Res 2012;6:121–7.
28. SMİH Z, Yaqoob N, Naveed A, et al. Positive attitude and stress among adults with coronary heart diseases in Faisalabad. Khyber Medical University Journal 2018;114.
29. Elizarrarás-Rivas J, Vargas-Mendoza JE, Mayoral-Garcia M, et al. Psychological response of family members of patients hospitalised for influenza A/H1N1 in Oaxaca, Mexico. BMC Psychiatry 2010;10:104.
30. SMİH Z, Yaqoob N, Saleem R. Psychological distress and disease: level of stress in victims of type 2 diabetes mellitus. J Postgrad. Med Inst 2017;31.
31. Spitzer RL, Kroenke K, Williams JBW, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 2006;166:1092–7.
32. Asad Nargis, Ali Nathwani Apsara, Lakhdir MPAL. Patient and public involvement. This study involves human participants and was approved by institutional review committee. Participants gave informed consent to participate in the study before taking part.
33. 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:e00090520.
34. Rodríguez-Arévalo D, Albaladejo A, Urrutia R, et al. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. Front Psychiatry 2020;11:1155.
35. Torales J, Rios-Gonzalez C, Barrios I, et al. Self-Perceived stress during the quarantine of COVID-19 pandemic in paraguay: an exploratory survey. Front Psychiatry 2020;11:1155.
36. Georgiou N, Delfabbro P, Balzan R. COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs. Pers Individ Dif 2020;166:110201.
37. Pedrozoo-Pupo JC, Pedrozo-Cortés MJ, Campo-Arias A, AjuCSP C-A. Perceived stress associated with COVID-19 epidemic in Colombia: an online survey. Cad Saude Publica 2020;36:e00090520.
38. Scarpellini F, Segre G, Cartabia M, et al. Distance learning in Italian primary and middle school children during the COVID-19 pandemic: a national survey. BMC Public Health 2021;21:1035.
39. Stocchetti N, Segre G, Zanier EA, et al. Burnout in intensive care unit workers during the second wave of the COVID-19 pandemic: a single center cross-sectional Italian study. Int J Environ Res Public Health 2021;18:6102.
40. Huang Y, Zhao N, disorder Gxendie. Depressive symptoms and sleep quality during COVID-19 epidemic in China: a web-based cross-sectional survey. medRxiv 2020.
41. Ro J-S, Lee J-S, Kang S-C, et al. Worry experienced during the 2015 middle east respiratory syndrome (MERS) pandemic in Korea. PLoS One 2017;12:e0173234.
Wakode N, Wakode S, Santoshi J. Perceived stress and generalized anxiety in the Indian population due to lockdown during the COVID-19 pandemic: a cross-sectional study. *F1000Res* 2020;9:1233.

Pappas S. The toll of job loss, 54. American Psychological Association, 2020.

Attuntaş O, Tekeci Y. Effect of COVID 19 on perceived stress, coping skills self-control and self-management skills. *Research Square* 2020.

Lee SM, Kang WS, Cho A-R, et al. Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Compr Psychiatry* 2018;87:123–7.

Jalloh MF, Li W, Bunnell RE, et al. Impact of Ebola experiences and risk perceptions on mental health in Sierra Leone, July 2015. *BMJ Glob Health* 2018;3:e000471.

Kaufman KR, Petkova E, Bhui KS, et al. A global needs assessment in times of a global crisis: world psychiatry response to the COVID-19 pandemic. *BJPsych Open* 2020;6:e48.

Barber S, Reed L, Syam N. Severe mental illness and risks from COVID-19, 2020. Retrieved on 03 SEP 2020.

Jeżewska-Zychowicz M, Plichta M, Królak M. Consumers’ fears regarding food availability and purchasing behaviors during the COVID-19 pandemic: the importance of trust and perceived stress. *Nutrients* 2020;12:2852.

Rehman U, Shahnawaz MG, Khan NH, et al. Depression, anxiety and stress among Indians in times of Covid-19 lockdown. *Community Ment Health J* 2021;57:42–8.

Bonati M, Campi R, Zanetti M, et al. Psychological distress among Italians during the 2019 coronavirus disease (COVID-19) quarantine. *BMC Psychiatry* 2021;21:20.

Tulane University. School of public health and tropical medicine 2020. Available: https://publichealth.tulane.edu/blog/effects-of-social-isolation-on-mental-health/