





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

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## 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.<sup>1 2</sup> The scale of this crisis has upsurged over time, claiming countless lives and affecting millions of

## 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.

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.<sup>3</sup> As it is being written (10 January 2021), there have been 502 416 cases of COVID-19 in Pakistan, out of which 456 969 have recovered, whereas 10 644 have died.<sup>3 4</sup> These numbers are inclusive of the second wave of the COVID-19. Amidst the first extremely fatal wave of COVID-19, 6795 lives were lost, and 632 were left dependent on mechanical ventilation.<sup>5</sup>

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



different provinces and cities, affecting more than 50 million people.<sup>6</sup> 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.<sup>7 8</sup> 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.<sup>9 10</sup> 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.<sup>11</sup>

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.'<sup>12</sup> 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.<sup>13 14</sup> Internationally, in Italy, 21.8% of the general population were found to have extremely high-perceived stress levels,<sup>15</sup> whereas, in Paraguay, almost 78% of the study subjects were suffering from moderate to high-perceived stress levels.<sup>16</sup> Other international studies from Australia and Columbia depicted similar findings as a substantial proportion of the general population had high levels of stress.<sup>17 18</sup> 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%).<sup>10</sup> Similarly, in Nepal, almost three-quarters of the study participants perceived moderate to severe stress.<sup>19</sup> 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.<sup>20</sup> 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 way of the pandemic.<sup>21</sup> 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 person.<sup>10 22 23</sup> 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.<sup>24</sup> Nearly 53.5% of dental students were suffering from severe stress in another study.<sup>25</sup> 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.<sup>7</sup> 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 morbidities. 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).

## 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.<sup>26</sup> 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, felt nervous or stressed, confidence about handling personal problems, felt 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.<sup>26</sup> The internal consistency of this tool was good, with a Cronbach alpha of 0.78–0.89.<sup>25</sup> The reliability of this tool was also considered good, with an intra-class correlation of >0.70.<sup>27</sup> This tool was previously used and validated in our settings.<sup>28</sup> Moreover, this tool was also used to assess perceived stress in the general population in pandemic situations.<sup>29</sup> This tool has been translated and used in Urdu in previous studies.<sup>30</sup>

### 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).<sup>22</sup> 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.<sup>31</sup> This tool was validated for use in the general population<sup>32 33</sup> and was previously used and validated in our settings.<sup>33</sup> Moreover, this tool was also previously used to assess GAD in the general population in pandemic situations.<sup>22 34</sup> This tool was translated and previously used in the Urdu language.<sup>33</sup>

#### *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

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%)
<b>Age</b>				
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)
<b>Sex</b>				
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)
<b>Education status</b>				
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 (19.91)	468 (68.52)	79 (11.57)
<b>Working status</b>				
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)
<b>Time</b>				
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)
<b>Generalised anxiety disorder</b>				
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)
<b>Currently having any psychiatric illness</b>				
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)
<b>Past history of chronic diseases</b>				
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)
<b>Worried about getting infected when the first case confirmed</b>				
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)
<b>Worried about getting infected when cases started increasing</b>				
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)
<b>Worried about the imposition of lockdown</b>				
No	851 (51.45)	184 (21.62)	551 (64.75)	116 (13.63)

Continued

**Table 1** Continued

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)
Worried about the shortage of food				
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				
No fear	224 (13.54)	56 (25.00)	134 (59.82)	34 (15.18)
Slight fear	796 (48.13)	170 (21.36)	546 (68.59)	80 (10.05)
A lot of fear	634 (38.33)	55 (8.68)	459 (72.40)	120 (18.93)
Fear of loved ones getting infected with COVID-19				
No fear	79 (4.78)	21 (26.58)	53 (67.09)	5 (6.33)
Slight fear	309 (18.68)	82 (26.54)	205 (66.34)	22 (7.12)
A lot of fear	1266 (76.54)	178 (14.06)	881 (69.59)	207 (16.35)
Frequency of checking news				
Frequently	469 (28.36)	65 (13.86)	329 (70.15)	75 (15.99)
Sometimes	586 (35.43)	110 (18.77)	404 (68.94)	72 (12.29)
Rarely	599 (36.22)	106 (17.70)	406 (67.78)	87 (14.52)
Stressful self-isolation/quarantine				
No	334 (20.19)	101 (30.84)	191 (57.19)	40 (11.98)
Somewhat	862 (52.12)	141 (16.36)	623 (72.27)	98 (11.37)
Yes, a lot	458 (27.69)	37 (8.08)	32 (70.96)	96 (20.96)
Currently indulging in physical activities				
No	814 (49.21)	107 (13.14)	562 (69.04)	145 (17.81)
Yes	840 (50.79)	175 (20.71)	590 (68.69)	90 (10.60)
Confident with infection control practices by people around				
No	1015 (61.37)	149 (14.68)	698 (68.77)	168 (16.55)
Yes	639 (38.63)	132 (20.66)	441 (69.01)	66 (10.33)
Anxious about the uncertainty of the situation				
Not anxious	138 (8.34)	30 (21.74)	96 (69.57)	12 (8.70)
Mildly anxious	655 (39.60)	147 (22.44)	460 (70.23)	48 (7.33)
Moderately anxious	595 (35.97)	84 (14.12)	417 (70.08)	94 (15.80)
Severely anxious	266 (16.08)	20 (7.52)	166 (62.41)	80 (30.08)
Current health status				
Infected or recovered from COVID-19	126 (7.62)	14 (11.11)	93 (73.81)	19 (15.08)
Currently one or more symptoms	65 (3.93)	7 (10.77)	44 (67.69)	14 (21.54)
Currently no symptoms of COVID-19	1463 (88.45)	260 (17.77)	1002 (68.49)	201 (13.74)
Knowledge regarding symptoms				
Poor	227 (13.72)	42 (18.50)	166 (73.13)	19 (8.37)
Satisfactory	934 (56.47)	166 (17.77)	629 (67.34)	139 (14.88)
Good	493 (29.81)	73 (14.81)	344 (69.78)	76 (15.42)
Knowledge regarding prevention				
Poor	91 (5.50)	7 (7.69)	77 (84.62)	7 (7.69)
Satisfactory	633 (38.27)	110 (17.38)	424 (66.98)	99 (15.64)
Good	930 (56.23)	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.<sup>35</sup>

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

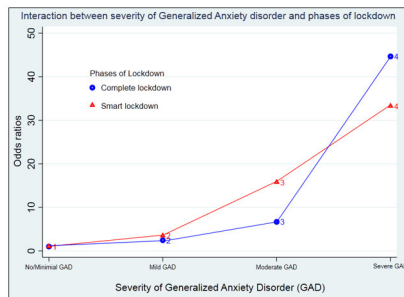
In the present study, rates of high and moderate perceived stress among the general population during the COVID-19 outbreak were 14% and 69%, respectively, comparable to the studies conducted in various parts of the world.<sup>15 16 36 37</sup> Such high prevalence could be explained by several factors, 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.<sup>16 36</sup>

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.<sup>38</sup> 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.<sup>36 39</sup> 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.<sup>40 41</sup> 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).				





**Figure 1** Graphical representation of association of generalised anxiety on perceived stress status of general population of Pakistan amidst COVID-19 enforced lockdowns.<sup>16</sup>

unemployment rates and hiring freeze worldwide to the COVID-19 outbreak.

Another significant variable was the persisting mental illnesses. Relative to other studies, psychiatrically ill individuals had greater odds of perceived stress.<sup>16</sup> 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.<sup>42 43</sup> 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.<sup>16</sup>

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.<sup>44</sup> 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.<sup>45</sup> Likewise, several other studies reported that quarantine amplifies the levels of stress and psychological distress among the general population.<sup>46</sup> 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.<sup>47</sup>

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.

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**Patient consent for publication** Not applicable.

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