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Post-COVID-19 mental health and its associated factors at 3-months after discharge: A case-control study

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ABSTRACT

Background: Mental health disorders are among the most significant sequelae of the COVID-19 pandemic. Therefore, the aim of this study is to investigate the mental health status and associated risk factors of Moroccan COVID-19 survivors 3 months after hospital discharge.

Methods: A case-control study was conducted from September 2021 to February 2022 on 824 participants. 213 were COVID-19 survivors and 611 were control group. Data were collected ether through an online anonymous survey. Anxiety and depression disorders were assessed using Hospital Anxiety and Depression Scale (HADS).

Results: The average age of all participants was 55.17 ± 16.44. Our findings highlighted higher prevalence of mental health disorders including anxiety and depression in COVID-19 survivors at 3 months after hospital discharge (HADS-A = 12.84; HADS-D = 10.91) compared to control group (HADS-A = 9.90; HADS-D = 8.27) ($p < 0.001$). Older patients, suffering from type 2 diabetes and kidney diseases, admitted to ICU, who stayed a long duration in the hospital, who had severe and longer duration of symptoms and who used Chloroquine, had higher levels of anxiety and depression after discharge.

Conclusions: The present investigation highlights the need to develop a post-COVID-19 rehabilitation programs that can better manage the post COVID-19 impact and restore a good mental health for COVID-19 survivors. Also, to create preventative strategies to limit mental health disorders in COVID-19 survivors.

1. Introduction

Coronavirus disease 2019 (COVID-19) caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) continues to be a public health emergency of international issue.[1,2] Worldwide, on March 15, 2022, COVID-19 caused more than 456 million confirmed cases and more than 6 million deaths. In Morocco, over 1,162,125 of confirmed cases and 16,043 deaths are recorded.[3]

Since the emergence of the first wave of COVID-19 pandemic, the clinical characteristics of COVID-19 patients had been documented by several studies. Richardson et al. reported that 14.2% of hospitalized patients were admitted to the Intensive Care Unit (ICU), 12.2% received invasive mechanical ventilation and 21% died.[4] Furthermore, Wang and colleagues demonstrated that fever (98.6%), fatigue (69.6%) and dry cough (59.4%) were the most clinical symptoms in COVID-19 patients.[5] Fu and colleagues showed that the severe clinical symptoms and the case-fatality rate (CFR) were higher in older patients.[6] Other studies investigated the factors associated to the ICU transfer. Indeed, the older patients presented comorbidities and severe COVID-19 symptoms were at higher risk to be transferred to ICU.[7]

The COVID-19-survivors could experience poor Health-Related Quality of Life (HRQoL) due some factors such as the ICU transfer, the duration of hospitalization, the COVID-19 symptoms' severity and other sequelae. The assessment of post COVID-19 sequelae has become a crucial concern for health authorities. Recently, Qamar and colleagues showed that the most common sequelae among the COVID-19 survivors were body aches (39.9%), low mood (32.6%), and cough (30.2%).[8] Halpin et al. showed that fatigue was the most common reported symptom followed by breathlessness and psychological distress.[9]

It is widely accepted that mental health disorders are a major determinant of disability and a worse HRQoL among critical illness survivors.[10] Wang et al. showed that the hospitalization in the ICU was

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significantly associated with Post-traumatic Stress Disorder Symptoms (PTSD) among COVID-19 survivors.[11] Consequently, evaluating their mental health status is of importance for health decision-makers to develop health care interventions to manage the mental health impairment. Therefore, we conducted a case-control study to investigate the mental health status and associated risk factors of Moroccan COVID-19 survivors 3 months after hospital discharge.

2. Materials and methods

2.1. Study design

This case-control study has been conducted from September 2021 to February 2022. Since we did not aim to estimate the prevalence of the COVID-19 or clinical symptoms, a case-control study is more suitable than a cross-sectional study. Furthermore, a case-control study is a good tool for estimating the Odds-ratio reflecting the association between a disease and risk factors. The use of control group in our study provides a better understanding of the impact of COVID-19 on the mental health and identifying its associated factors. Data were collected through an online questionnaire. The questionnaire was designed following Helsinki's declaration of ethics. On the main page, a summary of the purpose of the study and a letter of consent were presented to the respondents. Participation was voluntary and the access to the questionnaire was only given to participant who provided his/her informed consent by checking a box in the online questionnaire.

2.2. Participants

The study included two groups: (1) COVID-19 survivors and (2) control group with no history of COVID-19 infection. All the participants were aged 18 years old and above and they should not be under anti-anxiety or anti-depression treatment. In addition, the COVID-19 survivors had to be hospitalized for COVID-19 and recovered for more than 30 days and not more than 90 days. However, the patients who not yet recovered from COVID-19 were excluded.

2.3. Sampling

The aim of this case-control study was the assessment of anxiety and depression in COVID-19 survivors, we based the calculation of the number of subjects on the proportion of anxiety. Studies have assessed the level of anxiety during the period of COVID-19 confinement. In contrast, the level of anxiety in COVID-19 patients is not yet estimated in national level. In the present study, we assume to detect at least 12% difference in the level of anxiety between cases and controls. The minimum number of subjects is calculated from the following equation:

$$n = \frac{r+1}{r}\,\frac{p^{*}(1-p^{*})\left(Z_{\beta}+Z_{\alpha/2}\right)^{2}}{\varepsilon^{2}}$$

Where:

r = control/case ratio, we consider 3 controls for 1 case. Since the proportion of anxiety is not yet estimated, we assume $p^* = 0.5$.

For a 95% confidence interval ($\alpha = 0.05$) and statistical power of 80% ($\alpha = 0.2$) and a minimum difference to be detected of = 12%, the minimum number of subjects to interview is n = 868 (217 cases and 651 controls).

2.4. Measurement

The questionnaire consisted of 3 sections: (i) socio-demographic and clinical characteristics (age, gender, marital status, educational level, employment status, place of residence, socio-economic level and presence of chronic diseases specifically type 1 and 2 diabetes, hypertension, kidney and cardiovascular diseases), (ii) the COVID-19 clinical characteristics (treatment setting, duration of hospitalization, presence of symptoms, duration of symptoms and Chloroquine use) and (iii) Hospital Anxiety and Depression Scale (HADS) instrument.

The Hospital Anxiety and Depression Scale (HADS), developed by Zidmond and Snaith,[12] translated and validated in Arabic,[13] comprises two sub-scales: one assessing general anxiety level (7 items) and one assessing the depression level (7 items). For each item, the response is scored from 0 to 3. The maximum score of each subscale is 21. The Cronbach's alpha for the HADS Instrument used in this study was 0.98 which exhibiting a very good validity.

2.5. Statistical analysis

Categorical variables were reported as number and percentage while continuous variables were presented by means and standard deviation. The Student test was used to compare the anxiety/depression scores between COVID-19 survivors and control group. For the COVID-19 survivors, the Student and ANOVA tests were used to compare the anxiety/depression scores stratified on the clinical COVID-19 characteristics. A binary multiple logistic model was carried out to study the association between anxiety/depression levels and socio-demographic and clinical factors among the COVID-19 survivors. The Pearson correlation coefficient was used to verify the collinearity between independent variables for conducting multiple regressions. All statistical analysis was performed at a significance level $\alpha = 0.05$ using the R software (R version 4.0.3).

3. Results

3.1. Anxiety and depression among the COVID-19 survivors versus the control group

A total of 824 participants meeting the inclusion criteria, 213 participants were COVID-19 survivors and 611 did not have the COVID-19. The respondents' socio-demographic characteristics are displayed in Table 1. The average age of participants was 55.2 ± 16.4 [min = 18; max = 90]. Over half of respondents were female (52.2%) and married (68.4%). Regarding the education level, 41.3% of the COVID-19 survivors and 52.2% of the control group were illiterate. Most respondents in both groups (71.7%) were unemployed. About sixty percent of participants are living in urban areas (60.4%). Roughly, half of total respondents (50.1%) had a medium socioeconomic level. Type 1 diabetes, type 2 diabetes, hypertension, kidney disease and cardiovascular disease (including heart failure and ischaemic heart disease) were present in 25.2%, 12.5%, 26.9%, 27.8% and 8.1%, respectively.

Overall, we observed that the COVID-19 survivors were significantly more anxious (HADS-A = 12.84) and depressed (HADS-D = 10.91) compared to control group (HADS-A = 9.90; HADS-D = 8.27) ($p < 0.001$). Table 1 shows the comparison of anxiety and depression level between COVID-19 survivors and control group stratified on socio demographics and clinical variables. The results showed that both female and male COVID-19 survivors were significantly more anxious and depressed than those in control group. Also, the COVID-19 survivors aged between 40 and 60 years and over 60 years had higher anxiety and depression scores than those in control group. However, COVID-19 survivors aged between 18 and 40 years old had lower anxiety and depression level compared to those in control group. Single and married COVID-19 survivors seemed to be more anxious and depressed. Concerning educational level, anxiety and depression scores did not differ significantly between COVID-19 survivors and control group for illiterate and those with primary educational level. In contrast participants with secondary and university educational level in COVID-19 survivors' group had higher level of anxiety and depression than those in control group. Moreover, data indicated that both employed and unplowed COVID-19 survivors reported that they were more anxious and depressed than those in control group. Conversely to participants living

Table 1
Comparison of anxiety and depression level between COVID-19 survivors and control group (n = 824).

Variables	COVID-19 survivors (n = 213)		Control group (n = 611)			COVID-19 survivors (n = 213)	Control group (n = 611)	*p*-value[a]
	n (%)	HADS-A mean (SD)	n (%)	HADS-A mean (SD)	*p*-value[a]	HADS-D mean (SD)	HADS-D mean (SD)	
Age group								
18-40	36 (16.9)	2.89 (3.30)	123 (20.1)	5.67 (6.73)	**0.001**	2.28 (2.53)	4.56 (5.11)	**< 0.001**
40-60	62 (29.1)	11.29 (4.48)	247 (40.5)	9.40 (6.19)	**0.007**	9.66 (3.44)	8.04 (4.17)	**0.002**
+60	115 (54.0)	16.80 (3.58)	241 (39.4)	12.58 (5.34)	**< 0.001**	14.29 (3.82)	10.40 (3.50)	**< 0.001**
Gender								
Female	100 (46.9)	12.75 (6.71)	330 (54.0)	11.08 (6.87)	**0.033**	10.51 (5.44)	8,69 (5.00)	**0.002**
Male	113 (53.1)	12.93 (6.07)	281 (46.0)	8.52 (5.75)	**< 0.001**	11.27 (5.78)	7.78 (4.16)	**< 0.001**
Marital status								
Single	17 (8.0)	15.59 (4.65)	133 (21.8)	5.74 (6.58)	**< 0.001**	14.12 (3.82)	4.68 (5.11)	**< 0.001**
Married	156 (73.2)	12.38 (6.51)	408 (66.8)	10.66 (6.07)	**0.003**	10.37 (5.78)	8.95 (3.94)	**0.005**
Widowed	40 (18.8)	13.50 (6.19)	70 (11.4)	13.37 (4.92)	0.911	11.67 (5.19)	11.17 (3.69)	0.591
Level of education								
Illeterate	88 (41.3)	12.90 (6.61)	319 (52.2)	13.12 (5.31)	0.770	10.50 (5.42)	10.46 (3.35)	0.953
Primary school	31 (14.6)	11.06 (5.48)	48 (7.9)	11.69 (4.99)	0.604	10.00 (5.18)	10.50 (3.29)	0.635
Secondary school	42 (19.7)	14.90 (6.02)	64 (10.5)	10.26 (4.82)	**< 0.001**	13.57 (5.35)	9.42 (3.73)	**< 0.001**
University	52 (24.4)	12.15 (6.40)	180 (29.4)	3.58 (4.43)	**< 0.001**	10.02 (5.93)	3.39 (3.43)	**< 0.001**
Employment status								
Employed	76 (35.7)	12.09 (6.41)	157 (25.7)	6.16 (4.96)	**< 0.001**	10.39 (6.06)	5.92 (3.34)	**< 0.001**
Unemployed	137 (64.3)	13.26 (6.32)	454 (74.3)	11.19 (6.47)	**0.001**	11.20 (5.37)	9.09 (4.76)	**< 0.001**
Place of residence								
Urban	181 (85.0)	12.95 (6.35)	317 (51.9)	7.19 (6.25)	**< 0.001**	11.20 (5.87)	6.48 (4.95)	**< 0.001**
Rural	32 (15.0)	12.25 (6.51)	294 (48.1)	12.82 (5.42)	0.583	9.31 (3.60)	10.21 (3.37)	0.156
Socio economic level								
Low	76 (35.7)	12.70 (6.50)	337 (55.2)	13.19 (4.99)	0.534	10.31 (5.13)	10.60 (3.27)	0.639
Medium	137 (64.3)	12.93 (6.31)	274 (44.8)	5.85 (5.83)	**< 0.001**	11.25 (5.87)	5.40 (4.50)	**< 0.001**
Presence of chronic diseases								
Type 1 diabetes								
No	151 (70.9)	12.30 (7.09)	465 (76.1)	8.96 (6.88)	**< 0.001**	10.58 (6.38)	7.28 (4.62)	**< 0.001**
Yes	62 (29.1)	14.16 (3.82)	146 (23.9)	12.88 (3.80)	**0.027**	11.74 (3.00)	11.42 (3.09)	0.496
Type 2 diabetes								
No	160 (75.1)	12.36 (6.39)	561 (91.8)	9.67 (6.58)	**< 0.001**	10.25 (5.36)	8.20 (4.73)	**< 0.001**
Yes	53 (24.9)	14.32 (6.12)	50 (8.2)	12.44 (4.92)	0.090	12.92 (5.98)	9.04 (3.58)	**< 0.001**
Hypertension								
No	147 (69.0)	10.74 (6.09)	455 (74.5)	7.99 (5.96)	**< 0.001**	9.22 (5.45)	7.25 (4.61)	**< 0.001**
Yes	66 (31)	17.53 (4.06)	156 (25.5)	15.47 (4.53)	**0.002**	14.70 (3.93)	11.26 (3.30)	**< 0.001**
Kidney disease								
No	127 (59.6)	9.42 (5.62)	468 (76.6)	8.41 (6.26)	0.100	8.09 (4.98)	7.45 (4.76)	0.190
Yes	86 (40.4)	17.91 (3.27)	143 (23.4)	14.79 (4.60)	**< 0.001**	15.09 (3.53)	10.95 (3.02)	**< 0.001**
Cardiovascular disease								
No	175 (82.2)	11.45 (6.12)	582 (95.3)	9.61 (6.44)	**0.001**	9.78 (5.38)	8.09 (4.63)	**< 0.001**
Yes	38 (17.8)	19.26 (2.03)	29 (4.7)	15.76 (4.72)	**0.001**	16.16 (3.32)	12.00 (3.39)	**< 0.001**

[a] Student *t*-test.

in rural area, COVID-19 survivors in urban area had higher anxiety and depression disorders than those in control group. Furthermore, our results revealed that COVID-19 survivors who had a medium socio economic reported having more anxiety and depression level than those in control group.

For the association between clinical variables and the mental health, the results showed that COVID-19 survivors with hypertension and cardiovascular disease obtained higher scores for anxiety (mean difference = 2.06 and 3.5, respectively, $p < 0.001$) and depression (mean difference = 3.44 and 4.16, respectively, $p < 0.001$) than those in control group. Results further showed that chronic kidney disease was strongly related to the side effects of the COVID-19 infection on both anxiety and depression disorders ($p < 0.001$). Indeed, the COVID-19 survivors with chronic kidney diseases were more anxious (HADS-A = 17.91) and depressive (HADS-D = 15.09) compared to chronic kidney diseases patients in control group (HADS-A = 14.79; HADS-D = 10.95). Our results showed also that COVID-19 survivors with type 1 diabetes were significantly more anxious (HADS-A = 14.16) compared to type 1 diabetes patients in control group (HADS-A = 12.88) ($p < 0.027$). Moreover, depression level was increased for patients with type 2 diabetes in COVID-19 survivors' group (HADS-D = 12.92) than those in control group (HADS-D = 9.04) ($p < 0.001$).

3.2. Association between clinical setting and mental health among the COVID-19 survivors

Among the 213 COVID-19 survivors 25.8% was admitted in ICU (Table 2). The majority of patients (70.9%) stayed in hospital for less than 10 days. Mild COVID-19 symptoms were observed in 49.8% of patients, whereas moderate and severe COVID-19 symptoms were observed in 33.8% and 16.4%, respectively. Ninety-three patients (43.7%) had a duration of symptoms from 10 to 15 days. Most of patients (60.6%) received the Chloroquine as COVID-19 treatment.

The results for the association between the clinical COVID-19 characteristics and anxiety/depression showed that patients treated with Chloroquine had higher anxiety (mean difference = 5.13, $p < 0.001$) and depression (mean difference = 3.84, $p < 0.001$) scores (Table 2). In addition, patients admitted to ICU were more anxious and depressed that those who did not hospitalized in ICU. Indeed, the effect sizes were 7.19 ($t = 10.66$; $p < 0.001$) and 5.29 ($t = 6.57$; $p < 0.001$), respectively. More the duration of hospitalization increased more the anxiety and depression increased (HADS-A = 17.10; $p < 0.001$ and HADS-D = 14.02; $p < 0.001$). Also, the severity of symptoms and their duration increased significantly both anxiety and depression (Table 2).

Table 2
Association between the clinical COVID-19 characteristics and mental health for COVID-19 survivors (n = 213).

Variables	n (%)	HADS-Anxiety		HADS-Depression	
		means (SD)	*p*-value	means (SD)	*p*-value
Treatment setting			**<0.001**[a]		**<0.001**[a]
No ICU admission	158 (74.2)	10.99 (6.09)		9.55 (5.33)	
ICU admission	55 (25.8)	18.18 (3.48)		14.84 (4.52)	
Hospital stay			**< 0.001** [a]		**< 0.001** [a]
0–10 days	151 (70.9)	11.10 (6.10)		9.64 (5.37)	
10 or more days	62 (29.1)	17.10 (4.82)		14.02 (5.02)	
COVID-19 symptoms			**< 0.001** [b]		**< 0.001** [b]
Mild symptoms	106 (49.8)	9.60 (6.58)		8.35 (5.75)	
Moderate symptoms	72 (33.8)	14.87 (3.98)		12.74 (3.87)	
Severe symptoms	35 (16.4)	18.48 (3.38)		14.94 (4.44)	
Duration of symptoms			**< 0.001** [b]		**< 0.001** [b]
0–10 days	79 (37.1)	7.32 (5.14)		6.37 (4.42)	
10–15 days	93 (43.7)	15.20 (4.48)		13.14 (4.17)	
15 or more days	41 (19.2)	18.15 (3.82)		14.63 (4.79)	
Chloroquine use			**< 0.001** [a]		**< 0.001** [a]
Yes	129 (60.6)	14.87 (5.10)		12.43 (4.68)	
No	84 (39.4)	9.74 (6.87)		8.59 (6.17)	

[a] Student *t*-test.
[b] ANOVA test.

3.3. The association between the mental health and both socio-demographic and comorbidity among COVID-19 survivors

Tables 3 and 4 summarize the association between the mental health and both socio-demographic and comorbidity among COVID-19 survivors. The unadjusted odds ratios showed that gender, education level, employment status, socio-economic level, place of residence, and type 1 diabetes were not significantly associated with anxiety and depression among COVID-19 survivors. Furthermore, the results of the multiple binary logistic regression analysis revealed that age, type 2 diabetes and kidney diseases were significantly associated with anxiety and depression among COVID-19 survivors. The adjusted odds were four times higher for anxiety (aOR = 4.10 [1.39–12.08]) and depression (aOR = 4.28 [1.45–12.62]) among COVID-19 survivors aged 60 years old and above than younger (18–40 years). COVID-19 survivors with type 2 diabetes were three times more anxious (aOR = 3.17 [1.36–7.41]) and depressed (aOR = 3.54 [1.51–8.29]) than COVID-19 survivors living without diabetes type 2. Similarly, kidney disease increased significantly the anxiety and depression in COVID-19 survivors.

4. Discussion

COVID-19 is an unpleasant experience that can cause unprecedented disruption in the patients' well-being. ICU transfer, duration of hospitalization, presence of severe symptoms, chronic stress related to disease burden, daily activities restrictions, functional limitations, isolation and fear of death could further affect the patient's mental health. This case-control study (i) provided a detailed analysis of the mental health status of Moroccan COVID-19 survivors 3 months after hospital discharge and (ii) examined predictors of higher anxiety/depression for COVID-19 survivors.

Despite various investigations demonstrating that the COVID-19 pandemic has enormous negative mental health effects on general population, our study highlighted that COVID-19 survivors are at even higher risk of increased mental health disorders. Indeed, the COVID-19 survivors reported having higher levels of anxiety and depression (HADS-A = 12.84; HADS-D = 10.91) than control group (HADS-A = 9.90; HADS-D = 8.27). Similary, Guo and colleagues revealed that COVID-19 patients, manifested higher levels of depression (60.2%; $p < 0.001$) and anxiety (55.3%; $p < 0.001$) when compared to non-COVID controls.[14] Moreover, a systemic review and meta-analysis showing that about one-third of COVID-19 survivors have psychological conditions such as anxiety and depression persisting 6 months after discharge from hospital.[15] In addition, a Chinese study found that anxiety or depression was reported among 23% of COVID-19 patients discharged after 6 months.[16] Furthermore, these findings are also confirmed in previous outbreaks. In fact, influenza virus infection has been associated with increased risk of several psychiatric disorders.[17]

Age is the most influencing factor for developing more severe COVID-19 clinical spectrum, especially patients aged 70 and above.[18] Our result showed that older age is among the most predictors of higher anxiety and depression in COVID-19 survivors. This finding was similar to recent studies in the literature which revealed that older COVID-19 patients experienced a greater level of anxiety and depression compare to younger.[19] Xiao and colleagues showed that being female, was significant risk factor of mental health problems, including depression and anxiety.[20] This finding is in contrast to this current study which reported no significant association between gender and mental health among COVID-19 survivors. In other hand, our study reported an increased risk of anxiety and depression disorders in single COVID-19 survivors. However, this association was not confirmed after adjustment in a multivariable logistic regression model. This finding is consistent with a recent study, which found that the marital status was not significantly associated to mental health.[20] Mei and colleagues reported that the difference between the mean depression scores among COVID-19 patients was significantly depending on comorbidity.[21] Moreover, Mannan and colleagues, in a cross-sectional study on COVID-19 in Bangladesh, found that people with comorbidities have reported post-COVID complications such as anxiety and depression with a greater significance.[22] This is in line with our study which found that diabetes mellitus and kidney diseases increased the prevalence of anxiety and depression among COVID-19 survivors.

Higher anxiety and depression disorders rate associated with ICU admission for critical illness survivors were reported in previous studies.[23] This association is also confirmed in COVID-19 context. In fact, Martillo and colleagues observed that 48.9% of COVID-19 ICU survivors presented psychiatric impairment with depression endorsed most commonly.[24] Also, Huang and colleagues found that 32% of patients reported having anxiety or depression at 6 months after acute infection.[16] Moreover, a recent study investigating the occurrence of physical, mental, and cognitive symptoms among patients with COVID-19 at 1 year after ICU treatment found that the anxiety and depression symptoms were reported by 17.9% and by 18.3%, respectively.[25] These findings are consistent with our results, which showed a noticeable association between ICU transfer and mental health disorders. This emphasized the need for appropriate post-ICU care to diagnose and treat negative effects on mental health for COVID-19 survivors.

Our study revealed that higher length of hospital stay and the severity of COVID-19 symptoms and their duration were also most important predictors of worsening mental health. Similary, Todt et al. showed that the longer duration of hospital stay increased anxiety and depression levels up to 3 months following hospital discharge.[26] The Chloroquine has been widely used for treating COVID-19. However, it

Table 3
The association between anxiety and both socio-demographic and comorbidity among COVID-19 survivors.

Variables	Univariate analysis			Multivariate analysis		
	COR	[95% CI]	*p*-value	AOR	[95% CI]	*p*-value
Gender						
Male	1			–	–	–
Female	1.01	[0.58–1.77]	0.966	–	–	–
Age						
18-40	1			1		
40-60	7.53	[2.84–19.98]	**< 0.001**	3.23	[1.04–10.01]	**0.042**
+60	14.18	[5.57–36.08]	**< 0.001**	4.10	[1.39–12.08]	**0.011**
Marital status						
Single	1			1		
Married	0.22	**[0.05–0.99]**	**0.049**	0.63	[0.09–4.25]	0.637
Widowed/Divorced	0.20	**[0.04–0.99]**	**0.049**	0.34	[0.04–2.57]	0.297
Educational level						
Illeterate	1			–	–	–
Primary	0.83	[0.36–1.91]	0.663	–	–	–
Secondary	1.69	[0.75–3.81]	0.205	–	–	–
University	0.96	[0.47–1.94]	0.910	–	–	–
Profession						
No	1			–	–	–
Yes	0.80	[0.45–1.43]	0.452	–	–	–
Socio economic level						
Low	1			–	–	–
Unknown	1.14	[0.64–2.04]	0.650	–	–	–
Place of residence						
Urban	1			–	–	–
Rural	0.93	[0.43–2.03]	0.863	–	–	–
Presence of chronic diseases						
Type 1 diabetes						
No	1			–	–	–
Yes	1.60	[0.81–3.15]	0.172	–	–	–
Type 2 diabetes						
No	1			1		
Yes	2.45	[1.25–4.83]	**0.009**	3.17	[1.36–7.41]	**0.008**
Hypertension						
No	1			1		
Yes	5.45	[2.51–11.82]	**< 0.001**	0.47	[0.11–1.97]	0.301
Kidney disease						
No	1			1		
Yes	16.90	[6.87–41.60]	**< 0.001**	21.66	[4.69–10.13]	**< 0.001**
Cardiovascular disease						
No	1			1		
Yes	8.55	[2.53–28.86]	**0.001**	1.41	[0.27–7.28]	0.685

COR: Crude odds ratio; AOR: adjusted odds ratio; 95% CI: 95% confidence interval.

has shown undesirable effects.[27] This current study revealed that COVID-19 patients treated by the chloroquine were more anxious/depressed than those who did not received it.

Our study has several strengths. This is the first Moroccan study assessing the psychological status of COVID-19 survivors 3 months after hospital discharge and examining predictors of higher anxiety and depression in COVID-19 survivors. Moreover, this study used the valid standardized measure of anxiety and depression. Another strength in this work was the use of control group that provides a better understanding of post COVID-19 mental health disorders. Likewise, we included in this study COVID-19 survivors from both urban and rural area of several regions in Morocco. Lastly, the large sample size and the high response rate for online survey represent another strength.

Several study limitations should be noticed. Firstly, this study was limited by the lack of information about pre COVID-19 survivors' mental health. A comparative study between pre- and post-COVID-19 survivors' mental health could be conducted to have more information on the impact of COVID-19 on mental health. Secondly, we evaluated the mental health only once, 3 months after hospital discharge. Repeated measurements would help to understand the evolution of the impact of COVID-19 on the mental health.

5. Conclusion

In summary, this study investigated mental health impairment in the post-discharge among COVID-19 survivors. Our findings highlighted higher prevalence of mental health disorders including anxiety and depression in COVID-19 survivors. Older patients, suffering from type 2 diabetes and kidney diseases, admitted to ICU, who stayed a long duration in the hospital, who had severe and longer duration of symptoms and who used Chloroquine, had higher levels of anxiety and depression after discharge.

These findings underscore the need to create preventative strategies to limit mental health disorders in COVID-19 survivors. Also, to develop a post-COVID-19 rehabilitation programs that can better manage the post COVID-19 and restore a good mental health.

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Ethical approval of studies and informed consent

This study was conducted according to the Helsinki's Declaration of ethics. The online questionnaire was anonymous and the data were coded. On the main page, a summary of the purpose of the data collection and an online letter of consent were presented to the respondents. Access to the questionnaire was only given if the respondent

Table 4
The association between depression and both socio-demographic and comorbidity among COVID-19 survivors.

Variables	Univariate analysis			Multivariate analysis		
	COR	[95% CI]	*p*-value	AOR	[95% CI]	*p*-value
Gender						
Male	1			–	–	–
Female	0.85	[0.49–1.49]	0.577	–	–	–
Age						
18-40	1			1		
40-60	5.74	[2.18–15.09]	**< 0.001**	2.25	[0.72–7.01]	0.163
+60	14.18	[5.57–36.08]	**< 0.001**	4.28	[1.45–12.62]	**0.008**
Marital status						
Single	1			1		
Married	0.20	[0.04–0.91]	**0.038**	0.43	[0.07–2.67]	0.364
Widowed/Divorced	0.18	[0.04–0.90]	**0.036**	0.22	[0.03–0.59]	0.134
Educational level						
Illeterate	1			–	–	–
Primary	0.87	[0.38–2.00]	0.747	–	–	–
Secondary	1.77	[0.79–3.99]	0.166	–	–	–
University	0.79	[0.40–1.59]	0.515	–	–	–
Profession						
No	1			–	–	–
Yes	0.77	[0.43–1.36]	0.362	–	–	–
Socio economic level						
Low	1			–	–	–
Unknown	1.20	[0.67–2.13]	0.537	–	–	–
Place of residence						
Urban	1			–	–	–
Rural	0.88	[0.41–1.89]	0.743	–	–	–
Presence of chronic diseases						
Type 1 diabetes						
No	1			–	–	–
Yes	1.58	[0.81–3.08]	0.177	–	–	–
Type 2 diabetes						
No	1			1		
Yes	2.43	[1.25–4.73]	**0.009**	3.54	[1.51–8.29]	**0.004**
Hypertension						
No	1			1		
Yes	5.23	[2.48–11.04]	**< 0.001**	0.63	[1.17–2.28]	0.477
Kidney disease						
No	1			1		
Yes	13.18	[5.87–29.57]	**< 0.001**	11.49	[3.09–42.71]	**< 0.001**
Cardiovascular disease						
No	1			1		
Yes	9.38	[2.78–31.66]	**< 0.001**	1.88	[0.40–8.70]	0.421

COR: Crude odds ratio; AOR: adjusted odds ratio; 95% CI: 95% confidence interval.

consented to participate. Also, participants were informed that they will receive results of this study once they are published.

Institutional review board statement

This study was conducted in accordance with the Declaration of Helsinki, and approved by the "Ethics Committee of Mohamed 6 University of Health Sciences (UM6SS) of Casablanca, Morocco (CERB/UM6SS/26/21–24 May 2021)".

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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