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Depression in COVID-19-positive Vaccinated Patients during Isolation and its Relation to Chronic Medical Diseases in Abu Dhabi, United Arab Emirates

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Abstract

BACKGROUND: Psychological disorders are common in patients who experienced coronavirus disease 2019 (COVID-19). Thus, there is a need to assess the prevalence of these disorders following vaccination, particularly in non-hospitalized cases as most COVID-19 patients do not require hospitalization. The presence of specific chronic medical disease has been displayed to increase the severity of infection and may also cause negative psychological outcomes in these patients.

AIM: This study aimed to measure the prevalence of depression in COVID-19-positive non- hospitalized vaccinated patients during isolation and to detect the difference in depression between patients with and without medical diseases within the study.

METHODS: This was a cross-sectional study of a sample of patients from Abu Dhabi. A total of 194 participants were enrolled. All of them were COVID-19 vaccinated and tested positive for COVID-19. Participants were assessed using the Patient Health Questionnaire (PHQ9).

RESULTS: Depression was present in 10.8% of COVID-19 positive vaccinated patients while 89.2% had no depression according to their PHQ9 scores. A total of 18.5% of patients with chronic medical diseases had depression while 9.6% of patients without chronic medical diseases showed depression with no statistical significant difference in prevalence of depression between these two groups.

CONCLUSION: The prevalence of depression was relatively low in this study compared to previous studies. No significant difference was found in the likelihood of developing depression between patients with and without chronic medical diseases. Further studies should be conducted to evaluate the effect of vaccines on mental health.

Introduction

The World Health Organization declared the existing coronavirus disease 2019 (COVID-19) a pandemic in March 2020 and highlighted its effects on mental health [1]. High prevalence rates of psychiatric health problems following the COVID-19 outbreak have been reported including high rates of depression, anxiety, and insomnia [2]. However, the impact of the COVID-19 pandemic on psychological well-being appears to have varied across time, with psychiatric symptoms being more severe at the onset of the pandemic and less severe in the following period [3].

Most COVID-19 patients have presented with only mild symptoms or without symptoms [4], [5], [6], [7], [8], [9]. However, data related to the psychological health of these patients are lacking [10]. Being vaccinated has been linked with lower odds of depression and/or anxiety. However, there were subgroup differences in the association between vaccination and decreased symptoms of depression and/or anxiety [11]. Chronic medical diseases most strongly associated with negative outcomes in COVID-19 patients include malignancy, chronic obstructive pulmonary disease, obesity, cardiac problems, and diabetes mellitus [12].

Although numerous studies have been conducted to investigate the prevalence of depression during the COVID-19 pandemic, there is a need to evaluate the psychological impact following vaccination within the general population given that vaccination has been hypothesized to reduce depressive symptoms. The majority of COVID-19 patients are non-hospitalized. Thus, the aim of the present study was to detect the prevalence of depression in vaccinated patients who contracted COVID-19 but remained non-hospitalized. In addition, the study sought to explore whether the prevalence of depression in this population relates to patient history of chronic medical diseases.

Methods

Population and sample

This study is a cross-sectional study that was conducted at COVID clinic, Ruwais Hospital, Abu Dhabi, UAE. Any patients who have tested positive to COVID-19 either during routine check-ups at other facilities or those patients presenting with mild COVID-19 symptoms can be referred to this clinic for regular RT-PCR (reverse transcriptase-polymerase chain reaction) testing and follow-up until they recover. All patients were expected to self-isolate at home during this period.

A sample of 194 participants was included in the study. All patients were COVID-19 vaccinated and tested positive for coronavirus by RT-PCR. The exclusion criteria for the study were: (a) Being below the age of 18 years, (b) presenting with a co-morbid medical illness limits life expectancy, (c) having a diagnosis of a depressive disorder before the COVID-19 pandemic, and (d) having required psychiatric assessment or medication before the COVID-19 pandemic. Demographic information and clinical data for the patients were collected, including age, sex, educational level, marital status, living circumstances, and history of chronic medical illnesses.

Sample size was calculated based on the previous study conducted by Lusida *et al*., 2022, where the prevalence of depression among COVID-19-positive patients was 3.6%. It was calculated that a minimum sample size of 54 participants was required to achieve 95% confidence level with a margin of error 5%. Adding 25% to account for possible losses (e.g., people dropping out) therefore a minimum sample size will be 68 [13]. Ethical approval was obtained from the Ethical and Research Committee, Ruwais Hospital, Abu Dhabi, UAE. Written informed consent was obtained from all participants after the objectives and methods of the study were explained.

Measurement

The research was conducted using a hard copy of the Patient Health Questionnaire 9 (PHQ9). The PHQ9 is a self-administered tool [14]. It has nine items for detecting depressive disorders according to the diagnostic and statistical manual of mental disorders, fourth edition. It is used to determine the severity of depressive symptoms: None (from 0 to 4), mild (from 5 to 9), moderate (from 10 to 14), moderately severe (from 15 to 18), and severe (from 19 to 27) [15].

Statistical analysis

Results were coded and entered using the Statistical Package for the Social Sciences version 28 (IBM Corp., Armonk, NY, USA). Quantitative data were summarized using mean, standard deviation, median, and minimum and maximum scores, while categorical data were summarized using frequency (count) and relative frequency (percentage). For the comparison of categorical data, a Chi-square test was performed. An exact test was used when the expected frequency was <5 [16]. $p < 0.05$ was considered to be statistically significant.

Results

The sociodemographic variables of the participants are shown in Table 1. The total number of participants was 194 patients with an average age of 38.08 ± 11.23 years. The majority of participants were ranged in age between 30 and 39 years (35.1%), were males (86.6%), had completed university education (64.9%), were married (77.8%), lived with others (76.8%), and resided in a house without a garden or a balcony (57.2%). The majority of participants did not have a chronic medical disease (86.1%).

Table 1: Sociodemographic variables in the study group

Variables	Mean ± SD	
Age (years)	38.08 ± 11.23	
Variables	Count	%
Age groups		
18–29	41	21.1
30–39	68	35.1
40–49	53	27.3
50–59	28	14.4
60–69	4	2.1
Sex		
Male	168	86.6
Female	26	13.4
Education		
Non-educated	4	2.1
Primary	1	0.5
High school	56	28.9
Vocational training	7	3.6
University	126	64.9
Living		
Alone	45	23.2
With others: Family or friend	149	76.8
Houses		
Houses without garden or balcony	111	57.2
Houses having garden or balcony	83	42.8
Marital status		
Single	43	22.2
Married	151	77.8
Chronic medical disease		
Non	167	86.1
Diabetes	8	4.1
Hypertension	13	6.7
Diabetes and hypertension	2	1.0
Bronchial asthma	1	0.5
Others	3	1.6

The prevalence of depression measured by PHQ9 among the study sample is shown in Table 2. The mean score on the PHQ9 was 1.44 ± 2.69. Among

Table 2: Prevalence of depression in the study group (PHQ9)

(PHQ9) score	Total mean depression score (mean ± SD)	
	1.44 ± 2.69	
	Count	%
No depression	173	89.2
Mild depression	17	8.8
Moderate depression	2	1.0
Moderately severe depression	2	1.0
Severe depression	0	0.0

PHQ9: Patient health questionnaire.

the sample, 10.8% reported symptoms in line with depression, the majority of these cases falling in the mild depression range (8.8% of the overall sample).

The relationship between PHQ9 scores and sociodemographic data is shown in Table 3. In the present study, there was no association between PHQ9 scores and sociodemographic factors including age (p = 0.984), sex (p = 1.0), education (p = 0.684), marital status (p = 0.577), living situation (alone or with others) (p = 0.275), or even residing in homes with/without garden or balcony access (p = 0.994).

Table 3: Relationship between PHQ9 scale and sociodemographic factors

Variables	(PHQ9) scale		p-value
	Depression (%)	No depression (%)	
Age groups			
18–29	5 (12.2)	36 (87.8)	0.984
30–39	8 (11.8)	60 (88.2)	
40–49	5 (9.4)	48 (90.6)	
50–59	3 (10.7)	25 (89.3)	
60–69	0 (0.0)	4 (100.0)	
Sex			
Male	18 (10.7)	150 (89.3)	1.0
Female	3 (11.5)	23 (88.5)	
Education			
Non-educated	0 (0.0)	4 (100.0)	0.684
Primary	0 (0.0)	1 (100.0)	
High school	4 (7.1)	52 (92.9)	
Vocational training	1 (14.3)	6 (85.7)	
University	16 (12.7)	110 (87.3)	
Marital status			
Single	3 (7.0)	40 (93.0)	0.577
Married	18 (11.9)	133 (88.1)	
Living			
Alone	7 (15.6)	38 (84.4)	0.275
With family or friend	14 (9.4)	135 (90.6)	
Houses			
Houses without garden or balcony	12 (10.8)	99 (89.2)	0.994
Houses with garden or balcony	9 (10.8)	74 (89.2)	

PHQ9: Patient health questionnaire.

Table 4 shows the relationship between depression (PHQ9) and chronic medical diseases. The percentage of depression was higher in patients with chronic medical diseases (18.5%) when compared with those without chronic medical diseases (9.6%) (p = 0.182).

Table 4: Relationship between depression and chronic medical disease

Depression (PHQ-9)	Chronic diseases				p-value
	Yes		No		
	Count	%	Count	%	
Yes	5	18.5	16	9.6	0.182
No	22	81.5	151	90.4	

PHQ9: Patient health questionnaire.

Discussion

The prevalence of depression in COVID-19 -positive non-hospitalized vaccinated patients during isolation was 10.8%. Most of these cases presented with symptoms of mild depression (8.8%). Most participants were between the ages of 30–39 years (35.1%), university educated (64.9%), married (77.8%), living with others (family or friends) (76.8%), and residing in a home without a garden or a balcony (57.2%). The vast majority of patients did not suffer from a chronic medical disease (86.1%). However, among the patients who had a chronic medical illness 6.7% were diagnosed with hypertension.

In this study, 10.8% of the participants showed depressive symptoms. Among this group, 8.8% had mild depression. This finding is inconsistent with another cross-sectional study which was conducted in the UAE to assess depression during the COVID-19 pandemic before vaccination (May 14th–June 17th, 2020) where the PHQ-9 was also used to assess depression. In that study, almost half of the participants (47.8%) suffered from depressive symptoms and the mean depressive score was 10.5 ± 6.6, compared with a score of 1.44 ± 2.69 in the present study [17]. Moreover, a systematic search of many databases was conducted from January 1, 2020, to January 1, 2021. This included 52 studies which showed that the prevalence of depressive symptoms during the COVID-19 pandemic was 34% [18]. As such future investigations should be conducted to study the role of COVID-19 vaccines in the reduction of negative psychological outcomes. The present study is consistent with another study that showed being vaccinated for COVID-19 was associated with the lower prevalence of depression [11].

Although the possible mechanism is unknown, it is plausible that the COVID-19 vaccine lowered the fear of COVID-19 and related pressure resulting from COVID-19 restrictions, and therefore mental problems were reduced in people who were vaccinated [11], [19]. In a randomized and cross-sectional study conducted to investigate the adverse effects of the BNT162b2 vaccine (COVID-19 vaccine), depression was reported in only 0.37% of the sample, representing three in 803 participants who received the vaccine [20].

However, other results are not consistent with this finding of this study. Yesilkaya *et al*., 2021 reported that two male patients presented with mood symptoms following vaccination for COVID-19. Both of them presented with dysphoric mood, irritability, pressured speech, delusions, and lack of insight [21]. In addition, an elderly male patient aged 74 years presented with depressive symptoms following COVID-19 vaccine [22].

This can be explained by evidence that states that the immune system plays an important role in the pathophysiology of many psychiatric disorders including depression [23]. Following vaccination, immune changes are caused in the human body. Several studies demonstrated that influenza vaccination and typhoid vaccination can produce significant changes as regards mood and cognition. The severity of these changes has been found to be associated with circulating immune markers, such as interleukin-6 [24], [25].

With regards to the relationship between depression and patient age, no participants between 60 and 69 years had post-vaccine depression while 12.2% of participants between 18 and 29 years suffered from post-vaccine depression (p = 0.984). Furthermore, being single was associated with lower

depressive symptoms (7.0%) in comparison to being married (11.9%) (p = 0.577). This is in line with a study that showed that older people and people who are widowed, divorced, or separated have a robust association between COVID-19 vaccination and decreased symptoms of depression [11]. These results are in line with the previous studies, which found that these groups have higher vulnerability to COVID-19 and are more likely to express their need to be vaccinated against COVID-19 [26], [27], [28], [29].

In the present study, it was found that all non-educated participants (4/194) had no post-vaccine depression while 12.7% (16/194) of participants who went to university had post-vaccine depression (p = 0.684). However, since this represents only four out of 194 participants, it is difficult to draw any conclusion from the present study regarding links between education status and prevalence of post-vaccine depression.

This was not concordant with other results. It was found that vaccination in people with the lower educational attainment is associated with higher prevalence of depressive symptoms [11]. This may reflect the vaccine hesitancy which is more prevalent among this group of people [27], [30]. It may also relate to the lack of clarity and/or misinformation related to vaccination side effects within this cohort [31], [32].

As regards residency conditions, participants who were living with family or with friends showed lower incidence of post-vaccine depression (9.4%) than those who were living alone (15.6%) (p = 0.275). Social isolation and loneliness are associated with high risk for depression, as well as higher risk of suicide [33], [34].

Regarding the relationship between chronic disease and post-vaccine depression, 18.5% of patients with chronic illnesses suffered from depression while this rate was only 9.6% in participants with no chronic illness (p = 0.182). Findings in this study are similar to two studies, but inconsistent with others that showed positive associations between the existence of chronic medical diseases and higher prevalence of depression during the COVID-19 pandemic.

Our results are consistent with other studies conducted by Budu *et al*., 2021 and Louvardi *et al*., 2020, where they sought to assess the association between increased depressive symptoms and chronic medical diseases during the COVID-19 pandemic but found no significant association [35], [36]. In contrast, other studies have demonstrated a significant association between depression and chronic medical diseases during the COVID-19 pandemic [37], [38], [39], [40].

This difference in findings may be related to how chronic medical diseases were identified in each study. For instance, while we excluded patients who have a chronic medical illness that limited their life expectancy, some studies had no such restriction. In addition, the current result may be related to the effect of vaccines in decreasing depressive symptoms given that all patients in our study were vaccinated. There is growing recognition that both chronic medical diseases and mental disorders have a common underlying pathophysiologic processes [41]. The field of psychoneuroimmunology provides strong evidence of the relationship between depressive disorders and the immune system. It is established that depression and chronic diseases have a bidirectional relationship where impaired cellular immunity, continuous low-grade chronic inflammation, disruption of neurotransmitter systems correlated with depression, and depressive behavior all affect one another in the form of a decompensatory feedback loop [42].

Limitations

This was a cross-sectional study, meaning that any causal effects were difficult to investigate. The current study did not take into consideration the severity of chronic medical diseases. Unfortunately, it was not possible to have a non-vaccinated control group from the UAE as nearly all of the general population was vaccinated by this time.

Conclusion

The prevalence of depression was relatively low in this study. No significant difference was found in the likelihood of developing depression between patients with and without chronic medical diseases.

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