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RESEARCH

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Psychiatric outcomes among COVID-19 egyptian patients at ain shams university quarantine hospitals: A cross-sectional study

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Abstract

Background Psychological repercussions resulting from coronavirus disease 2019 (COVID-19) have been encountered, such as anxiety, depression, insomnia, and post-traumatic stress disorder (PTSD). The study aimed to assess the frequency and severity of PTSD, depression, and anxiety in a sample of Egyptian patients with COVID-19 infection and analyze potential risk factors. The current study is a descriptive cross-sectional, hospital-based study, conducted from August 2020 to June 2021. The sample was selected from patients diagnosed with COVID-19 infection at Ain Shams University hospitals (outpatient clinics and inpatient units). Patients underwent a COVID severity criteria scoring system, structured clinical interview for DSM-IV (SCID-I), PTSD checklist–Civilian Version (PCLC), Beck depression inventory, and Taylor's manifest anxiety scale.

Results PTSD was observed in 79.29% of the study sample, 61.43% had depression, and 18.57% had anxiety. The severity of COVID-19 infection was significantly associated with PTSD severity mean scores (*P* value = 0.027). Furthermore, a significant relationship was observed between the severity of depression and COVID-19 infection severity (*P* value = 0.028). The number of comorbid medical risk factors demonstrated significance to PTSD severity (*P* value = 0.014).

Conclusion A significant portion of the study's patients experienced psychiatric consequences following COVID-19 infection, with 79.29% developing PTSD, 61.43% suffering from depression, and 18.57% experiencing anxiety. Various factors, such as the presence of chronic medical illnesses and the number of co-morbid medical risk factors, were observed to contribute to these psychiatric outcomes. Therefore, comprehensive psychiatric assessment and management in COVID-19 patients especially with severe forms of the disease and hospitalized patients are mandatory.

Keywords COVID-19, Anxiety, Depression, Psychiatric consequences, Post-traumatic stress disorder

Background

The World Health Organization (WHO) declared the COVID-19 outbreak a pandemic on March 11, 2020. Egypt's health ministry announced the first case in Cairo on the 14th of February. The government of Egypt closed airspaces, and declared a partial lockdown and curfew [1].

A wide range of preventive measures involved limiting social interaction and isolating individuals infected or at risk to impede the virus's transmission [2]. Although the primary intervention of isolation may successfully

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achieve its goals, it affects the psychological well-being of numerous individuals. Consequently, high levels of distress, anxiety, mood fluctuations, sleep disturbances, obsessive cleaning, and symptoms associated with post-traumatic stress disorder (PTSD) have been recorded [3, 4].

Among mental disorders arising from outbreaks, PTSD, depression and anxiety have been one of the most recognized disorders following severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS) outbreaks, in which symptoms persisted up to one-third of survivors even 6 months after discharge and beyond.

This mental health issue may be linked to the neuroinvasive properties of the viruses. In the case of SARS-CoV-2, the virus enters into the central nervous system (CNS) through receptor-mediated mechanisms, leading to its tropism toward endothelial cells, disrupting the blood–brain barrier (BBB), consequently infiltration of virus-carrying leukocytes and monocytes to multiple brain regions, triggering a neuroinflammatory response with astrogliosis and microglial activation. Simultaneously, a systemic COVID-19 infection dysregulates the immune response, causing a cytokine storm, leading to a significant elevation of plasma inflammatory mediators, including interleukins, chemokines, cytokines, and antibodies. These mediators trigger apoptosis in epithelial cells and cause vascular leakage, which compromise the integrity of the BBB and facilitating the entry of the virus into the brain [5, 6].

Previous studies signified that enduring mental health repercussions was not merely attributed to the infectious disease itself but also influenced by additional factors including fear, stigma, and challenges associated with the quarantine experience [4, 7].

In Egypt, research has provided valuable and crucial insights into the psychological complications following COVID-19 infection, highlighting key contributors to the risk of depression, anxiety and stress. One study found that 70.5% of students experienced depression, 53.6% faced anxiety, and 47.8% suffered from stress among university students [8].

Another study reported high rates of depression (67.1%), anxiety (53.5%), stress (48.8%), and inadequate sleep (< 6 h/day) among 23.1% of participants. Factors, such as being female, working outside the healthcare sector, consuming COVID-19 news for two or more hours daily, and lacking emotional support from family and society, were strongly associated with a higher prevalence of severe to very severe depression, anxiety and stress [9].

During the COVID-19 pandemic, not only those who acquired had suffered physically and psychologically as a result of endotracheal intubation, fear of death from fatal illness, social isolation, and feelings of loss of control, but also survivors who witnessed the demise of family members, face lasting psychological impacts, manifesting as heightened vulnerability to emotions, such as anger, anxiety, depression, insomnia, and symptoms, indicative of posttraumatic stress [10, 11].

While most mental health problems will fade out after the epidemic subsides, symptoms of PTSD may last for a prolonged time and affect a patient's quality of life. This underscores the importance of addressing PTSD as a critical component of post-pandemic mental health care [12].

Therefore, this study aimed to assess the frequency and severity of PTSD, depression, and anxiety after 1 month of COVID-19 infection in a sample of hospitalized and non-hospitalized Egyptian patients to enhance early interventions and to direct the promotion of mental well-being among those patients.

Methods

A descriptive cross-sectional, hospital-based study was conducted from August 2020 to June 2021. The sample was selected from patients diagnosed with COVID-19 infection at Ain Shams University hospitals (outpatient clinics and inpatient units).

The study enrolled 140 Egyptian patients more than ≥ 18 years old and diagnosed with COVID-19 infection by either radiological, laboratory, or clinical findings according to the WHO criteria. Radiological criteria included the presence of bilateral infiltrates, ground-glass opacities, or multifocal consolidation over chest X-rays or CT scans. Laboratory findings involved a positive RT-PCR test, lymphopenia and elevated inflammatory markers [C-reactive protein (CRP) or D-dimer]. Clinically, patients presented with fever, cough, shortness of breath, fatigue, loss of smell or taste, and gastrointestinal symptoms, with severe cases showing respiratory distress, including tachypnea or hypoxia [13].

Patients were divided into 4 equal groups of 35 cases according to the COVID-19 severity criteria scoring system into mild, moderate, severe, and critical. Patients who were diagnosed with previous psychiatric illness, those receiving psychotropic medications and patients who were unable to cooperate or complete the interview due to any cognitive impairment, or severe illness were excluded.

A convenient sample was selected from Ain Shams University hospitals (outpatient clinics and inpatient units).

Sample size was calculated by PASS program version 15, setting the type-1 error (α) at 0.05 and the confidence interval width at 0.1 (margin of error 5%). Liu et al. [6] showed that 7% of the study participants had PTSD.

Calculation according to these values produced a minimal sample size of 130 participants taking into account a 20% dropout rate.

Patients were assessed after 1 month of COVID-19 infection using a pre-designed sheet including age, gender, occupation, past and current general medical history including risk factors for severe COVID-19 co-morbidity, clinical symptomatology of COVID infection, CT chest findings, duration of illness and place of quarantine then the following questionnaires were applied:

COVID-19 severity criteria scoring system [14]: in Korea, a concise severity scoring system was administered by telephone for assigning priority for hospitalization and arranging for facility isolation for COVID-19 patients. Patients were categorized into 4 groups: asymptomatic to mild, moderate, severe, and critical. The assessment takes into account factors, such as age, underlying diseases, and social factors. A score exceeding 10 indicated critical pneumonia patients, warranting admission to a tertiary care hospital ICU; 8–9 referred to severe pneumonia patients requiring admission to a tertiary care hospital general ward while 6–7: were to be admitted to Public hospitals (group A), 4–5: Public hospitals (group B) as moderate severity patients were considered suitable for the community hospital (group A is more severe than group B) and at last if less than 3 were considered asymptomatic to mild cases suitable for the therapeutic living centers. (ex. home isolation).

The structured clinical interview for DSM-IV (SCID-I) [15] was used for assessment of the presence of different psychiatric disorders. The used version was a validated and reliable Arabic version [16].

PTSD Check-List—Civilian Version (PCL-C) (Arabic version) [17] which is a standardized self-report rating scale for the key symptoms of PTSD applied to any traumatic event such as the COVID-19 pandemic outbreak. Respondents were asked how much they have been bothered by each PTSD symptom over the past month on a 5-point severity scale ranging from 1 (not at all) to 5 (extremely stressed). The PCL-C assesses the four clusters of PTSD symptoms including re-experiencing/intrusive, avoidance/numbing, amnesia, and hyperarousal. The total score of PCL-C ranges from 17 to 85; with a score ranging from 17 to 39 indicating mild posttraumatic stress, 40 to 62 reflecting moderate stress, and 63 to 85 indicating severe stress. A validated and reliable Arabic version was used which demonstrated a high internal consistency with Cronbach's alpha ($\alpha = 0.89$) [18].

Beck Depression Inventory [19] is a self-rating inventory used to assess the severity of depressive symptoms. It consists of 21 items, each of which has four responses indicating increasing severity The scoring system was defined as: a score of 0–10 is normal ups and downs, 11–16 indicates mild depression, 17–20 suggests borderline, 21–30 reflects moderate depression, while 31–40 signifies severe and above 40 is classified as extreme. The study employed the Arabic version [20].

The Taylor Manifest Anxiety Scale [21] is derived from the MMPI and presented in 2 forms. For the assessment of anxiety state, the long form (50 items) was used. The total score indicates the severity of the anxiety state, score ranging from 0 to 16 is considered normal, scores between 17 and 25 suggest mild anxiety, from 25 to 36 indicates moderate anxiety, while scores exceeding 36 are indicative of severe anxiety. The Arabic version was used for assessment [22].

Data were analyzed using the Statistical Package for Social Science (SPSS version 22.0, IBM Corp., Chicago, USA, 2013). Quantitative data were expressed as mean and standard deviation for numerical data while frequency and percentage for non-numerical data. The chi-square test was used to examine the relationship between two qualitative variables. Continuous variables were compared using analysis of variance (ANOVA) or non-parametric equivalents. All results were statistically significant when their significant probability was less than 5% ($p < 0.05$).

Results

The study included 140 patients, of whom 80 (57.14%) were under the age of 50. Males made up 40.71% of the participants (Table 1). In terms of medical history, 39.29% of the patients had no prior chronic illnesses. The most prevalent risk factor associated in the study sample was diabetes mellitus (44.29%), followed by hypertension (33.57%) (Table 1).

On applying the Structured Clinical Interview for DSM-IV (SCID-I), it was found that 111 patients (79.29%) had PTSD, 86 patients (61.43%) had depression, and 26 patients (18.57%) had anxiety.

No significant correlation was found between PTSD diagnosis or severity and factors, such as age, occupation, place or duration of quarantine, or CT chest findings. However, a statistically significant association was observed between female gender and PTSD (P value = 0.016). The presence of chronic medical illness and the number of co-morbid medical risk factors were significantly associated with the severity of PTSD (P-values = 0.011 and 0.014, respectively). Notably, congestive heart failure was significantly linked to PTSD severity (P value = 0.001).

Additionally, the severity of COVID-19 infection was significantly associated with the severity of PTSD symptoms (P value = 0.027), indicating that the more severe

Table 1 Socio-demographic characteristics and medical risk factors of the study sample

	Total	
	n	%
Age (years)		
< 50	80	57.14
51–60	49	35.00
61–70	9	6.43
> 70	2	1.43
Gender		
Male	57	40.71
Female	83	59.29
Job		
Healthcare worker	78	55.71
Non-healthcare worker	62	44.29
Chronic medical illness		
No	55	39.29
Yes	85	60.71
Taking immunosuppressants		
No	132	94.29
Yes	8	5.71
HTN		
No	93	66.43
Yes	47	33.57
DM		
No	78	55.71
Yes	62	44.29
Congestive heart failure		
No	138	98.57
Yes	2	1.43

HTN: hypertension; DM: diabetes mellitus; %: percentage

the COVID-19 infection was, it had led to the more severe PTSD symptoms (Table 2).

Moreover, a significant relationship was observed between the COVID-19 infection severity and the severity of depression (*P* value = 0.028). However, when correlating Taylor manifest anxiety scale scores with COVID-19 severity scoring, no significant correlation was observed (*P* value = 0.334) (Table 3).

Furthermore, PTSD severity, as assessed by the PCLC, was significantly correlated with the presence of depression and anxiety (*P* value < 0.001), indicating that the occurrence of depression or anxiety increased the risk of severe PTSD following COVID-19 infection (Table 4).

Discussion

This study is one of the early investigations into the psychiatric consequences of COVID-19 infection in Egypt, particularly focusing on the associated factors. Moreover, it is the first study conducted at Ain Shams University quarantine hospital to assess this issue.

This study reported a high prevalence of PTSD (79.29%), depression (61.43%), and anxiety (18.57%) among Egyptian patients diagnosed with COVID-19. These findings align with multiple studies, including two from Egypt, one conducted by El-Morshedy et al. [23] evaluated the psychological impact of COVID-19 in newly diagnosed cases, with follow-up assessments at 1, 6, and 9 months post-infection. The study found PTSD in 78.3% of patients and anxiety in 17%. Additionally, these findings align with another research conducted in Zagazig, Egypt, where 72% of COVID-19 survivors suffered moderate-to-severe PTSD [24]. This similarity could be attributed to the shared cultural background in addition to the inherent reaction of the Egyptian population to stressful conditions posed by the life-threatening virus.

Furthermore, Xiong et al. [25] highlighted high rates of anxiety (6.33% to 50.9%), depression (14.6% to 48.3%), and PTSD (7% to 53.8%) in the general population during the COVID-19 pandemic across several countries,

Table 2 Correlation between COVID-19 severity and PTSD severity score

COVID-19 severity classification	PTSD severity score		ANOVA	
	Range	Mean ± SD	*F*	*P* value
Mild	17–62	34.800 ± 13.029	3.150	0.027*
Moderate	18–73	41.543 ± 12.899		
Severe	19–68	44.200 ± 13.722		
Critical	17–76	39.600 ± 13.231		

COVID-19 coronavirus disease 2019, *PTSD* post-traumatic stress disorder, *ANOVA* analysis of variance

F: *F*-statistic, a value that represents the ratio of the variance between group means to the variance within the groups

**P* value < 0.05: significant

Table 3 Correlation between COVID-19 severity and depression severity score

COVID-19 severity classification	Depression severity score		ANOVA	
	Range	Mean ± SD	*F*	*P* value
Mild	0–36	9.200 ± 8.425	3.115	0.028*
Moderate	0–54	15.000 ± 10.663		
Severe	0–40	16.200 ± 11.458		
Critical	0–50	12.857 ± 10.396		

COVID-19 coronavirus disease 2019, *ANOVA* analysis of variance, *SD* standard deviation

F: *F*-statistic, a value that represents the ratio of the variance between group means to the variance within the groups

**P* value < 0.05: significant

Table 4 Relation between PTSD severity, depression, and anxiety

	PTSD checklist TS grade										Chi-square	
	Normal		Mild		Moderate		Severe		Total			
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	X^2	*P* value
Depression	1	3.45	0	0	7	13.21	22	40.74	30	21.43	20.749	**< 0.001***
Anxiety	0	0	0	0	13	24.53	36	66.67	49	35	44.126	**< 0.001***

PTSD checklist TS grade: post-traumatic stress disorder total severity grade; %: percentage; Chi square: a statistical test used to determine if there is a significant association between categorical variables; X^2: the chi-square statistic value

**P* value < 0.05: significant

including China, Spain, Italy, Iran, the US, Turkey, Nepal, and Denmark.

The elevated rates of PTSD and depression in the Egyptian studies could be linked to the hospitalization for severe, life-threatening COVID-19, which may have acted as a significant stressor contributing to the development of PTSD and depression [26].

In contrast, a study conducted by Szcześniak etal. [27] and Liu et al. [10] observed lower PTSD prevalence rates of 12.2% and 7% respectively and a study in China by Sun et al. [28] reported that 4.6% of their patient sample experienced a high level of post-traumatic stress, emphasizing the influence of early assessment timing and cultural differences. It should be noted that comparing our results with the previous studies could be challenging due to wide differences in sociodemographic characteristics between different populations and health support systems in addition to the variations in the scales assessing psychological conditions across studies and the health support systems that were established earlier in response to the pandemic.

This study aimed to identify associations between sociodemographic and medical risk factors with PTSD severity. Notably, being female was significantly associated with PTSD (*P* value = 0.016), a finding that aligns with previous research, which consistently highlights gender as a risk factor for PTSD [29–31].

Liu et al. [10] also reported that women are more susceptible to PTSD than men. This observation is further supported by studies from Cim et al. [32] Armitage et al. [33], Ashby et al. [34], and Taquet et al. [35] all of which identified female gender and a history of psychiatric illness as predictors of PTSD symptoms during the pandemic. This susceptibility in women could be explained by the hormonal fluctuations specifically in the ovarian hormones, contributed to the altered sensitivity to emotional stimuli during particular phases in the menstrual cycle. This heightened sensitivity may enhance intrusive flashbacks, forming the potential basis for a specific susceptibility to psychological disorders in women [36].

The presence of chronic medical illnesses and the number of co-morbid medical risk factors were significantly linked to the severity of PTSD in our study. Similar to Miori et al. [37], who noted that one of the main factors associated with the development of PTSD-related symptoms was the presence of more than two comorbidities. Emphasizing a specific focus on chronic and co-morbid conditions as key contributors to PTSD severity. An explanation for this was noted in the literature as patients suffering from multiple chronic illnesses might perceive themselves as more at risk of being endangered than those without medical co-morbidities. Earlier investigations exploring the psychological impact on patients with chronic medical conditions, such as cardiovascular disease, diabetes mellitus, and neoplastic diseases, have uncovered the association with psychiatric symptoms or emotional/psychological distress [38, 39].

This study found no significant correlation between PTSD diagnosis or severity and factors, such as age and place or duration of quarantine. In contrast, the study by El-Morshedy et al. [23] identified older age and the duration of hospitalization as significant risk factors for psychiatric complications. The discrepancy between these findings may be due to differences in the study designs, as the El-Morshedy study evaluated patients at 1, 6, and 9 months post-infection [23].

Our study has shown that severity of COVID-19 infection was linked to the severity of PTSD symptoms, a result consistent with earlier research [40–42]. This relationship can be explained by studies suggesting that more serious COVID-19 required longer hospital stay and more special treatments were needed, such as ICU treatment, mechanical ventilation, and extracorporeal membrane oxygenation [43]. These additional treatments would bring more traumatic events to patients than those for mild patients [42].

Moreover, this study found a significant relationship between the severity of COVID-19 infection and depression severity. However, no significant correlation was observed when relating Taylor manifest anxiety scale

scores with COVID-19 severity. These findings align with other research suggesting that disease severity is a risk factor for psychological problems among COVID-19 survivors, such as anxiety and depression [44, 45].

Furthermore, our study revealed that PTSD severity, as assessed by the PCLC, was significantly correlated with the presence of depression and anxiety, indicating that the occurrence of depression or anxiety increased the risk of severe PTSD following COVID-19 infection. This finding is consistent with previous research, which shows that anxiety disorders are associated with the later development of PTSD symptoms [46, 47]. Additionally, other studies have emphasized that individuals with pre-existing mental health conditions may experience increased vulnerability during the pandemic, owing not only to their existing psychiatric disorders but also to associated physical health issues [48].

This study highlights the critical need for systematic screening of individuals with COVID-19 for psychiatric disorders to enable early intervention and improve quality of life. It is one of the earliest studies to explore the psychiatric impact of COVID-19 infection in Egypt, providing valuable insights into the influencing factors. The study's strength lies in its thorough examination of various factors affecting the development of psychiatric consequences related to COVID-19, including medical, psychiatric, and socio-demographic aspects. However, the cross-sectional design offers only a snapshot of the outcomes, and the study did not include specific populations, such as children, adolescents, or pregnant women, which limits the generalizability of the findings. Additionally, since the study was conducted at a tertiary healthcare center, its results may not be broadly applicable to other populations or healthcare settings, underscoring the need for caution when inferring the findings.

Conclusions

A substantial portion of patients experienced psychiatric repercussions, primarily in the form of PTSD, followed by depression, and anxiety. The findings further unveiled numerous contributing factors associated with the development of psychiatric consequences post-COVID-19 infection. These factors encompassed sociodemographic data, the severity of the COVID-19 infection, as well as medical and psychiatric comorbidity. There is a need for the creation of comprehensive management plans for COVID-19 infection. Additionally, the management of psychiatric conditions in conjunction with COVID-19 requires further evaluation of potential drug interactions. Further research and ongoing monitoring are essential to uncover the precise pathological connection between COVID-19 infection and the emergence of psychiatric symptoms.

Abbreviations

COVID-19	Coronavirus disease 2019
PTSD	Post-traumatic stress disorder
SCID-I	Structured clinical interview for DSM-IV
PCLC	PTSD checklist—Civilian Version
WHO	World Health Organization
SARS	Severe acute respiratory syndrome
MERS	Middle East Respiratory Syndrome
FMASU REC	Research Ethical Committee at the Faculty of Medicine, Ain Shams University
SPSS 20	Statistical Package for Social Science
DIC	Disseminated intravascular coagulopathy
AKI	Acute kidney injury
TNF alpha	Tumor necrosis factor-alpha
IL	Interleukins

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Author contributions

MS, RE, TE, MY and FT: analysis and interpretation of the data design, concept of the study, critical revision of the manuscript. RA: data collection, statistical analysis, analysis and interpretation of the data, and drafting of the manuscript. The authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was a cross-sectional, hospital-based study conducted from August 2020 to June 2021. The sample was selected from patients diagnosed with COVID-19 infection at Ain Shams University hospitals (outpatient clinics and inpatient units). Approval of the research was received from the Research Ethical Committee at the Faculty of Medicine, Ain Shams University (FMASU REC) under the approval number FMASU M S 529/2020. Patients participating in the study provided informed consent after a thorough explanation of the study's design and objectives. Participants had the option to withdraw from the study at any point without the need for justification. Additionally, participants were made aware that the findings of this study might be utilized for scientific publication, and the confidentiality of their information was guaranteed.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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