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Anxiety and depression among COVID-19 survivors: a cross-sectional study

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Abstract

Background The novel coronavirus disease (COVID-19) outbreak has spread globally and resulted in physical suffering in addition to its negative effects on mental health. In the context of the COVID-19 pandemic, concerns about health, finances, employment, and social isolation all played a role in contributing to its effect on mental health. In this study, we aimed mainly to evaluate depression and anxiety among post-COVID-19 survivors in Egyptian population.

Results In this study, 150 post-COVID-19 patients were included. The age range was 51.01 years ± 12.6. The prevalence of depression and anxiety were 65.3% and 36% in the COVID-19 patients 1 month after recovery. Female gender and isolation for more than 15 days are significant risk factors for depression, while age less than 50 years old, urban residence, and worry about getting infected again are significant risk factors for anxiety.

Conclusions Based on the results, we found that COVID-19 recovered patients had a high rate of depression and anxiety. In addition to the emphasis on infection and respiratory symptoms, we need to pay more attention to post-COVID-19 psychiatric symptoms.

Keywords COVID-19 survivors, Depression, Anxiety, Mental health

Background

Late in December 2019, Wuhan, China, saw an outbreak of the highly contagious respiratory illness coronavirus disease 2019 (COVID-19) [1]. On March 11, 2020 [2], the World Health Organization proclaimed COVID-19 to be a pandemic. The basic reproduction rate of SARS-COV-2 may have outpaced that of severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), according to a report on the virus's transmissibility [1]. Globally, 6.6 million fatalities and more than 632 million confirmed cases have been documented as of November 2022 [2].

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More and more studies indicate that neuropsychiatric symptoms may be present in COVID-19 patients even after the infection is no longer detectable, raising concerns about the long-term neuropsychiatric effects in remitted COVID-19 patients as more patients are being diagnosed with the disease [3]. Depressive symptoms, anxiety, and cognitive deficits have been the most common long-term neuropsychiatric consequences [4].

As a result, many nations, including Egypt, have imposed a state of lockdown to stop the spread of the disease, which has led to a global atmosphere of depression and anxiety brought on by social isolation, fears of contracting the disease, disruptions in supply chains, financial distress, ruined travel plans, and uncertainty about the future [5]. Evidence from earlier SARS and MERS outbreaks indicates that viral infections and isolation can quickly cause anxiety and depressive episodes [6].

Psychological manifestations may be caused by COVID-19 infection, the associated medical

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interventions, traumatic memories of severe illness or amnesia, the outcome of the illness, or virus-infected individuals who are worried about the stigma [7, 8]. A prevalent, highly diverse, and chronic complicated, major depressive disorder (MDD) affects over 350 million people globally [9]. Physical, behavioral, and emotional issues are all brought on by MDD [10, 11].

The inability to enjoy yourself, feelings of pessimism, social isolation, and a sense of worthlessness are all typical signs of depression. concentration issues, the inability to make decisions, sleep abnormalities (insomnia or excessive sleep), anorexia, libido loss, and a variety of bodily ailments [12] are all examples of these symptoms. Most depressed symptoms in COVID-19 patients can be detected clearly both during and after a partial recovery [13].

The prognosis for COVID-19 could worsen due to depression. For instance, mental distress and depression may have a detrimental effect on a patient's immunological response [14]. Antiviral therapy may not be as well tolerated or effective by depressed patients because of their unfavorable views towards it. Patients may continue to have depressive symptoms after an epidemic of an infectious disease, according to earlier research [15].

Anxiety is a state of worry that frequently manifests as an emotional overreaction to situations that are merely perceived as dangerous. This sensation typically goes hand in hand with fatigue, irritability, tiredness, and attention deficit. Long-term consequences of anxiety result in alterations in brain chemistry and a rise in stress hormones, which ultimately heighten the frequency or severity of dizziness, headache, and depressive symptoms [16].

Because coronavirus-related anxiety was substantially linked to functional impairments, alcohol or drug use, negative religious coping, excessive pessimism, and passive suicide thoughts, it is suggested by recent research that high anxiety levels be problematic during the pandemic [17]. In order to undertake early treatments that aim to lessen the likelihood of future irrational behaviors and assist those populations in returning to their normal lives, it is crucial to understand the psychological impact of COVID-19 among those who survived the outbreak [18].

While some studies in Asia looked at depression and/or anxiety in COVID-19 patients while they were in the hospital [19] and found increased levels of both (6.8–21.0% and 7.4–31.5%, respectively) there were only a small number of studies looking at post-discharge conditions, particularly mental health status for survivors after COVID-19 [20]. To the best of our knowledge, this study will be among the first to examine sadness and anxiety among post-COVID-19 survivors from the Egyptian community.

Aim of the work

In this study, we aimed to measure the prevalence of depression and anxiety among post-COVID-19 patients and find out sociodemographic and clinical factors associated with depression and anxiety among post-COVID-19 patients.

Methods

The current study is a Cross-sectional descriptive study, which was carried out from October 2021 to March 2022 at Mansoura University post-COVID-19 clinic. The clinic provides outpatient services to the entire population of delta region who recovered from COVID-19 infection. A sample of 150 patients were included. Participants ages were 18 and above. Institutional review board (IRB) approval was obtained prior to the study (MS.21.05.1516); and all participating students agreed to participate in the study at the beginning of the form before answering any questions. Patients were directly interviewed by a trained psychiatrist 1 month after their infection for collection of data described below (questionnaire of demographic, psychosocial, clinical and laboratory data, PHQ-9, and GAD-7)

Study questionnaires

A structured questionnaire containing demographic and psychosocial data. Clinical and laboratory data were gathered from patient's medical records.

The PHQ-9 which is based on the criteria from the DSM-5, was used for assessment of depression [21]. A validated Arabic version of the PHQ-9 [22] was used. It constitutes of nine items. Each item is rated on a 4-point scale ranging from 0 ("not at all") to 3 ("nearly every day"). The sum of the nine items represents the respondent's raw total score on the PHQ-9. A cutoff $\geq$ 10 was used for the categorical diagnosis of depression [23].

The GAD-7 which is based on the criteria from the DSM-5, was also used for assessment of anxiety [24]. A validated Arabic version of the GAD-7 [22] was used. It constitutes of seven items. Each item is rated on a 4-point scale ranging from 0 ("not at all") to 3 ("nearly every day"). The sum of the seven items represents the respondent's raw total score on the GAD-7. A cutoff $\geq$ 10 was used for the categorical diagnosis of anxiety [25].

Sampling and sample size calculation

Sample size was calculate online using Open Epi program (https://www.openepi.com/Samplesize/SSproper.htm). Previous study [26] found that 10.8% of post-COVID-19 patients have depression with α error = 0.05 and absolute

precision of 0.05 then the sample size is 149 at least. Patients who were diagnosed with a psychiatric disorder before COVID-19 infection were excluded.

During a period of 6 months (October 2021 to March 2022), one of the researchers interviewed the patients after explaining the purpose of the study and taking consent from the participants. Cases were assessed by a specialist pulmonologist with severity of COVID-19 classified according to MoHP management protocol for COVID-19 patients in EGYPT (November, 2020). Clinical and laboratory data (CRP and oxygen saturation) were obtained from patients' medical records. Patients were interviewed consecutively until the sample size was completed. All study participants were assured that the data collected would be kept confidential and anonymous, and they agreed to participate in the study at the beginning of the interview.

Statistical analysis

Data analysis was done by IBM SPSS Statistics for Windows, Version 25.0. (IBM Corp, 2017). Categorical data were presented as number and percentage, while continuous data were expressed as mean ± standard deviation. Chi-square test was used to compare categorical data between two groups. Fisher's exact test was used when expected count in any cell is less than five. Crude odds ratio (COR) was calculated using Epi Info program. Significant factors associated with depression, anxiety and insomnia by univariate analysis were entered in forward Wald binary logistic regression analysis to identify significant independent predictors and adjusted odds ratio (AOR). P value ≤ 0.05 is considered statistically significant.

Results

This study was conducted on 150 post-COVID-19 patients. Regarding sociodemographic characteristics of the studied group, the mean age of the participants was 51.01 years ± 12.6, they consisted of 64 males (42.7%) and 86 females (57.3 %), 96 of them were living in urban areas (64%) while 54 were living in rural areas (36%). The majority of the studied participants had completed secondary education (36.7%) and were professionals or semi-professionals (50%). Most of them were married (84.7%). 81.3% of the sample were non-smokers. patients who had chronic illness before COVID-19 infection were found to represent 56% of the sample (Table 1).

Of the 150 patients participating in this study, 44% had a family member infected with COVID-19 and 8% had a family member who died due to COVID-19. 69.3% of the participants worried about getting infected again with COVID-19, 41.3% worried about the stigma of getting infected with COVID-19 and 68.7% worried about the possibility of infecting a family member (Table 2).

Table 1 Sociodemographic characters of studied patients

Variable	*N* (%) (*N* = 150)
Age	
< 50	67(44.7)
≥ 50	83(55.3)
Mean ± SD	51.01 ± 12.6
Sex	
Male	64(42.7)
Female	86(57.3)
Residence	
Rural	54(36)
Urban	96(64)
Educational	
Illiterate	43 (28.7)
≤ secondary education	52 (34.7)
> secondary education	55 (36.7)
Profession	
Housewife	47(31.3)
Manual worker	28(18.7)
Professional or semiprofessional	75(50)
Marital status	
Married	127(84.7)
Not married	23(15.3)
Smoker	
No	122(81.3)
Yes	28(18.7)
Chronic illness *	
No	66(44)
Yes	84(56)

* include diabetes, hypertension, cancer, HCV, renal disease, hypothyroidism, ILD, high cholesterol, bronchial asthma, COPD, stroke, and disc

Patients who were classified as severe COVID-19 infection were found to be 90 patients (60%). Eighty-eight patients had oxygen saturation level < 92% (58.7%) and 106 patients had CRP level > 64.75 (70.7%). 64.7% of our patients were isolated at the hospital while the remaining 35.3 % were home quarantined. The duration of isolation was 15 or more days for the majority of cases (79%). Thirty-five patients received oxygen supplementation (23.3%), 108 patients were admitted to the ICU and 24 patients were put on a ventilator (16%). Most of our patients reported various symptoms during recovery ranging between cough (84.7%), dyspnea (957.3%), fatigue (24%), and expectoration (18.7%) (Table 3).

Females reported higher depression rate (73.3%) compared to males (54.7%) with statistically significant difference between the two groups (P value = 0.02, COR = 2.3) (Table 4).

Table 2 Psycho-social factors related to COVID-19 in studied patients

Variable	*N* (%) (*N* = 150)
A member of family infected with COVID-19	
No	84 (56)
Yes	66 (44)
A member of family died due to COVID-19	
No	138 (92)
Yes	12 (8)
Worry about getting infected again	
No	46(30.7)
Yes	104(69.3)
Worry about the stigma of getting infected	
No	88 (58.7)
Yes	62 (41.3)
Worry about possibility of infecting a family member	
No	47 (31.3)
Yes	103 (68.7)

Table 3 Clinical and laboratory characters of studied patients

Variable	*N* (%) (*N* = 150)
Disease severity	
Mild	37 (24.7)
Moderate	23 (15.3)
Severe	90 (60)
Oxygen saturation	
< 92	88(58.7)
≥ 92	62(41.3)
CRP	
≤ 64.75	44 (29.3)
> 64.75	106 (70.7)
Treatment place	
Home	53(35.3)
Hospital	97(64.7)
Duration of isolation (day)	
< 15	71(47.3)
≥ 15	79(52.7)
Received oxygen supplementation	
No	115(76.7)
Yes	35(23.3)
ICU admission	
No	42(28)
Yes	108(72)
Put on a ventilator	
No	126(84)
Yes	24(16)
Physical symptoms during recovery	
No	23(15.3)
Yes*	127(84.7)
Cough	57(38)
Expectoration	28(18.7)
Dyspnea	86(57.3)
Fatigue	36(24)

* Multiple responses

Depression rates were found to be higher in people who had a family member infected with COVID-19 (72.7%), had a family member who died due to COVID-19 (75%), worried about getting infected again with COVID-19 (67.3%), worried about the stigma of getting infected with COVID-19 (71%) and patients who worried about the possibility of infecting a family member (68%), but there was no statistically significant difference (Table 5).

Patients who were isolated for 15 days or more reported higher depression rate (74.7%) compared to patients who were isolated for less than 15 days (54.9%) with statistically significant difference between the two groups (*P* value = 0.01, COR = 2.4) (Table 6).

Independent predictors of depression among studied patients were female sex with *P* value of 0.003 and AOR = 3.1, and duration of isolation of more than 15 days with *P* value of 0.002 and AOR of 3.3 (Table 7).

Patients aged less than 50 years reported higher anxiety rate (46.3%) compared to patients aged more than 50 years (27.7%) with statistically significant difference between the two groups (*P* value = 0.02, COR = 2.2), females reported higher anxiety rate (43%) compared to males (26.6%) with statistically significant difference between the two groups (*P* value = 0.04, COR = 2.1). Patients with urban residential reported higher anxiety rate (41.7%) than patients with rural residential (25.9%) with statistically significant difference between the two groups (*P* value = 0.05, COR = 2.04) (Table 8).

Patients who worried about getting infected again had higher anxiety rate (42,3%) compared to patients who did not worry about getting infected again with statistically significant difference between the two groups (*P* value = 0.02, COR = 2.6). Patients who worried about the stigma of being infected with COVID-19 had higher anxiety rate (46.8%) compared to patients who did not worry about the stigma of being infected with COVID-19 with statistically significant difference between the two groups (*P* value = 0.02, COR = 2.2) (Table 9).

Anxiety level was found to be higher in mild patients (43.2%), patients with oxygen saturation ≥ 92% (37.1%), patients with CRP level > 64.75 (37.7%), in patients who were home quarantined (41.5%), patients who were isolated for 15 or more days (41.8%), patients who received oxygen supplementation (37.1%), ICU admission(35.2%), patients who were put on a ventilator (37.5%), and patients who had no symptoms during

Table 4 Association of depression and sociodemographic factors

Variable	Total * *N* (%)	Depression # *N* (%)	*P* value	COR (95%CI)
Overall	150	98(65.3)	–	–
Age				
< 50	67(44.7)	46(68.7)	0.4	1.3(0.7–2.6)
≥ 50	83(55.3)	52(62.7)		1r
Sex				
Male	64(42.7)	35(54.7)	0.02	1r
Female	d86(57.3)	63(73.3)		2.3(1.1–4.5)
Residence				
Rural	54(36)	36(66.7)	0.8	1.1(0.5–2.2)
Urban	96(64)	62(64.6)		1r
Educational				
Illiterate	43 (28.7)	27(62.8)	0.6	1.2(0.5–2.7)
≤secondary	52 (34.7)	39(75)	0.07	2.2(0.9–4.9)
>secondary	55 (36.7)	32(58.2)		1r
Profession				
Housewife	47(31.3)	33(70.2)	0.6	1.3(0.6–2.7)
Manual worker	28(18.7)	16(57.1)	0.4	0.7(0.3–1.7)
Professional or semiprofessional	75(50)	49(65.3)		1r
Marital status				
Married	127(84.7)	84(66.1)	0.6	1.3(0.5–3.1)
Not married	23(15.3)	14(60.9)		1r
Smoker				
No	122(81.3)	82(67.2)	0.3	1.5(0.7–3.6)
Yes	28(18.7)	16(57.1)		1r
Chronic illness				
No	66(44)	44(66.7)	0.9	1.1(0.6–2.2)
Yes	84(56)	54(64.3)		1r

* Column percentage

Row percentage

Table 5 Association of depression and social factors related to COVID-19

Variable	Total * *N* (%)	Depression # *N* (%)	*P* value	COR (95%CI)
A family member infected with COVID-19				
No	84 (56)	50(59.5)	0.09	1r
Yes	66 (44)	48(72.7)		1.8(0.9–3.6)
A family member died due to COVID-19				
No	138 (92)	89(64.5)	0.5	1r
Yes	12 (8)	9(75)		1.7(0.4–6.4)
Worry about getting infected again				
No	46(30.7)	28(60.9)	0.4	1r
Yes	104(69.3)	70(67.3)		1.3(0.6–2.7)
Worry about the stigma of getting infected				
No	88 (58.7)	54(61.4)	0.2	1r
Yes	62 (41.3)	44(71)		1.5(0.8–3.1)
Worry about possibility of infecting a family member				
No	47 (31.3)	28(59.6)	0.3	1r
Yes	103 (68.7)	70(68)		1.4(0.7–2.9)

* Column percentage

Row percentage

recovery (39.1%), but there was no statistically significant difference (Table 10).

Independent predictors of anxiety among studied patients were age less than 50 years old with *P* value of 0.004 and AOR = 2.3, urban residence with *P* value of 0.003 and AOR of 2.5 and worrying about getting infected again with *P* value of 0.009 and AOR of 3.2 (Table 11).

Discussion

Understanding how the SARS-CoV-2 can affect our brains and minds is necessary to comprehend how the pandemic may impact our psychological health.

Different routes by which coronaviruses could cross the blood-brain barrier (BBB) and result in neuropsychiatric consequences were described by Wu et al. [15]. The virus can damage endothelial cells, causing inflammation, thrombi, and brain damage. It enters through angiotensin-converting enzyme 2 receptors. Additionally, systemic inflammation causes trophic factors, monoamines, and microglia to become activated, which raises glutamate and N-methyl-d-aspartate (NMDA) levels as well as excitotoxicity. These insults cause neuropsychiatric symptoms to appear for the first time or to worsen [27].

According to Nalleballe, et al.'s research of the spectrum of neuropsychiatric manifestations linked to COVID-19, headaches were the most common neurologic manifestations reported followed by sleep disorders. Other cerebrovascular complications included encephalopathy, myalgia, pain, loss of taste and smell, stroke and transient ischemic attack, dizziness, extrapyramidal and movement disorders, seizures, polyneuropathy, and nerve root and plexus disorders [28].

In our study, participants who had a history of COVID-19 infection displayed depression and anxiety symptoms related to their mental health affection. This is in line with other research conducted by Xiong, Xu [29], Huang [30], Orrù, Bertelloni [31], and Badenoch, Rengasamy [32], which discovered that individuals with a history of COVID-19 have higher levels of anxiety and depression from a few months to a year following infection. During an epidemic, sick people are more likely to have mental health symptoms due to their stressful circumstances, physical discomfort, and potentially harmful side effects from antibiotics [33].

Table 6 Association of depression and clinical and laboratory characters

Variable	Total * *N* (%)	Depression # *N* (%)	*P* value	COR (95%CI)
Disease severity				
Mild	37 (24.7)	24(64.9)		1r
Moderate	23 (15.3)	14(60.9)	0.8	0.8(0.3–2.5)
Severe	90 (60)	60(66.7)	0.8	1.1(0.5–2.4)
Oxygen saturation				
< 92	88(58.7)	59(67)	0.6	1.2(0.6–2.4)
≥ 92	62(41.3)	39(62.9)		1r
CRP				
≤ 64.75	44 (29.3)	28(63.6)	0.8	1r
> 64.75	106 (70.7)	70(66)		1.1(0.5–2.3)
Treatment place				
Home	53(35.3)	38(71.7)	0.2	1.5(0.8–3.2)
Hospital	97(64.7)	60(61.9)		1r
Duration of isolation (day)				
< 15	71(47.3)	39(54.9)	0.01	1r
≥ 15	79(52.7)	59(74.7)		2.4(1.2–4.8)
Received oxygen supplementation				
No	115(76.7)	74(64.3)	0.6	1r
Yes	35(23.3)	24(68.6)		1.2(0.5–2.7)
ICU admission				
No	42(28)	28(66.7)	0.8	1.1(0.5–2.3)
Yes	108(72)	70(64.8)		1r
Put on a ventilator				
No	126(84)	82(65.1)	0.8	1r
Yes	24(16)	16(66.7)		1.1(0.4–2.7)
Physical symptoms during recovery				
No	23(15.3)	14(60.9)	0.6	1r
Yes	127(84.7)	84(66.1)		1.3(0.5–3.1)

* Column percentage

Row percentage

Table 7 Independent predictors of depression among studied patients

Variable	*B*	*P* value	AOR (95%CI)
Sex			
Male			1r
Female	1.1	0.003	3.1(1.4–6.5)
Duration of isolation (day)			
< 15			1r
≥ 15	1.2	0.002	3.3(1.5–6.9)
Constant	− 0.56		
% Correctly predicted	68.7		
Model χ^2 , *p* value	15.6, < 0.001		

β regression coefficient, *AOR* adjusted odds ratio, *CI* confidence interval. *P* value ≤ 0.05 is considered statistically significant

Table 8 Association of anxiety and sociodemographic factors

Variable	Total * *N* (%)	Anxiety # *N* (%)	*P* value	COR (95%CI)
Overall	150(100)	54(36)	–	–
Age				
< 50	67(44.7)	31(46.3)	0.02	2.2(1.1–4.4)
≥ 50	83(55.3)	23(27.7)		1r
Sex				
Male	64(42.7)	17(26.6)		1r
Female	86(57.3)	37(43)	0.04	2.1(1.04–4.2)
Residence				
Rural	54(36)	14(25.9)		1r
Urban	96(64)	40(41.7)	0.05	2.04(1.01–4.2)
Educational				
Illiterate	43 (28.7)	11(25.6)		1r
≤ secondary	52 (34.7)	25(48.1)	0.02	2.7(1.1–6.5)
> secondary	55 (36.7)	18(32.7)	0.4	1.4(0.6-3.4)
Profession				
Housewife	47(31.3)	17(36.2)		1r
Manual worker	28(18.7)	9(32.1)	0.7	0.8(0.3–2.3)
Professional or semiprofessional	75(50)	28(37.3)	0.9	1.1(0.5–2.2)
Marital status				
Married	127(84.7)	45(35.4)		1r
Not married	23(15.3)	9(39.1)	0.7	1.2(0.5–2.9)
Smoker				
No	122(81.3)	46(37.7)	0.4	1.5(0.6–3.7)
Yes	28(18.7)	8(28.6)		1r
Chronic illness				
No	66(44)	24(36.4)	0.9	1.02(0.5–2.01)
Yes	84(56)	30(35.7)		1r

* Column percentage

Row percentage

We discovered that the rate at which COVID-19 infection has long-term negative effects on mental health is at alarming rates. People having a history of the COVID-19 in our sample had a high frequency of clinically severe depression (65.3%). This is consistent with the findings of Liu, Baumeister's [34] study, which found a prevalence rate of depression of 65.7%. However, just 11% of Tomasoni, Bai's sample [35] reported having depression.

Two other studies on the Egyptian populace were conducted; the first by Ezzelregal, Hassan [36] at Ain Shams University Hospitals found that 42.2% of participants had depression, and the second by Radi, Mohammed [37] at Minia University found that 13.6% did. The larger sample size of our study compared to previous

Table 9 Association of anxiety and social factors related to COVID-19

Variable	Total * *N* (%)	Anxiety # *N* (%)	*P* value	COR (95%CI)
A family member infected with COVID-19				
No	84 (56)	28(33.3)	0.4	1r
Yes	66 (44)	26(39.4)		1.3(0.7–2.5)
A family member died due to COVID-19				
No	138 (92)	49(35.5)	0.7	1r
Yes	12 (8)	5(41.7)		1.3(0.4–4.3)
Worry about getting infected again				
No	46(30.7)	10(21.7)	0.02	1r
Yes	104(69.3)	44(42.3)		2.6(1.2–5.9)
Worry about the stigma of getting infected				
No	88 (58.7)	25(28.4)	0.02	1r
Yes	62 (41.3)	29(46.8)		2.2(1.1–4.4)
Worry about possibility of infecting a family member				
No	47 (31.3)	12(25.5)	0.07	1r
Yes	103 (68.7)	42(40.8)		2(0.9–4.3)

* Column percentage

Row percentage

Table 10 Association of anxiety and clinical and laboratory characters

Variable	Total * *N* (%)	Anxiety# *N* (%)	*P* value	COR (95%CI)
Disease severity				
Mild	37 (24.7)	16(43.2)	0.4	1.5(0.7–3.2)
Moderate	23 (15.3)	7(30.4)	0.7	0.8(0.3–2.2)
Sever	90 (60)	31(34.4)		1r
Oxygen saturation				
< 92	88(58.7)	31(35.2)	0.8	1r
≥ 92	62(41.3)	23(37.1)		1.1(0.6–2.1)
CRP				
≤ 64.75	44 (29.3)	14(31.8)	0.5	1r
> 64.75	106 (70.7)	40(37.7)		
Treatment place				
Home	53(35.3)	22(41.5)	0.3	1.4(0.7–2.9)
Hospital	97(64.7)	32(33)		1r
Duration of isolation (day)				
< 15	71(47.3)	21(26.9)	0.1	1r
≥ 15	79(52.7)	33(41.8)		1.7(0.9–3.4)5
Received oxygen supplementation				
No	115(76.7)	41(35.7)	0.9	1r
Yes	35(23.3)	13(37.1)		1.1(0.5–2.3)
ICU admission				
No	42(28)	16(38.1)	0.7	1.1(0.5–2.4)
Yes	108(72)	38(35.2)		1r
Put on a ventilator				
No	126(84)	45(35.7)	0.9	1r
Yes	24(16)	9(37.5)		1.1(0.4–2.7)
Physical symptoms during recovery				
No	23(15.3)	9(39.1)		1.2(0.5–2.9)
Yes	127(84.7)	45(35.4)	0.7	1r

* Column percentage

Row percentage

samples and differences in the scales used to assess psychological illnesses across studies may help to explain why this condition was more prevalent in our study.

In our study, 36% of participants with a history of COVID-19 reported having anxiety. This is consistent with research by Nie, Wang [38], ahan, Ünal [32], and Kong, Kong [39], which found that anxiety prevalence rates were 38.5%, 34.9%, and 34.7%, respectively. Frontera, Yang [40] reported a 46% prevalence rate of anxiety, but Raman, Cassar [20] claimed that only 14% of his patients had anxiety.

We could notice that our sample had a higher prevalence of psychological problems than the other populations. This may be attributed to Egypt's poorer economic standing relative to China and other developed nations, which resulted in worse psychological states in our population research [41]. This diversity may also be explained by changes in sociodemographic traits, cultural perspectives, scales used to assess psychological states, study designs, and sample sizes.

Age was found to be an independent predictor of anxiety among the examined patients, with patients under 50 years old reporting an anxiety rate of 46.3% ($p = 0.02$) as opposed to patients over 50 years old who reported a rate of 27.7%. This is consistent with the conclusions made by Youssef and Mostafa [42]. Older age was associated with greater anxiety coping mechanisms, while younger age was associated with higher levels of psychological morbidities [43]. Another explanation would be that patients were exposed to social media more frequently when they were younger, which was linked to a higher frequency of mental health issues, particularly anxiety and depression, during the COVID-19 outbreak [44].

In terms of gender, women had statistically significant higher levels of depression than males (p value = 0.003). According to the combined findings of five recent research, depression was present in 20.3% of men and 26.9% of women, respectively [38]. According to Fernández-de-Las-Peas and Martn-Guerrero [45], women are more likely than males to experience the longer-term effects of COVID-19 infection on their mental health. This is consistent with our study's findings, which showed that female depression rates were 73.3%. These results confirm the existing gender disparity in depression [46], which is thought to be influenced by sex hormones, genetics, and gender features. In

Table 11 Independent predictors of anxiety among studied patients

Parameter	*B*	*P* value	AOR (95%CI)
Age			
< 50	0.8	0.04	2.3(1.1–4.9)
≥ 50			1r
Residence			
Rural	0.9	0.03	1r
Urban			2.5(1.1–5.4)
Worry about getting infected again			
No			1r
Yes	1.2	0.009	3.2(1.3–7.6)
Constant	− 2.6		
% Correctly predicted	70		
Model χ^2 , *p* value	22.3, < 0.001		

β regression coefficient, *AOR* adjusted odds ratio, *CI* confidence interval. *P* value ≤ 0.05 is considered statistically significant

addition, women who have contracted COVID-19 may worry that they would be unable to care for their children and perform household duties [47].

Depression was influenced by isolation for more than 15 days ($p = 0.002$). This is corroborated by Wang, Shi [26] who claimed that being in quarantine was linked to all mental health issues due to the restricted access to necessities, the disruption of information flow, and the elevated dread and anxiety. According to Jawaid [48], being in a quarantine situation can also cause social isolation and a feeling of loneliness, especially for elderly people who might not feel as comfortable using online resources.

Participants who resided in urban regions (41.7%) had significantly higher rates of anxiety (p value = 0.03) compared to those living in rural areas (25.9%), which was another independent factor in our study. This finding is in line with the claims made by Hikmah and Prisandy [49], who claimed that due to the stressful and competitive environment required to thrive, those who live in cities are more likely to develop mental illnesses. The likelihood of social concerns and environmental stresses contributing to anxiety disorders is often higher in urban than in rural locations.

Patients who worried about re-infection were also shown to have anxiety that was clinically significant (p value = 0.009). This is consistent with the case series study by Deng and Wang [11] who linked social isolation, perceived danger, uncertainty, physical discomfort, a fear of spreading the disease to others, a lack of family support, and unfavorable news in the media coverage to the fear of reinfection in COVID-19 patients. These worries contribute to mental health problems including anxiety and depression.

Dubey and Biswas [50] remarked that it seems unlikely that depression and anxiety symptoms might be a direct result of the SARS-CoV-2 when discussing social aspects. It is more likely that the psychological contexts of the pandemic is to blame for the increasing prevalence of mental health issues following COVID-19. COVID-19 affected individuals have likely experienced long durations in quarantine, and some have reported of their dread of spreading the virus to friends and family [51]. According to one study, those with infected family members or coworkers had a greater likelihood of experiencing any mental health symptoms [29]; however, our research identified no statistically significant link between these variables and psychiatric symptoms.

Patients with COVID-19 must also contend with stigma, which can have a significant impact on their ability to live normal lives in the community [52]. Liu and Baumeister [34] emphasized the significance of social stigma and discrimination in escalating the COVID-19's emotional impact. He demonstrated the link between perceived discrimination and clinically significant severe anxiety and despair. In our study, 62% of patients expressed concern about the stigma associated with having COVID-19, although there was no statistically significant difference.

Regarding interactions between psychological distress and inflammatory biomarkers, Guo and Zheng [52] found that among patients with depressive symptoms, depression levels were strongly associated to CRP levels; however, the correlation in our investigation was not statistically significant. Our results are consistent with those of Mazza and De Lorenzo [53], who found no connection between baseline inflammatory markers and either depression or anxiety.

According to the results of our study, neither oxygen saturation level at follow-up nor persistent symptoms after recovery were substantially related to depression, indicating that psychiatric disease was not a manifestation of physical symptoms. This runs counter to findings by Kong, Kong [39] and Liu, Baumeister [34] that reduced oxygen saturation is one of the factors taken into account for patients to become apprehensive and that all three outcomes of mental illness were more severe when more symptoms persisted after discharge. Moreover, it is still unknown if the high rate of depression among people with post-COVID-19 syndrome is a long-term effect of the virus infection or a result of the pandemic's social and/or economic effects.

Limitations

This study has some potential limitations that should be considered when interpreting the findings reported. It is a cross-sectional study, so future longitudinal studies need to be done to identify the nature of the associations between COVID-19 and mental health disorders. It is also a single-center study. The COVID-19 survivors were selected from only Mansoura University hospitals. Despite being the largest general hospitals in Dakahlia Province, but the present findings would not be readily generalized to all COVID-19 survivors of Egypt. Further research is required to investigate the other factors associated with psychiatric disorders and COVID-19 among different groups of society.

Conclusions

The present study found that the prevalence of depression and anxiety among post-COVID-19 patients was found to be 65.3% and 36% respectively. Female gender and isolation for more than 15 days are significant risk factors for depression by logistic regression analysis (AOR = 3.1 and 3.3 respectively). Age less than 50 years old, urban residence, and worry about getting infected again are significant risk factors for anxiety by logistic regression analysis (AOR = 2.3, 2.5, and 3.2 respectively).

Abbreviations

COVID-19	Coronavirus Disease 2019 (COVID-19)
CRP	C-reactive protein
GAD-7	The 7-item Generalized Anxiety Disorder
DSM-5	The Diagnostic and Statistical Manual of Mental Disorders fifth edition
ICU	Intensive care unit
IRB	Institutional review board
MDD	Major depressive disorder
PHQ-9	Patient health questionnaire 9
SARS	Severe acute respiratory syndrome
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

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None.

Authors' contributions

AM collected the data and interviewed the patients. HM contributed in writing the manuscript. MA contributed in writing the manuscript. OA revised and edited the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The data are available upon request.

Declarations

Ethics approval and consent to participate

The questionnaire and methodology for this study were approved by the IRB committee at the Faculty of Medicine, Mansoura University, Egypt (MS.21.05.1516); Informed consent was obtained from all participants before they were included in the study.

Consent for publication

The participants consented to publication.

Competing interests

The authors declare that they have no competing interests.

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