

Comparative study on the depression, anxiety, and some risk factors among different nationalities during the coronavirus disease 2019 pandemic: a cross-sectional study

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Background/aim

Coronavirus disease 2019 (COVID-19) pandemic can cause widespread anxiety, panic, and worry. The viral pandemic may be triggered by a parallel shadow pandemic of mental illness, including corona-phobia in adults and children. Monitoring of mental health during crises is an immediate priority. The present study aims to compare the depression and anxiety effects of coronavirus pandemic on the general population of different ages and different countries and to highlight risk factors of depression during the pandemic.

Patients and methods

This observational cross-sectional study was conducted through an online questionnaire using Google forms with a total sample of 1573 participants from Egypt and other countries aged from 7 to 66 years old. The participants filled out an online survey for assessment of their sociodemographic characteristics and their psychological status using Beck's Depression Inventory. Data was analyzed using SPSS.

Results

Depression was detected in 74.0% of cases, mainly mild, moderate, moderately severe, and severe (34.0, 21.0, 12.8, and 6.1% of all cases, respectively). The most common sources of worry related to the COVID-19 pandemic were worry about family (70.0%), worry about getting infected (32.2%), and worry about being hospitalized (23.8%). Depression among Egyptian, other Arabic, Western, and Asian nationalities was 75.7, 68.3, 50.9, and 50.0%, respectively. Being Egyptian, single, and aged below 50.0 years, as well as worrying about hospitalization, financial impacts, death, and prayer limitations, were risk factors for depression. While being a male and getting a university or postgraduate education were protective factors, however, all participants had variable degrees of anxiety related to COVID-19; notably, nearly 16% of the patients had moderate-to-severe and severe anxiety. The overall prevalence of anxiety was 29.6%.

Conclusion

Mild depression is common among the study participants. Worry about hospitalization, financial impacts, death, and prayer limitations were modifiable risk factors for having depression.

Keywords:

anxiety, coronavirus disease 2019, depression, mental health, pandemic, psychological status

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Introduction

In January 2020, the WHO declared the outbreak of a new coronavirus disease 2019 (COVID-19), to be a Public Health Emergency of International Concern with a high risk of COVID-19 spreading to other countries around the world. In March 2020, WHO reported COVID-19 as a pandemic. To date, WHO has reported more than 775 million confirmed cases,

seven million deaths, and more than 13 billion vaccine doses were administrated [1–3]. Egypt reported the first case of COVID-19 in March 2020. Since then,

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the cases steadily increased, reaching the first peak in June 2020 and the second peak in January 2021. Egypt has recorded more than 516 thousand cases, with at least 24 thousand deaths and 442 thousand recovered [4]. The COVID-19 pandemic has had a significant impact on public mental health. Therefore, monitoring and oversight of the population's mental health during the pandemic is an immediate priority [5]. Mental health is a state of well-being in which an individual realizes his or her abilities, can cope with the normal stresses of life, can work productively, and is able to contribute to his or her community. Multiple social, psychological, and biological factors determine the level of mental health of a person at any point in time [6].

During the pandemic, recent evidence suggests that people who are kept in isolation and quarantine experience significant levels of anxiety, anger, confusion, and stress [7]. All studies that examined the psychological effects of COVID-19 pandemic reported symptoms of mental trauma, emotional distress, depression, stress, mood swings, irritability, insomnia, attention deficit hyperactivity disorder, posttraumatic stress, and anger [8,9]. According to a recent study, people who have higher education levels have higher levels of stress, anxiety, and depression [10]. In addition, anxiety levels are significantly higher in people with at least one family member, relative, or friend with the COVID-19 disease [11]. Multiple factors need to be studied to identify the main risk factors of mental disorders during the pandemic.

The present study aims to compare the depression and anxiety effects of coronavirus pandemic on the general population of different ages and different countries and to highlight risk factors of depression during the pandemic. The results of this study are necessary for the management of the mental disorders during corona pandemic.

Patients and methods

Patients and study design

An observational cross-sectional study approach was utilized to achieve the objectives of this study, with a total sample of 1573 participants from Egypt and representing the western region (e.g. USA and UK), Asia (e.g. India), and Arab countries like KSA. The participants aged from 7 to 66 years old. The study was conducted from May 10, 2020 to August 23, 2020 through an online questionnaire survey was designed.

After filtering the participants using the exclusion criteria, all participants who met the inclusion

criteria were enrolled. The inclusion criteria comprise participants older than 7 years old, while the exclusion criteria include participants suffering from diseases. This method allows large populations to be assessed with relative ease. The questionnaire consisted of two main themes: (a) demographics, which surveyed participants' sociodemographic information, including sex, age, residence, and occupation; (b) psychological status using Beck's Depression Inventory. The survey was offered in English and Arabic languages.

Ethical approval

The present study was conducted with the Code of Ethics of the World Medical Association, according to the principles expressed in the Declaration of Helsinki. This study has been approved by the Ethical Committee of the National Research Centre (NRC), Cairo, Egypt, with approval number 20/063. The digital consent form was obtained before the start of data collection.

Sample size

The sample size was calculated using Epi Info, STATCalc, version 7, setting the expected frequency of depression at the highest level (50%), 95% confidence interval, 3.5% margin of error, and a design effect of 2. A minimum sample size of 1566 participants was calculated to be increased to 1573 participants from different regions worldwide, including Arab, Western, and other Asian countries.

Data collection instrument (questionnaire)

Before the start of the questionnaire, the participants were given a brief description of the study and its aim. The questionnaire consisted of questions about different aspects and was divided into two main sections. It assessed a variety of demographic characteristics, anxiety, and depression.

The first section was about the demographic characteristics of the studied participants, including age, sex, marital status, employment, nationality, and residence, while the second section was related to the Hamilton Anxiety Rating Scale (HAM-A), which is a widely used clinical tool designed to quantify the severity of anxiety symptoms. The HAM-A consists of 14 items, each aimed at assessing a different aspect of anxiety as experienced by the individual. These items are rated on a scale ranging from not present to severe, with the total score providing an overall measure of the person's anxiety level. The second one was the Beck's Depression Inventory, which is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression.

Statistical analysis

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software (version 28.0, 2021; IBM Corp., Chicago, Illinois, USA). Qualitative data is described as number and percentage and compared using the χ^2 test. Ordinal regression was used to find out independent factors affecting depression and anxiety grades. The level of significance was taken at P value less than 0.05 was significant; otherwise was nonsignificant.

Results

The present study was an international comparative cross-sectional study of 1573 participants in Egypt and other countries. They were 501 male and 1072 female. Their age ranged from 11 to more than 60 years.

Table 1 shows that high depression grades were significantly more frequent in younger age ($P \leq 0.001$), female sex ($P = 0.002$), single ($P \leq 0.001$), nonemployment ($P = 0.013$), higher education ($P = 0.048$), Egyptian nationality ($P \leq 0.001$), and residence in Egypt ($P = 0.027$).

Depression was statistically significant and more frequent in fears about family loss ($P = 0.003$), getting infection ($P = 0.003$), hospitalization ($P = 0.001$), financial breakdown ($P \leq 0.001$), death ($P \leq 0.001$), limiting religious rituals ($P \leq 0.001$), and long-lasting epidemic ($P = 0.027$) as well as high anxiety grades ($P \leq 0.001$), as obtained in Table 2.

Table 3 revealed that, male sex ($\beta = -0.40$, $P \leq 0.001$) and being employed ($\beta = -0.22$, $P = 0.024$) were statistically independent protective factors that

Table 1 Relation between depression grades and demographic characteristics among the studied group

Variables	Depression grades					P value
	None	Mild	Moderate	Moderately severe	Severe	
Age (years)						
11–17	15 (28.3)	14 (26.4)	16 (30.2)	7 (13.2)	1 (1.9)	<0.001*
18–30	47 (13.4)	114 (32.5)	88 (25.1)	62 (17.7)	40 (11.4)	
30–40	106 (22.5)	166 (35.2)	96 (20.4)	70 (14.9)	33 (7.0)	
40–50	74 (26.6)	107 (38.5)	47 (16.9)	37 (13.3)	13 (4.7)	
50–60	80 (36.4)	67 (30.5)	53 (24.1)	13 (5.9)	7 (3.2)	
>60	87 (43.5)	68 (34.0)	30 (15.0)	13 (6.5)	2 (1.0)	
Sex						
Male	157 (31.3)	177 (35.3)	87 (17.4)	51 (10.2)	29 (5.8)	0.002*
Female	252 (23.5)	359 (33.5)	243 (22.7)	151 (14.1)	67 (6.3)	
Marital status						
Single	67 (15.6)	131 (30.5)	104 (24.2)	73 (17.0)	55 (12.8)	<0.001*
Married	304 (30.2)	351 (34.9)	207 (20.6)	110 (10.9)	33 (3.3)	
Divorced	18 (22.5)	35 (43.8)	10 (12.5)	12 (15.0)	5 (6.3)	
Widow	16 (42.1)	11 (28.9)	7 (18.4)	2 (5.3)	2 (5.3)	
Nonspecified	4 (20.0)	8 (40.0)	2 (10.0)	5 (25.0)	1 (5.0)	
Employed						
Yes	267 (27.3)	349 (35.7)	183 (18.7)	126 (12.9)	52 (5.3)	0.013*
No	142 (23.8)	187 (31.4)	147 (24.7)	76 (12.8)	44 (7.4)	
Education						
Below university	41 (34.5)	32 (26.9)	27 (22.7)	16 (13.4)	3 (2.5)	0.048*
University	200 (24.1)	288 (34.7)	179 (21.6)	99 (11.9)	63 (7.6)	
Postgraduate	168 (26.9)	216 (34.6)	124 (19.8)	87 (13.9)	30 (4.8)	
Nationality						
Egyptian	335 (24.3)	467 (33.8)	299 (21.7)	189 (13.7)	90 (6.5)	<0.001*
Other Arabian	38 (31.7)	45 (37.5)	23 (19.2)	8 (6.7)	6 (5.0)	
Western	26 (49.1)	17 (32.1)	6 (11.3)	4 (7.5)	0	
Asian	10 (50.0)	7 (35.0)	2 (10.0)	1 (5.0)	0	
Residence						
Egypt	293 (24.7)	389 (32.8)	256 (21.6)	166 (14.0)	83 (7.0)	0.027*
Other Arab	77 (32.0)	85 (35.3)	47 (19.5)	25 (10.4)	7 (2.9)	
Western	37 (27.2)	59 (43.4)	25 (18.4)	9 (6.6)	6 (4.4)	
Asian	2 (22.2)	3 (33.3)	2 (22.2)	2 (22.2)	0	

All data are represented as numbers and percentages. Percentages were taken from categories of row variables. *Significant difference at P value less than 0.05 using the χ^2 test.

Table 2 Depression grades, fears, and anxiety among the studied group

Variables	Depression					P value
	None	Mild	Moderate	Moderately severe	Severe	
Fears						
Family loss						0.003*
Yes	261 (23.7)	387 (35.1)	226 (20.5)	154 (14.0)	75 (6.8)	
No	148 (31.5)	149 (31.7)	104 (22.1)	48 (10.2)	21 (4.5)	
Getting infection						0.003*
Yes	111 (21.9)	166 (32.8)	134 (26.5)	64 (12.6)	31 (6.1)	
No	298 (27.9)	370 (34.7)	196 (18.4)	138 (12.9)	65 (6.1)	
Hospitalization						0.001*
Yes	67 (17.9)	140 (37.3)	94 (25.1)	52 (13.9)	22 (5.9)	
No	342 (28.5)	396 (33.1)	236 (19.7)	150 (12.5)	74 (6.2)	
Financial breakdown						<0.001*
Yes	48 (16.8)	103 (36.0)	54 (18.9)	54 (18.9)	27 (9.4)	
No	361 (28.0)	433 (33.6)	276 (21.4)	148 (11.5)	69 (5.4)	
Death						<0.001*
Yes	38 (13.9)	76 (27.8)	80 (29.3)	44 (16.1)	35 (12.8)	
No	371 (28.5)	460 (35.4)	250 (19.2)	158 (12.2)	61 (4.7)	
Limiting religious rituals						<0.001*
Yes	30 (15.2)	71 (36.0)	60 (30.5)	25 (12.7)	11 (5.6)	
No	379 (27.5)	465 (33.8)	270 (19.6)	177 (12.9)	85 (6.2)	
Isolation						0.470
Yes	3 (13.6)	7 (31.8)	6 (27.3)	5 (22.7)	1 (4.5)	
No	406 (26.2)	529 (34.1)	324 (20.9)	197 (12.7)	95 (6.1)	
Long-lasting epidemic						0.027*
Yes	2 (10.0)	5 (25.0)	7 (35.0)	2 (10.0)	4 (20.0)	
No	407 (26.2)	531 (34.2)	323 (20.8)	200 (12.9)	92 (5.9)	
Pain						0.274
Yes	1 (11.1)	1 (11.1)	4 (44.4)	1 (11.1)	2 (22.2)	
No	408 (26.1)	535 (34.2)	326 (20.8)	201 (12.9)	94 (6.0)	
Anxiety						
Mild	390 (36.4)	440 (41.1)	168 (15.7)	57 (5.3)	15 (1.4)	<0.001*
Mild to moderate	3 (1.5)	63 (31.5)	76 (38.0)	47 (23.5)	11 (5.5)	
Moderate to severe	1 (0.8)	15 (11.9)	41 (32.5)	49 (38.9)	20 (15.9)	
Severe	0	4 (3.2)	29 (23.4)	42 (33.9)	49 (39.5)	

All data are represented as numbers and percentages. Percentages were taken from categories of row variables. *Significant difference at P value less than 0.05 using the χ^2 test.

decreased depression grade. Egyptian nationality ($\beta=1.10$, $P\leq 0.001$), fear of death ($\beta=0.73$, $P\leq 0.001$), being single ($\beta=0.64$, $P\leq 0.001$), and fear of financial

breakdown ($\beta=0.46$, $P\leq 0.001$) were statistically independent risk factors that increased depression grade, they were arranged from most to least risk

Table 3 Ordinal regression for risk factors affecting depression grade among the studied group

Factors	β	SE	P value	95% CI
Male sex	-0.40	0.10	<0.001*	-0.60 to -0.20
Employed	-0.22	0.10	0.024*	-0.42 to -0.03
Egyptian nationality	1.10	0.15	<0.001*	0.81–1.39
Fear of death	0.73	0.12	<0.001*	0.49–0.97
Single	0.64	0.14	<0.001*	0.37–0.91
Fear of financial breakdown	0.46	0.12	<0.001*	0.22–0.70
Age years grades (relative to >60)				
11–17	0.27	0.31	0.391	-0.34 to 0.88
18–30	1.08	0.19	<0.001*	0.70–1.46
30–40	0.94	0.16	<0.001*	0.62–1.26
40–50	0.72	0.17	<0.001*	0.37–1.06
50–60	0.29	0.18	0.117	-0.07 to 0.65

β , regression coefficient; CI, confidence interval. *Significant at P value less than 0.05.

Table 4 Relation between anxiety grades and demographic characteristics among the studied group

Variables	Anxiety				P value
	Mild	Mild to moderate	Moderate to severe	Severe	
Age (years)					
11–17	0	0	0	0	<0.001*
18–30	217 (61.8)	44 (12.5)	40 (11.4)	50 (14.2)	
30–40	316 (67.1)	69 (14.6)	41 (8.7)	45 (9.6)	
40–50	205 (73.7)	38 (13.7)	20 (7.2)	15 (5.4)	
50–60	171 (77.7)	28 (12.7)	11 (5.0)	10 (4.5)	
>60	161 (80.5)	21 (10.5)	14 (7.0)	4 (2.0)	
Sex					
Male	375 (78.1)	56 (11.7)	24 (5.0)	25 (5.2)	<0.001*
Female	695 (66.8)	144 (13.8)	102 (9.8)	99 (9.5)	
Marital status					
Single	233 (61.2)	49 (12.9)	41 (10.8)	58 (15.2)	<0.001*
Married	741 (73.8)	135 (13.4)	69 (6.9)	59 (5.9)	
Divorced	54 (67.5)	9 (11.3)	12 (15.0)	5 (6.3)	
Widow	32 (84.2)	3 (7.9)	2 (5.3)	1 (2.6)	
Nonspecified	10 (58.8)	4 (23.5)	2 (11.8)	1 (5.9)	
Employed					
Yes	717 (73.8)	121 (12.5)	64 (6.6)	69 (7.1)	<0.001*
No	353 (64.3)	79 (14.4)	62 (11.3)	55 (10.0)	
Education					
Below university	54 (77.1)	9 (12.9)	3 (4.3)	4 (5.7)	0.097
University	559 (67.7)	110 (13.3)	76 (9.2)	81 (9.8)	
Postgraduate	457 (73.2)	81 (13.0)	47 (7.5)	39 (6.3)	
Nationality					
Egyptian	908 (68.4)	188 (14.2)	116 (8.7)	116 (8.7)	0.001*
Other Arabian	94 (78.3)	10 (8.3)	9 (7.5)	7 (5.8)	
Western	49 (94.2)	1 (1.9)	1 (1.9)	1 (1.9)	
Asian	19 (95.0)	1 (5.0)	0	0	
Residence					
Egyptian	774 (67.6)	164 (14.3)	103 (9.0)	104 (9.1)	0.001*
Other Arabian	178 (77.1)	26 (11.3)	13 (5.6)	14 (6.1)	
Western	113 (83.7)	7 (5.2)	10 (7.4)	5 (3.7)	
Asian	5 (55.6)	3 (33.3)	0	1 (11.1)	

All data are represented as numbers and percentages. Percentages were taken from categories of row variables. *Significant difference at P value less than 0.05 using the χ^2 test.

strength. Age decades for the three categories ranging from 18 to 50 years were statistically independent risk factors that increased depression grade ($\beta=1.08$, 0.94, and 0.72, respectively, $P\leq 0.001$ for all), increasing in the age among them was associated with decreasing the risk strength.

Table 4 shows that high anxiety grades were statistically significantly most frequent in lower age categories, female sex, being single, nonemployment, Egyptian nationality, and residence in Egypt.

Anxiety was statistically significantly more frequent in fears about family loss, getting infection, hospitalization, financial breakdown, death, and long-lasting epidemics where the majority of participants showed mild levels of anxiety, and percentages tended to decrease as the level of anxiety

increased with very few exceptions. Regarding depression grades and level of anxiety, it was noted that participants with no or low levels of depression had mild levels of anxiety, and as the level of depression increased, the severity of anxiety increased as well, whereas among participants with no depression 99.0% showed mild anxiety while among those with severe depression, 51.6% had severe anxiety (Table 5).

Table 6 shows that male sex was a statistically independent protective factor that decreased anxiety grade ($\beta=-0.44$, $P\leq 0.001$). Egyptian nationality ($\beta=-1.09$, $P\leq 0.001$), fear of death ($\beta=-0.73$, $P\leq 0.001$), being single ($\beta=-0.63$, $P\leq 0.001$), and fear of financial breakdown ($\beta=-0.46$, $P\leq 0.001$) were statistically independent risk factors that increased depression grade, they were arranged from most to

Table 5 Anxiety grades, fears, and depression among the studied group

Variables	Anxiety				P value
	Mild	Mild to moderate	Moderate to severe	Severe	
Fears					
Family loss					0.003*
Yes	753 (68.3)	157 (14.2)	105 (9.5)	88 (8.0)	
No	317 (76.0)	43 (10.3)	21 (5.0)	36 (8.6)	
Getting infection					0.026*
Yes	333 (65.8)	80 (15.8)	51 (10.1)	42 (8.3)	
No	737 (72.7)	120 (11.8)	75 (7.4)	82 (8.1)	
Hospitalization					0.003*
Yes	242 (64.5)	69 (18.4)	36 (9.6)	28 (7.5)	
No	828 (72.3)	131 (11.4)	90 (7.9)	96 (8.4)	
Financial breakdown					0.007*
Yes	185 (64.7)	37 (12.9)	27 (9.4)	37 (12.9)	
No	885 (71.7)	163 (13.2)	99 (8.0)	87 (7.1)	
Death					<0.001*
Yes	146 (53.5)	52 (19.0)	41 (15.0)	34 (12.5)	
No	924 (74.1)	148 (11.9)	85 (6.8)	90 (7.2)	
Limiting religious rituals					0.528
Yes	138 (70.1)	22 (11.2)	21 (10.7)	16 (8.1)	
No	932 (70.4)	178 (13.5)	105 (7.9)	108 (8.2)	
Isolation					0.463
Yes	18 (81.8)	2 (9.1)	0	2 (9.1)	
No	1052(70.2)	198 (13.2)	126 (8.4)	122 (8.1)	
Long-lasting epidemic					0.021*
Yes	14 (70.0)	1 (5.0)	0	5 (25.0)	
No	1056 (70.4)	199 (13.3)	126 (8.4)	119 (7.9)	
Pain					0.035*
Yes	5 (55.6)	0	1 (11.1)	3 (33.3)	
No	1065(70.5)	200 (13.2)	125 (8.3)	121 (8.0)	
Depression					<0.001*
None	390 (99.0)	3 (0.8)	1 (0.3)	0	
Mild	440 (84.3)	63 (12.1)	15 (2.9)	4 (0.8)	
Moderate	168 (53.5)	76 (24.2)	41 (13.1)	29 (9.2)	
Moderately severe	57 (29.2)	47 (24.1)	49 (25.1)	42 (21.5)	
Severe	15 (15.8)	11 (11.6)	20 (21.1)	49 (51.6)	

All data are represented as numbers and percentages. Percentages were taken from categories of row variables. *Significant difference at P value less than 0.05 using the χ^2 test.

least risk strength. Age decades for the three categories ranging from 18 to 50 years were statistically independent risk factors that increased anxiety grade

($\beta=-1.07, 0.88$, and 0.67 , respectively, $P\leq 0.001$ for all), increasing the age among them was associated with decreasing the risk strength.

Table 6 Ordinal regression for risk factors affecting anxiety grade among the studied group

Factors	β	SE	P value	95% CI
Male sex	-0.44	0.10	<0.001*	-0.64 to -0.24
Egyptian nationality	1.09	0.15	<0.001*	0.80–1.38
Fear of death	0.73	0.12	<0.001*	0.49–0.97
Single	0.63	0.14	<0.001*	0.36–0.90
Fear of financial breakdown	0.46	0.12	<0.001*	0.22–0.70
Age years grades (relative to >60)				
11–17	0.36	0.31	0.239	-0.24 to 0.97
18–30	1.07	0.19	<0.001*	0.69–1.45
30–40	0.88	0.16	<0.001*	0.57–1.20
40–50	0.67	0.17	<0.001*	0.33–1.01
50–60	0.23	0.18	0.200	-0.12 to 0.59

β , regression coefficient; CI, confidence interval. *Significant at P value less than 0.05.

Discussion

The COVID-19 pandemic has resulted in dramatic healthcare, societal, and economic changes since its appearance in December 2019, leading to substantial strains on healthcare services and delivery [12,13]. Alongside the devastating clinical complications of severe COVID-19 that resulted in healthcare services shortages, the world is still witnessing the ongoing consequences of the pandemic on social relationships and the dynamics of the population behaviors [14,15]. Besides, the COVID-19 pandemic substantially impacted global economic stability and led to food supply shortages, dysfunctional importation systems, and economic recession [14]. In return, several researchers proposed a significant psychological impact of these clinical, social, and economic consequences of the COVID-19 pandemic [15,16]. Nonetheless, the current evidence is still limited by the small number of patients, and being predominantly a single-center experience. Thus, we conducted the present large-scale multinational study to investigate the psychological impact of the COVID-19 pandemic on a large cohort of 1573 individuals.

Previous experience with challenging pandemics, such as severe acute respiratory syndrome and Ebola, noted alarming levels of worry and fear among the population [17]. These worries and fears were not attributed solely to the possibility of contracting the infection and developing severe disease, but they were also related to the fear of being separated from family and friends due to social isolation measures, limited movement freedom, long-term pandemic, economic collapse, and the uncertainty regarding their financial status and the ability to meet financial responsibilities [17,18]. The COVID-19 pandemic was associated with an unprecedented sheer volume of cases, a striking global scale, and a high number of critically ill cases, necessitating even more strict measures than the previous pandemics [19]. In return, it was hypothesized that the COVID-19-associated worrying symptoms may be severe enough to reach clinically relevant psychological disorders in some individuals [20]. In this report, we found that the vast majority of the participants (94%) suffered from one or more worrying symptoms related to COVID-19; the most commonly reported fear was a family loss, followed by getting the infection, the need for hospitalization, and financial breakdown. Our findings run in line with previous reports that showed a high frequency of worrying symptoms among the population, particularly during the early

waves of the pandemic. For example, a recent meta-analysis of 91 studies reported that the majority of the global population had a high level of worrying symptoms and fear of COVID-19 and its consequences [21]. A meta-analysis of 33 studies reported similar findings [22]. Li *et al.* [23] present new insights into the long-term psychological consequences of COVID-19. They found that a high proportion of COVID-19 survivors still suffered from poor sleep quality, fatigue, fear, anxiety, depression, and PTSD 1 year after infection. Several reasons were reported to contribute to these high levels of worrying symptoms and fear of COVID-19; although some of them are logical and attributed to a realistic perception of COVID-19 consequences, risk miscommunication, and misleading information by the media were among the reported reasons for the high level of worry and fear of COVID-19 [24].

Public fear and worry about COVID-19 have significantly increased the risk of anxiety among the population [25]. During the first wave of the pandemic, many countries faced a shortage of protective measures, such as masks, and an overwhelming amount of misinformation linked to increased anxiety [26]. In the present study, we found that all participants had variable degrees of anxiety related to COVID-19; notably, nearly 16% of the patients had moderate-to-severe and severe anxiety. The overall prevalence of anxiety was 29.6%. In concordance with our findings, Collier Villaume *et al.* [27] found the percentage to be 40.4 in their study. Such a figure demonstrated an increase in the pre-pandemic level of anxiety in the general population; according to the UK Household Longitudinal Study, the prevalence of pre-pandemic anxiety was 18%, which increased to 27% after the pandemic [28]. The COVID-19 Mental Disorders Collaborators reported that the anxiety prevalence increased by 25.6% after the COVID-19 pandemic [29]. However, it should be noted that other reports showed variable rates of clinically significant anxiety than our report. For example, da Silva *et al.* [30] conducted a meta-analysis of 16 studies and reported an overall prevalence of anxiety symptoms of 46%. In another meta-analysis, the overall prevalence of anxiety was 25% [31]. This was in line with another systematic review showing an overall prevalence of 27.3% [32]. Cao *et al.* [33] demonstrated that only 3.6% of college students had moderate and severe anxiety related to COVID-19. Another report on the general population from China showed that the rate of moderate-to-severe anxiety was around 5% [34]. However, regardless of the exact level of anxiety, the current literature seems

consistent regarding the significant increase in the anxiety level amongst the general population following the COVID-19 pandemic. This increased level of anxiety can be attributed to public fear and anxiety; in a previous meta-analysis, fear was strongly correlated with anxiety scores and distress [22].

Regarding the prevalence of depression in the present study, we found that the prevalence of mild, moderate, moderately severe, and severe depression was 34.1, 21, 12.8, and 6.1%, respectively. Aside from the social causes and fears of the pandemic consequences, biological causes can also be the reason for depression after the COVID-19 pandemic, particularly the hyperinflammatory state [35]. According to the COVID-19 Mental Disorders Collaborators, the global prevalence of depression during the COVID-19 pandemic increased by 27.6% compared to the pre-pandemic era [36]. The same findings were reported in the US population [37]. Collier Villaume *et al.* [27] found the percentage to be 36.3 in their study. In a meta-analysis of 12 studies, the global prevalence of depression during the COVID-19 pandemic ranged from 18 to 33% [38]. While another meta-analysis showed that the overall prevalence of depression during the COVID-19 pandemic was 29.6%, moreover the data collected from 1388 adults from Germany showed that depressive symptoms and loneliness increased throughout the pandemic while life satisfaction decreased comparing baseline to 12-month follow-up [39]. In addition, it was found that particularly vulnerable groups, such as younger people or those with mental disorders, were more severely affected by psychopathological symptoms [40].

The psychological impact of COVID-19 can have short-term and long-term consequences on the general population. Anxiety is strongly associated with a long-term increase in stress hormones that significantly increase the intensity of headache, restlessness, irritability, and depression [41]. On the other hand, patients with depressive symptoms are at increased risk of substance use disorders, suicidal behaviors, aggravation of comorbidities, and reduced productivity [42]. Besides, anxiety and depression increase healthcare resource utilization and demand for mental health services. Thus, identifying the risk factors for depression and anxiety can identify at-risk populations who need tailored psychological support and intervention. In the present study, we found that the risk of clinically relevant anxiety and depression was higher in younger participants, females, single, nonemployment, higher education, Egyptian nationality, and residence in Egypt. Male sex and

being employed were independent protective factors that decreased depression grades. Egyptian nationality, fear of death, being single, and fear of financial breakdown were independent risk factors that increased depression grade. In agreement with our findings, a recent survey found higher levels of anxiety symptoms among children and young adults [42]. Women were also more likely to suffer from anxiety and depression [43]. Similarly, economic hardships and low educational levels were reported to significantly increase the COVID-19 impact on mental health [44]. Metwally *et al.* [45] reported the highest PD symptoms were fear of losing any of the family members, especially grandparents (97%), fear of the unknown consequences of the corona (78%), and fear of dying because it has not a treatment yet (68%). However, the prevalence of moderate to extremely severe anxiety, stress, and depression during the COVID-19 curfew among Saudi adults was noted to be 13.8, 3.7, and 8.4%, respectively, without any sex difference [46].

Conclusion

In conclusion, the present large-scale multinational study confirms that the COVID-19 pandemic is associated with alarming levels of psychological consequences that may extend to severe anxiety, depression, and suicidal thoughts. Owing to the significant association between worrying symptoms and COVID-19-related psychological disorders, we believe that the psychological impact of COVID-19 has a profound social context and psychological behavior rather than neurological mechanisms. We also reported several individual-level risk factors for COVID-19-related depression and anxiety, which can be used to identify at-risk populations and take appropriate psychological interventions. Future research should focus on studying the impact of stress relief interventions on the at-risk population and their effectiveness in reducing the symptomatic burden of COVID-19-related depression and anxiety.

Recommendations

The present study has the strength of multinational collaboration and a large sample size. Nonetheless, several limitations exist. First, the study was a cross-sectional survey, which limited our ability to establish a causal relationship between psychological symptoms and the COVID-19 pandemic. The sampling was based on a convenient sample technique, which might have also increased the risk of selection bias. Lastly, assessing the pre-pandemic psychological symptoms was not feasible and, therefore could not

control for possible changes in these symptoms after the pandemic. It is necessary to create an enabling environment that is free from any fears or stressors. It is really recommended to encourage community-based awareness programs to raise awareness about depression and anxiety and how to manage it.

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Conflicts of interest

There are no conflicts of interest.

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