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The immediate psychological response of the general population in Saudi Arabia during COVID-19 pandemic: A cross-sectional study

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ABSTRACT

Background: The outbreak of COVID-19 may differentially exacerbate anxiety and stress in people subjected to the real or perceived threat of the virus.

Method: An online cross-sectional survey was carried out to assess the general population's psychological response during the initial state of the outbreak in Saudi Arabia. The study used brief screening tools PHQ-4 for anxiety-depression symptoms and IES-6 for posttraumatic stress disorder symptoms.

Results: Among the 584 respondents, 19.8% and 22.0% reported moderate to severe anxiety and depression symptoms respectively. According to the combined PHQ-4 score, 14.5% of participants showed moderate to severe anxiety or depression disorder. Overall, 64.8% met the level of clinical concern for posttraumatic stress disorder and 51.3% met the level of probable posttraumatic stress disorder diagnosis. Multivariate analyses showed that females, non-Saudi nationalities, and those who had a history of mental illness were more vulnerable to anxiety and depression disorders than their counterparts, whereas a higher prevalence of distress symptoms was reported among those who prefer Arabic over English for communication. It was found that people whose colleagues or family infected with the disease were more likely to report moderate to severe symptoms of anxiety or depression and distress. The study further showed that the higher the perceived threat, the higher the chances of exhibiting anxiety-depressive disorder symptoms and distress symptoms.

Conclusion: The findings might be a matter for serious concern, and considerable attention is required from authorities and policymakers regarding early detection and treatment of these illnesses in order to reduce the burden of the pandemic related mental illness.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), publicly known as Coronavirus disease 2019 (COVID-19) or the novel coronavirus (2019-nCoV) disease, started as a zoonotic transmission event in China. Quickly it becomes a threat to the world community, eventually WHO declared COVID-19 as a pandemic disorder [1,2]. Despite the extreme preventive measures, the number of people affected directly or indirectly is substantial, with no exemption to countries in the Arab region. As of 31st

May 2020, more than half a million COVID-19 cases, including 12,353 deaths, were reported in the Arab region. The Kingdom of Saudi Arabia (KSA) was placed on the top after Iran in terms of the total number of COVID-19 confirmed cases (83,384 cases) and on the bottom four with the lowest case fatality ratio of 0.60 [3].

Globally, governments and health services authorities are vigilant about the rapid spread, and they implement many measures to control the spread of SARS-CoV-2. These measures include identification and isolation of suspected and diagnosed cases, contact tracing and monitoring, the establishment of isolation units, practicing social distancing, home quarantine, travel restrictions, and the extreme stay-at-home restrictions [4]. In KSA, a 16-days lockdown with travel restrictions was initially announced on 15th Mar 2020 following the first COVID-19 case was reported on 2nd Mar 2020, and it further extended for an indefinite period [5]. Besides, a strict curfew with stay-at-home restriction was employed during

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April and May as the number of confirmed cases reached 1720 as of 1st Apr (number of daily new cases = 153) and 24,097 as of 1st May (number of daily new cases = 1344) [5]. The steep increases in the number of confirmed cases and the restrictions on movement and day-to-day activities may negatively affect people's mental health [6,7].

Previous studies on SARS and Ebola outbreaks reported a wide array of psychiatric morbidities, including anxiety, psychomotor excitement, panic attack, posttraumatic stress disorder (PTSD), psychotic symptoms, persistent depression, delirium, and even suicidality [8–11]. Frontline health care professionals, especially those working in hospitals caring for people, high-risk communities, and the survivors were more vulnerable to the outbreak-related mental health problems. The largest outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV) was seen in KSA with 2102 confirmed cases during the period 2012–2019 [12]. A previous study on MERS-CoV reported that residents in the country, especially health care providers, experienced a wide range of mental health problems [13].

Infectious disease outbreaks significantly cause psychosocial problems [6–8]. The outbreak of COVID-19 may differentially exacerbate anxiety and stress in people subjected to the real or perceived threat of the virus. The uncertainty of the incubation period, asymptomatic transmission, extraordinary large-scale quarantine measures, curfew, and lockdown surge the likelihood of adverse psychosocial effects on the public [4]. Importantly, the quarantine measures lead to substantial decline in economic activities, raise in unemployment or in job insecurity, increases in cost of living, and to implement severe cuts in government's public spending. The economic crisis may weaken the protective factors and strengthen the risk factors of population mental well-being [14,15]. The extensive media coverage that highlights COVID-19 as a unique threat may further added to panic, stress, and the potential for hysteria. The WHO, along with national authorities, is keen on monitoring the impact of the COVID-19 pandemic on people's mental health [6,7].

An updated systematic review and meta-analysis on COVID-19 related mental health issues among COVID-19 patients, health professionals, and the general public published until the end of May 2020 identified 62 studies from 17 countries [16]. Among these studies, five were from the Middle East (including four from Iran and one from Israel), but none from the Gulf Cooperation Council countries. The prevalence ranged 8%–81% for anxiety, 10%–67% for depression, 3%–93% for PTSD. The review showed substantial heterogeneity between country estimates and within-country estimates of the prevalence of psychological disorders, and hence it advocates multiple studies to quantify the problem. Though an extended search found a few publications covering different mental health issues among different populations in Saudi Arabia [17–20], epidemiological documents on the psychiatric morbidity of the current COVID-19 pandemic are still limited and localized. It is unclear, as no related studies are available, that how general public's personal experiences with COVID-19 related events and their perceived COVID-19 threat to their community affect the mental well-being of the public.

The present study was aimed to collect information on the mental health problem and psychiatric comorbidities during the pandemic period among the general population of the KSA. The objectives of this study were (1) to estimate the prevalence of anxiety-depression and distress following exposure to the COVID-19 outbreak in the general population; and (2) to assess the impact of COVID-19 experience and the perceived threat on anxiety, depression, and distress symptoms.

Methodology

Study design

An online-based cross-sectional study was carried out from 12th April to 10th May 2020. During the period, the number of confirmed COVID-19 cases was increased from 4462 to 39,048, and the number of related deaths was increased from 59 to 246 [21]. The online questionnaire was created using the Question-Pro tool and circulated through emails and social media platforms. For the data collection, the administrative regions of the KSA were merged into five geographical regions (Eastern, Central, Western, Northern, and Southern regions). The incidence of COVID-19 was higher in the Eastern, Central, and Western regions compared to the other regions. The distribution of the questionnaires was planned to have participants from these regions. Residents of Saudi Arabia who were aged 15 years or older were eligible to participate in the study if they could respond to the questionnaire either in Arabic or English. Participation in the study was voluntary, and the participants were requested to provide their informed consent and confirm their eligibility by selecting checkboxes. The online questionnaire was designed such that only those individuals who consented to participate and meet the eligibility criteria were allowed to continue with the survey. The study was approved by the Institutional Review Board (IRB approval number: IRB-2020-05-173).

Sample size

As the study expected a high prevalence of mental health symptoms, a prevalence of 50% that yields the largest sample size was assumed. The study required sample size of 600 participants to detect the prevalence with a 95% confidence level and a 4% type 1 error rate.

Data collection

Both Arabic and English version of the study questionnaire was made available through QuestionPro. The study adopted a questionnaire that assessed the mental health impact of the Ebola epidemic in the general population of Sierra Leone [11], with modifications suitable for COVID-19 in the Middle-East population. The questionnaire has 30 items over six sections. The sections include (1) socio-demographic and clinical characteristics of participants; (2) personal experience with the COVID-19 related events (knowing persons tested positive for SARS-CoV-2); (3) perceived COVID-19 threat to the country, neighborhood, and household; (4) anxiety and depression using the Patient Health Questionnaire 4 (PHQ-4) [22]; and (5) distress using Impact of Event Scale – 6 (IES-6) [23,24].

PHQ-4 is a validated ultra-brief screening scale consisting of the first two items from the PHQ-9 questionnaire (a 9-item depression severity scale), and generalized anxiety disorder -7 (GAD-7; a 7-item generalized anxiety severity scale), respectively [22]. Both Arabic and English versions of PHQ-4 were obtained from the PHQ website (https://www.phqscreeners.com/select-screener). Each subscale ranges from a score of 0–6, and the combined scale ranges from a score of 0–12. Previous research suggests scores of three or greater as moderate and five or greater as severe indicators for potential cases of depression and anxiety in the depression and anxiety subscales, respectively [25]. For use in clinical practice, the study suggested considering the combined scale with scores of six or greater as "yellow flags-moderate" and scores of nine or greater as "red flags - severe" for the presence of a

depressive or an anxiety disorder [25]. The internal consistency of the scale was assessed, and the reliability test gave a Cronbach's α of 0.73.

IES-6 is a brief scale measure severity of distress following exposure to traumatic events, and it has six items that were measured on a 4-point severity scale with a total score ranges from a scale of 0–24, which reflects the level of posttraumatic stress reactions [23,24]. The scale is particularly useful in studies for quick screening of a large population for PTSD and was used in an Ebola epidemic study [11]. We used scores of 7 or greater as a 'clinical concern' for PTSD and scores of 9 or greater as 'probable diagnosis' of PTSD according to a previous study [11]. The Arabic instrument was validated through translation and back-translation method by three independent groups of translators. The Arabic version was piloted on a sample after consonance was achieved between translators. The reliability test gave a Cronbach's α of 0.79.

Analysis

Data were summarized using frequencies (percentages) and mean (standard deviation) as appropriate. For analyses, binary variables were created for indicating the presence of symptoms for anxiety-depression and clinical concerns for PTSD, respectively. Univariate analyses were carried out using the Chi-square test for testing the association between predictors and the outcome variables. Multivariate logistic regression models were used to assess the determinants of psychological disorder symptoms. Variables that found significant in the univariate analysis were entered into multivariable logistic regression. The adjusted odds ratio (AOR) and its 95% confidence interval (CI) were reported. A two-sided p-value of 0.05 or lower regarded as statistically significant. All analyses were carried out using Stata/SE 16.1.

Results

Characteristics of participants

The questionnaire was reached to 1273 individuals, and 60% (n = 765) of them initiated filling the questionnaire, and 649 met the eligibility criteria. A total of 90% (584/649) completed the baseline and PHQ-4 items, and 50 of those completed the PHQ-4 items had discontinued before filling the IES-6 related items.

The participants' characteristics are summarized in Table 1. Majority of participants were males, aged less than 45 years, Saudi nationalities, and mostly from the Eastern, Central or Western regions. Importantly, one-fifth of participants were health care professionals, and nearly one-third were working from the office site during the COVID-19 lockdown. A minor proportion of participants reported that they had a serious or chronic illness, or some mental health issues before the COVID-19 outbreak. Majority preferred the Arabic version of the questionnaire over the English version, and there observed an increased participation over weeks.

Prevalence of anxiety and depression

A total of 104 (17.6%) and 128 (21.9%) participants showed moderate-severe anxiety and depressive symptoms, respectively (Fig. 1). According to the combined scale PHQ-4, prevalence of moderate-severe anxiety-depressive disorder symptom was 14.5% (n = 85). Importantly, 20 (3.4%) were on the severe anxiety-depressive disorder as per the combined scale. The mean (SD) PHQ-4 score was 2.9 (2.6) on a 0–12 scale.

Univariate analyses showed gender and existing mental health issues were significantly associated with the moderate-severe

Table 1
Characteristics of participants (n = 584).

Baseline data	n	%
Gender		
Male	361	61.8%
Female	223	38.2%
Age		
<25 years	132	22.6%
25−34 years	232	39.7%
35−44 years	107	18.3%
45 years or older	113	19.3%
Nationality		
Non-Saudi	124	21.2%
Saudi	460	78.8%
Region of Saudi		
Eastern Region	250	42.8%
Central Region	91	15.6%
Western Region	133	22.8%
Southern/northern Region	110	18.8%
Education		
Secondary school or lower	126	21.6%
Bachelor's degree	312	53.4%
Professional degree, masters or higher	146	25.0%
Employment Status		
Student	112	19.2%
Health Professionals	110	18.8%
Other government sectors	154	26.4%
Other private sectors	134	22.9%
Unemployed	74	12.7%
Working status during the lockdown		
Not working	160	27.4%
Mostly work-from-home	244	41.8%
Mostly work at the office site	180	30.8%
Marital status		
Single	256	43.8%
Married	328	56.2%
Accommodation status		
Living alone	57	9.8%
Living with family	502	86.0%
Living in shared accommodation	25	4.3%
Presence chronic illness		
No	518	88.7%
Yes	66	11.3%
Existing mental health issues		
No	564	96.6%
Yes	20	3.4%
Preferred communication language		
Arabic	423	72.4%
English	161	27.6%
Week of data collection		
Week 1	74	12.7%
Week 2	162	27.7%
Week 3	146	25.0%
Week 4	202	34.6%

anxiety-depressive disorder (Columns 2, 3 & 4 in Table 2). A multivariate logistic regression model showed a higher risk of the moderate-severe anxiety-depressive disorder among females [AOR (95% CI): 2.8 (1.7, 4.6)] compared to males, non-Saudi individuals [AOR (95% CI): 1.8 (1.03, 3.2)] compared to Saudi nationals, and individuals having existing mental health issues [AOR (95% CI): 4.0 (1.4, 10.9)] compared to those without any existing mental health issues. The higher risk, but not statistically significant, was also observed among students [AOR (95% CI): 1.8 (0.75, 4.3)] and health professionals [AOR (95% CI): 2.1 (0.86, 4.9)] compared to unemployed.

Prevalence of posttraumatic stress disorder

The mean (SD) IES-6 score was 8.8 (4.9) on a 0–24 scale. The results in Fig. 1 displays the prevalence of distress. Overall, 65.5% (n = 350) met levels of clinical concern for PTSD and 51.9% (n = 277) met levels of probable PTSD diagnosis.
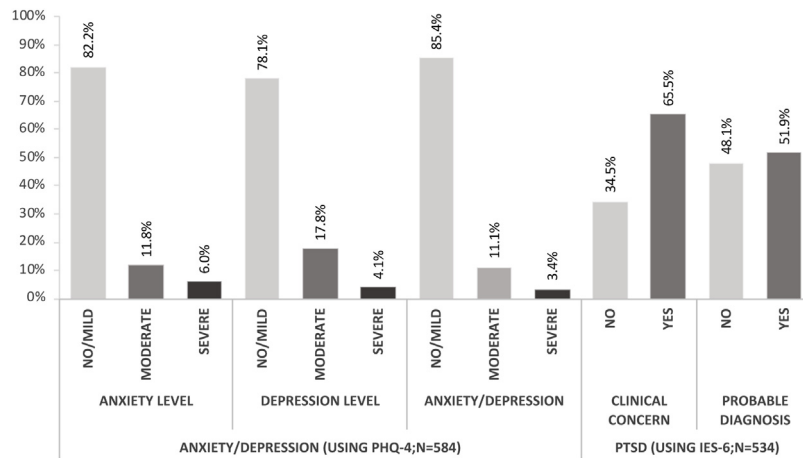
Fig. 1. Prevalence of anxiety/depression and distress.

Univariate analysis (Columns 5, 6 & 7 in Table 2) showed the risk of having clinical concern for PTSD was not statistically differed by the levels of socio-demographic characteristics of individuals. Multivariate analysis showed that only the variable preferred language for communication was found to be associated with the clinical concern for PTSD: more people who prefer the Arabic language at the risk compared to those prefer the English language [AOR (95% CI): 1.5 (1.01, 2.3)].

Impact of personal experience with the COVID-19 related events on psychological disorders

As shown in Table 3, more than a quarter of the participants knew a person who was tested positive for SARS-CoV-2. Both univariate and multivariate analyses (model 1) showed that individuals having personal experience with COVID-19 related events were at higher risk for anxiety-depression [AOR (95% CI): 1.6 (0.94, 2.7)] and PTSD [AOR (95% CI): 1.7 (1.1, 2.6)]. Model 2 in Table 3 explored the association between the degree of personal level experience with COVID-19 and psychological disorders. The results showed that individuals who knew only non-hospitalized COVID-19 cases were at higher risk for anxiety-depression [prevalence = 21.2%; AOR (95% CI): 2.0 (1.1, 3.5)] and individuals who knew hospitalized COVID cases were at higher risk for PTSD [prevalence = 80.4%; AOR (95% CI): 2.5 (1.2, 5.0)] compared to who did not have such experience levels (prevalence = 12.8% for anxiety-depression and 62.6% for PTSD symptoms).

Impact of perceived COVID-19 threat on psychological disorders

Table 4 lists the prevalence of moderate-severe anxiety-depression and PTSD by different levels of perceived COVID-19 threat. Model 1 explored the association of the perceived threat at the level of the country, neighborhood and household with the psychological disorders. The results showed that the moderate-severe perceived threat at the household level was significantly associated with anxiety-depressive symptoms [AOR (95% CI): 2.3 (1.01, 5.1)] and PTSD symptoms [AOR (95% CI): 2.4 (1.4, 4.1)]. Model 2 considered a composite risk perception score as a predictor for the psychological disorder symptoms. According to the model 2, persons with moderate-severe threat perception at all levels were at a substantially higher risk of reporting moderate-severe anxiety-depression symptoms [prevalence = 20.5%; AOR (95% CI): 9.0 (2.1, 38.8)] and PTSD symptoms [prevalence = 74.5%; AOR (95% CI): 4.5 (2.4, 8.1)] compared to those with minor or lower threat perception at all levels (2.8% for anxiety-depression and 40.0% for PTSD symptoms).

Discussion

The study assessed the prevalence of psychological symptoms using the brief screening tools PHQ-4 for anxiety-depression symptoms [22] and IES-6 for distress symptoms [23,24] among the general population in KSA during the initial period of COVID-19. In this study, 19.8% and 22.0% of respondents reported moderate to severe anxiety and depression symptoms, respectively. According to the combined PHQ-4 score, which was suggested for the screening purpose [25], 14.5% of participants showed moderate to severe anxiety or depression disorder symptoms. In the present study, in terms of distress due to COVID-19, 64.8% of participants met the level of clinical concern for PTSD, and 51.3% met the level of probable PTSD diagnosis. Regression models adjusted with socio-demographic characteristics found that personal experience with the COVID-19 related events and perceived COVID-19 threat to the community are associated with population mental well-being. The results indicate that the COVID-19 pandemic may cause significant psychiatric burdens among the general population during the outbreak, as evident from the previous coronavirus epidemics [8].

This study has some limitations. Firstly, the data collection was done using self-administered questionnaires through an online tool. Therefore, the responders may provide data that meet the social expectation rather than reality, and the clinical significance may be unpredictable. Secondly, the study did not exploit the psychological responses of COVID-19 patients or survivors as such as the primary focus of the study was the general public. Further, but importantly, the study used ultra-brief questionnaires to screen for anxiety, depression, and distress. However, the shorter questionnaires are proven to be used for the initial screening of a large number of individuals [22–25] and result in less abandonment in an online setting [26]. Finally, though financial issues are known risk factors of impaired mental well-being, the study did not consider the COVID-19 related economic crisis that was not severe at the early stage of the pandemic as a factor for mental health. The study involved a fair number of participants with different social-demographic characteristics at the national level, however the generalizability of the findings may be limited by possible selection bias due to language barrier, unfamiliarity with online survey tools, and the oversampling of a particular network of similar groups.

The estimates of the prevalence of anxiety and depression disorders in the present study were lower than the pooled prevalence (33% with anxiety and 28% with depression) reported by a recent meta-analysis of 62 studies from 17 countries [16]. The current estimates were slightly lower than that reported by Al-Khamees et al. [17], researchers from Qassim region of Saudi Arabia (24.0% with

Table 2
Anxiety or depression and distress – association with socio-demographic characteristics.

Baseline data	Anxiety/depression (N = 584)			Clinical concern on PTSD (N = 534)		
	No/Mild	Moderate/ severe	p-value[a]	No	Yes	p-value[a]
Gender						
Male	326 (90.3%)	35 (9.7%)	0.000*	110 (33.3%)	220 (66.7%)	0.487
Female	173 (77.6%)	50 (22.4%)		74 (36.3%)	130 (63.7%)	
Age						
<25 years	110 (83.3%)	22 (16.7%)	0.270	42 (34.7%)	79 (65.3%)	0.552
25−34 years	197 (84.9%)	35 (15.1%)		64 (31.1%)	142 (68.9%)	
35−44 years	89 (83.2%)	18 (16.8%)		37 (36.6%)	64 (63.4%)	
45 years or older	103 (91.2%)	10 (8.8%)		41 (38.7%)	65 (61.3%)	
Nationality						
Non-Saudi	101 (81.5%)	23 (18.5%)	0.155	42 (38.9%)	66 (61.1%)	0.278
Saudi	398 (86.5%)	62 (13.5%)		142 (33.3%)	284 (66.7%)	
Region of Saudi						
Eastern Region	210 (84%)	40 (16.0%)	0.214	76 (33.5%)	151 (66.5%)	0.076
Central Region	77 (84.6%)	14 (15.4%)		35 (44.9%)	43 (55.1%)	
Western Region	111 (83.5%)	22 (16.5%)		35 (27.6%)	92 (72.4%)	
Southern/northern Region	101 (91.8%)	9 (8.2%)		38 (37.3%)	64 (62.7%)	
Education						
Secondary school or lower	109 (86.5%)	17 (13.5%)	0.747	42 (37.5%)	70 (62.5%)	0.747
Bachelor's degree	268 (85.9%)	44 (14.1%)		96 (33.6%)	190 (66.4%)	
Professional degree, masters or higher	122 (83.6%)	24 (16.4%)		46 (33.8%)	90 (66.2%)	
Employment Status						
Student	92 (82.1%)	20 (17.9%)	0.098	34 (33.7%)	67 (66.3%)	0.817
Health Professionals	88 (80.0%)	22 (20.0%)		31 (32.0%)	66 (68.0%)	
Other government sectors	131 (85.1%)	23 (14.9%)		47 (32.4%)	98 (67.6%)	
Other private sectors	122 (91%)	12 (9.0%)		47 (38.5%)	75 (61.5%)	
Unemployed	66 (89.2%)	8 (10.8%)		25 (36.2%)	44 (63.8%)	
Working status during the lockdown						
Not working	135 (84.4%)	25 (15.6%)	0.825	51 (34.9%)	95 (65.1%)	0.327
Mostly work-from-home	211 (86.5%)	33 (13.5%)		84 (37.3%)	141 (62.7%)	
Mostly work at the office site	153 (85.0%)	27 (15.0%)		49 (30.1%)	114 (69.9%)	
Marital status						
Single	220 (85.9%)	36 (14.1%)	0.766	84 (36.4%)	147 (63.6%)	0.418
Married	279 (85.1%)	49 (14.9%)		100 (33.0%)	203 (67.0%)	
Accommodation status						
Living alone	47 (82.5%)	10 (17.5%)	0.529	19 (36.5%)	33 (63.5%)	0.599
Living with family	429 (85.5%)	73 (14.5%)		155 (33.8%)	304 (66.2%)	
Living in shared accommodation	23 (92.0%)	2 (8.0%)		10 (43.5%)	13 (56.5%)	
Presence chronic illness						
No	442 (85.3%)	76 (14.7%)	0.822	167 (35.4%)	305 (64.6%)	0.215
Yes	57 (86.4%)	9 (13.6%)		17 (27.4%)	45 (72.6%)	
Existing mental health issues						
No	486 (86.2%)	78 (13.8%)	0.008*	179 (34.8%)	336 (65.2%)	0.447
Yes	13 (65%)	7 (35.0%)		5 (26.3%)	14 (73.7%)	
Preferred communication language						
Arabic	365 (86.3%)	58 (13.7%)	0.349	126 (32.1%)	266 (67.9%)	0.062
English	134 (83.2%)	27 (16.8%)		58 (40.8%)	84 (59.2%)	
Week of data collection						
Week 1	62 (83.8%)	12 (16.2%)	0.911	28 (41.8%)	39 (58.2%)	0.345
Week 2	140 (86.4%)	22 (13.6%)		54 (37.0%)	92 (63.0%)	
Week 3	123 (84.2%)	23 (15.8%)		40 (30.1%)	93 (69.9%)	
Week 4	174 (86.1%)	28 (13.9%)		62 (33.0%)	126 (67.0%)	

[a] Chi-square test.
* <statistically significant at 5% level.

anxiety and 28.3% with depression on DASS-21 scale), but substantially higher than that reported by Alyami et al. [27], researchers from Najran region of Saudi Arabia (7.3% with anxiety on GAD-7 scale and 9.4% with depression on PHQ-9). The first study was carried out at the very early phase of the COVID-19 pandemic where the total COVID-19 cases were lower than 1000, while the latter study (not yet peer-reviewed) was carried out at the similar phase of the present study where the exponential growth in the number of cases was initiated. However, the prevalence was within the range of that reported by studies among the various population within Saudi Arabia (prevalence varied 15.8%–26% for depression and 16.6%–66% for anxiety) before the COVID-19 outbreak [28–32]. A similar or higher prevalence of psychological burden was reported during the past major infectious diseases outbreaks, such as MERS, SARS and Ebola, especially among those directly affected by the outbreaks [9–11,13,33].

Researches on previous infectious disease outbreak warn about psychiatric presentations, including posttraumatic stress reactions, associated with the COVID-19 pandemic [8,11,33,34]. The estimate of the prevalence of distress from the present study indicated that more than half of the general public in Saudi Arabia were under severe distress during the pandemic period, which was higher than the pooled prevalence of distress of 35% among the general public reported by a recent meta-analysis of studies from 17 countries [16]. The current estimate was also higher than that reported by Al-Khamees et al. (prevalence of moderate-severe psychological impact of the outbreak = 23.6%) [17] and Al-Hanawi et al. (prevalence of distress = 40%) [19] in Saudi Arabia. The lower prevalence with the study by Al-Khamees et al. might be because the data collection was at the early stage of the pandemic and the oversampling from the Qassim region, which affected at the very least during the period [17]. In the present study, more than 40% of participants

Table 3
Personal experience with the COVID-19 related events.

Personal experience with	Anxiety/depression				Clinical concern on PTSD			
COVID-19	Total	Moderate/severe	p-value[a]	AOR	Total[b]	Clinical concern on PTSD	p-value[a]	AOR
Model 1								
Know persons tested positive for SARS-CoV-2								
No	423 (72.4%)	54 (12.8%)	.047*	Reference	390 (73%)	244 (62.6%)	.017*	Reference
Yes	161 (27.6%)	31 (19.3%)		1.6 (0.94, 2.7)	144 (27%)	106 (73.6%)		1.7 (1.1, 2.6)*
Model 2								
Know persons tested positive for SARS-CoV-2 and their hospitalization status								
Do not know	423 (72.4%)	54 (12.8%)	0.093	Reference	390 (73%)	244 (62.6%)	.023*	Reference
Know only COVID cases who were not hospitalized	99 (17%)	21 (21.2%)		2.0 (1.1, 3.5)*	88 (16.5%)	61 (69.3%)		1.4 (0.83, 2.3)
Know COVID hospitalized cases	62 (10.6%)	10 (16.1%)		1.1 (0.49, 2.4)	56 (10.5%)	45 (80.4%)		2.5 (1.2, 5.0)*

[a] Chi-square test.
[b] excluded subjects with no outcome data on PTSD. AOR-adjusted odds ratio; CI – confidence interval.
* <statistically significant at 5% level.

Table 4
Perceived COVID-19 Threat.

Perceived COVID-19 Threat	Anxiety/depression				Clinical concern on PTSD			
	Total	Moderate/severe	p-value[a]	AOR	Total[b]	Clinical concern on PTSD	p-value[a]	AOR
Model 1								
COVID-19 is a threat for the country								
Not a threat	39 (6.7%)	3 (7.7%)	.047*	Reference	32 (6%)	13 (40.6%)	.001*	Reference
Minor	55 (9.4%)	3 (5.5%)		0.7 (0.1, 4.6)	48 (9%)	26 (54.2%)		1.4 (0.5, 3.9)
Moderate/Severe	490 (83.9%)	79 (16.1%)		1.3 (0.3, 6.3)	454 (85%)	311 (68.5%)		1.5 (0.6, 3.9)
COVID-19 is a threat in your neighborhood								
Not a threat	43 (7.4%)	3 (7%)	.025*	Reference	37 (6.9%)	13 (35.1%)	.000*	Reference
Minor	76 (13%)	5 (6.6%)		0.9 (0.2, 5.4)	68 (12.7%)	36 (52.9%)		1.4 (0.5, 3.7)
Moderate/Severe	465 (79.6%)	77 (16.6%)		1.1 (0.2, 6.1)	429 (80.3%)	301 (70.2%)		1.7 (0.7, 4.6)
COVID-19 is a threat in your family								
Not a threat	150 (25.7%)	12 (8%)	.000*	Reference	135 (25.3%)	67 (49.6%)	.000*	Reference
Minor	137 (23.5%)	12 (8.8%)		0.9 (0.4, 2.4)	127 (23.8%)	80 (63%)		1.5 (0.9, 2.6)
Moderate/Severe	297 (50.9%)	61 (20.5%)		2.3 (1.01, 5.1)*	272 (50.9%)	203 (74.6%)		2.4 (1.4, 4.1)*
Model 2								
Risk perception - Composite								
minor/no threat at all levels	71 (12.2%)	2 (2.8%)	.000*	Reference	60 (11.2%)	24 (40.0%)	.000*	Reference
severe threat at some level, but not at all levels	230 (39.4%)	25 (10.9%)		4.4 (1.01, 19.7)*	215 (40.3%)	133 (61.9%)		2.4 (1.3, 4.3)*
severe threat at all levels	283 (48.5%)	58 (20.5%)		9.0 (2.1, 38.8)*	259 (48.5%)	193 (74.5%)		4.5 (2.4, 8.1)*

[a] Chi-square test.
[b] excluded subjects with no outcome data on PTSD. AOR-adjusted odds ratio; CI – confidence interval.
* <statistically significant at 5% level.

were from the Eastern region that was one of the most affected regions in the country, and hence a higher prevalence of COVID-19 related distress might be observed. This finding is a matter for serious concern as psychological problems such as PTSD need early detection and intervention. The high prevalence may be the sudden reaction to the ongoing stressful time and the continuous insensitivity around it due to the most severe pandemic ever had happened in the last decade. The nationwide lockdown and associated social and financial uncertainty, continuous exposure to massive information on COVID-19 related events, poor understanding of the virus and spreading mechanisms, uncertainty about the vaccination and treatment, and fear of getting infected and transmitting the virus to family members or friends also may stimulate the distress.

Multivariate analysis of our data showed that females, non-Saudi nationalities, and those with mental illness histories are more vulnerable to anxiety and depression disorders than their counterparts. The prevalence of the mental disorder symptoms was also found to be higher, but not significantly, among students and health professionals. Other epidemiological studies including a study from Saudi Arabia on the current pandemic have demonstrated that women are more vulnerable to anxiety and depression than men [16,17]. Recent reports from the Ministry of Health revealed that

more than three-quarters of confirmed cases of COVID-19 were from immigrant workers. The higher COVID-19 incidence among expatriates may reflect on their mental health as well, however, the association was not explored in other studies. Factors such as living in a crowded area, public transportation to work, fear of losing a job, consequent deprivation of their income, unpredictable future during and after the current pandemic, and the pandemic situation in their native country may explain the higher prevalence of mental health issues among the non-Saudi nationalities. People with existing mental health conditions are under more threat as the emotional responses to COVID-19 epidemic could result in relapses or worsening of their existing conditions [35]. Similar to the results reported by a study from China [36], students were found to experience a high level of anxiety or depression. In Saudi Arabia, the pandemic outbreak was in the middle of the second semester. The government closed all the educational facilities and switched them to remote learning. Thus, the students faced some obstacles, such as new teaching methods, different exam-style, and lack of appropriate devices for learning. Also, uncertainty about academic progression and fear of losing the year or occurrence of delays in their studies could negatively impact students' mental health. Further, our data showed that one in four health-

care professionals had anxiety or depression symptoms. Though the proportion was highest among all professions, both univariate and multivariate analyses did not show a statistical significance. A recent meta-analysis reported that the prevalence of mental health illness among healthcare workers is more or less similar to the general public, but is more prevalent among the frontline healthcare workers during the current disease outbreak [16]. In terms of PTSD in the present study, the immediate psychological response was similarly prevalent across all considered socio-demographic factors except the preferred language for communication. Since most of the COVID-19 related communications are in Arabic, people prefer Arabic may be more exposed to COVID-19 related events. It could be a reason that led to a higher prevalence of distress symptoms among those who prefer Arabic over English for communication.

The present study also explored how individuals' personal experience with pandemic-related events affects their mental health during the outbreak. It was found that people whose colleagues or family infected with SARS-CoV-2 were more likely to report moderate to severe symptoms of anxiety, depression, and PTSD. Further, it was observed that knowing COVID-19 cases had more than double the chance for showing symptoms of PTSD. A similar finding was observed in the past as well as in the current outbreaks [11,36]. The higher prevalence could be due to concern over the well-being of family and colleagues, and the fear of personal safety.

More than three-fourth of participants thought COVID-19 is a moderate-severe threat to their country and neighborhood, while nearly 50% believed the pandemic is a minor or no threat to their family. The study showed that the higher the perceived threat indicate higher the chances for exhibiting anxiety-depressive disorder symptoms and distress symptoms, as reported by another Saudi study [17]. The finding in the present study was more evident at the household level perceived threat data compared to the threat at other levels. Further, a substantially higher proportion of participants who had perceived moderate-severe threat at all levels reported anxiety-depressive disorder symptoms (20.5% vs. 2.8%; AOR = 9.0) and distress symptoms (74.% vs. 40.0%; AOR = 4.5) compared to that among those who had perceived minor or no threat at all levels. Similar findings reported by an epidemiological study from china [36], wherein high levels of fear of infection to family members were significantly associated with higher stress scale scores. From the lessons learned from the MERS-CoV epidemic, Saudi Arabia started its public awareness program much before the first COVID-19 case reported on 2nd Mar, 2020, to prepare the people to cope with the pandemic and related mental health problems [5]. The campaign employs television advertisements and different social media platforms. In addition to daily press releases, residents in the country receive daily text messages on preventive measures, the new developments of COVID-19, and the sources of help to deal with the pandemic related events [5]. The accurate updates from authorities help to reduce the impact of rumors, still these measures could have adverse psychological effects during the early stage of the outbreak, where growth on the number of cases was significant. Though the prevalence of initial psychological responses may get reduce over time as the number of recovered cases increase, still a significant minority may need proper medical attention for a prolonged time as evident from past infectious disease outbreaks [8,34].

The current study's findings emphasize the need of adopting strategies to mitigate the potential psychological consequences of COVID-19 pandemic among general and vulnerable populations. Many guidelines were issued worldwide, including in Saudi Arabia, to help alleviate some of these negative impacts [37,38]. These guidelines suggest that individuals should rely on accurate information from reliable sources and limit excessive exposure to pandemic related news. It is advisable to follow a healthy diet with regular physical activities, be focused on exciting areas of work,

and stay in touch with relatives and friends to stay away from negative emotions and thoughts. Further, in Saudi Arabia, the National Center for Mental Health Promotion extended country-wide online mental health support services, including mental health awareness campaigns and online psychological support through a dedicated hotline number and a mobile application (http://ncmh.org.sa/). As the burden of pandemic grows, the effectiveness of these corrective measures on remediating the pandemic related mental health illness as and when they arise in society should be further reviewed so that appropriate steps can be taken to refine the mitigation strategies.

Conclusion

The study provided a picture about the occurrence of depression, anxiety, and distress among the general public during the initial phase of the COVID-19 pandemic in Saudi Arabia. The study found that a minority but a substantial proportion of individuals had exhibited symptoms for anxiety or depression, while a majority reported symptoms for psychological distress. Personal experience with the disease-related events and perceived threat to the society and family were found associated with the symptoms of mental health illness. Though the severity of the pandemic related mental health illness may reduce over time as evident from the infectious disease outbreaks, considerable attention is required from authorities and policymakers regarding early detection and treatment of these illnesses in order to enhance the reduction further.

Author contributions

RJ had the idea for the study. RJ, DA and JL equally contributed in study design and literature review. All authors had involved in the data collection. RJ did the data analysis. All authors interpreted the data analysis and helped in drafting the manuscript. All authors have approved the final manuscript.

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Conflict of interest

None

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