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Research Article

Association between Covid-19 Vaccines and Anxiety

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Abstract

Background: The viral infection known as coronavirus disease 2019 (COVID-19) is carried on by the SARS-CoV-2 virus, leading to severe acute respiratory syndrome. Currently, individuals around the world have been exposed to all types of coronavirus disease (COVID-19) vaccines. Although COVID-19 vaccines are effective against the virus, we have not obtained any measure of how doses influence the effects of anxiety. Hence, understanding the potential anxiety effects of COVID-19 vaccines is critical to ensuring the public safety and well-being of individuals receiving these vaccines. By conducting this study, the researchers aim to fill the current knowledge gap and provide valuable insights into any possible anxiety associated with different doses of COVID-19 vaccines. **Methodology:** A cross-sectional study, an online survey was used among a covid-19 vaccinated people in Saudi Arabia. Data were collected between September 2023 and November 2023. The survey collected a questionnaire assessing sociodemographic characteristics of COVID-19 vaccine doses, and anxiety. **Results:** 847 participants answered the survey. As a result, 211 participants reported experiencing anxiety following their Covid-19 vaccination. Regarding the onset of anxiety following any of the three doses. In response, 48 people reported it appeared after the first dose, 54 and 67 of them reported it appeared after the second and three doses respectively. **Conclusion:** This study provides valuable insights into the results of the post-COVID-19 vaccine effect and its relationship to anxiety. It has been determined that post-exposure to a COVID-19 vaccine is associated with anxiety.

Keywords: COVID-19; Vaccine; Anxiety; Hypertension; Women; Infection

Introduction

Coronavirus disease 2019 (COVID-19) is an infection caused by Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. This has impacted 448,000,000 people worldwide and killed almost 6,000,000 people so far [1]. The COVID-19 pandemic has led to a second pandemic of anxiety and depression around the world in the first year [2].

The widespread implementation of lockdowns, isolation, and closures of public spaces, educational institutions, and workplaces, strict rules about social distancing, and mask laws in an attempt to curb the swift spread of SARS-CoV-2 had a devastating effect on mental health throughout the world [3]. The World Health Organization (WHO) reported that women were more affected than men, and those with pre-existing physical illnesses like asthma, cancer, and heart disease were more likely to experience mental health symptoms.

The first COVID-19 vaccination was approved in December 2020. By December 2021, it was anticipated that 55.9% of the world's population had received the vaccine at least once, 45.5% had received two doses, and 4.3% had received a booster dose. The Oxford- Astra Zeneca vaccine proved to be 70.4% successful, whereas the Pfizer-BioNTech vaccine was 95% effective, the Moderna vaccine was 94.1% effective, and the COVID-19 inactivated vaccine was 50.7% effective [4,5]. A study was showed that after receiving the first dosage mental health significantly improved and related to greater decreases in the symptoms of anxiety and depression [6]. On the other hand, the psychological impact of vaccinations on anxiety and sleep quality is possible [7].

Anxiety is a common psychological condition characterized by feelings of worry, fear, and unease. There are physical and emotional signs of anxiety. Heart palpitations, dyspnea, trembling, sweating, migraines, and tense muscles are examples of neurological symptoms. An emotional reaction to anxiety can include restlessness, irritation, trouble focusing, excessive worrying, and a sense of approaching disaster. Anxiety can have a significant impact on a person's daily life and functioning. Before and after COVID-19 recovery, anxiety is common, as the pandemic has been a difficult and stressful period for many people. In women, anxiety disorders are much more common than in men and the symptoms can vary depending on the stage of a woman's life including distinct hormonal phases such as puberty, the premenstrual period, pregnancy or postpartum, and the menopausal transition [8].

However, the anxiety that follows vaccination is not well known, and our goal is to close this knowledge gap.

Materials and Methods

Participants

Ethical approval was abstained from the research committee of the College of Medicine at Taif University-Saudi Arabia with an approval number (HAO/02/T/105).

The participants were invited to participate via an online link to the survey with various social media platforms in Arabic language. The survey was available for the public to fill out between September 2023 and November 2023. The study population compared all the residents of both genders in Saudi Arabia (Saudis & non-Saudis) of any age who received the COVID-19 vaccine. Study objectives were highlighted in the cover letter of the survey. All the collected data about the participants were stringently maintained to be anonymous and confidential throughout the study; if the participant clicks "disagree", the survey will close and end. The sample size was those who agreed to participate and complete the survey, there were 847 responses. Inclusion criteria included all participants who took the first dose of the vaccine.

Study design

A cross-sectional online survey was done using a self-developed questionnaire among COVID-19-vaccinated people in Saudi Arabia to seek the anxiety that developed after the vaccine.

Assessment Questionnaire

The survey collected several variables. First, some general information including personal information: age, gender, educational level, and health information: chronic illness. Then, the main questions about the COVID-19 vaccine doses and their relation to anxiety and its severity after taking the vaccine. The participants were asked about anxiety in separate sections, the content of the first section was about whether the anxiety was present after the vaccine, if the answer was "no" it would skip to the end of the survey, if the answer was "yes" it will continue to the next section. The questions of the next section were about the onset of the anxiety, with which dose of the vaccine (first-second-third) the anxiety appeared, after what time of taking the vaccine the anxiety commenced, did the anxiety disappear, and after how long.

Statistical analysis

Descriptive statistics were used to present the findings. All collected data were analyzed using the Statistical Package for the Social Sciences Software version 29.0 (SPSS V.29, IBM Corp, Armonk, NY, US). A binary logistic regression test was used to test for the association between categorical variables. Frequency and percentage were used for describing categorical data. P-value <0.05 is considered statistically significant.

Results

According to Tables 2, all the participants in the study received the first dose of the vaccine, and most of them received at least two doses. In addition to that, majority of participants had received the Pfizer vaccine, followed by AstraZeneca, then Moderna.

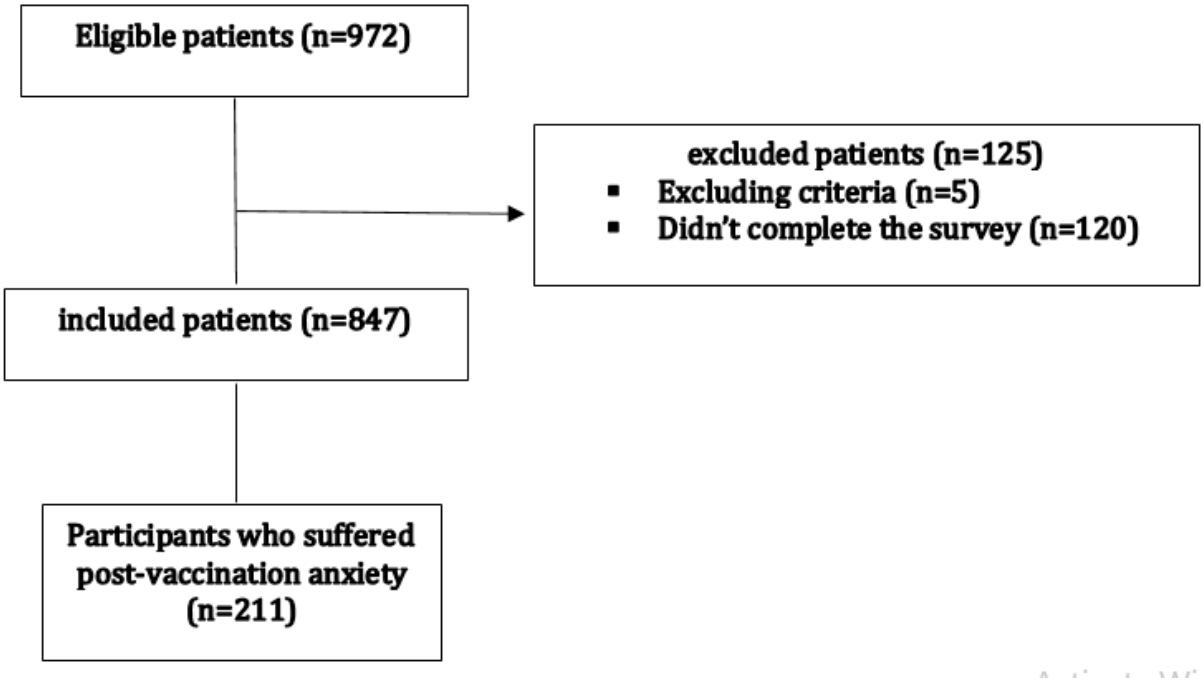
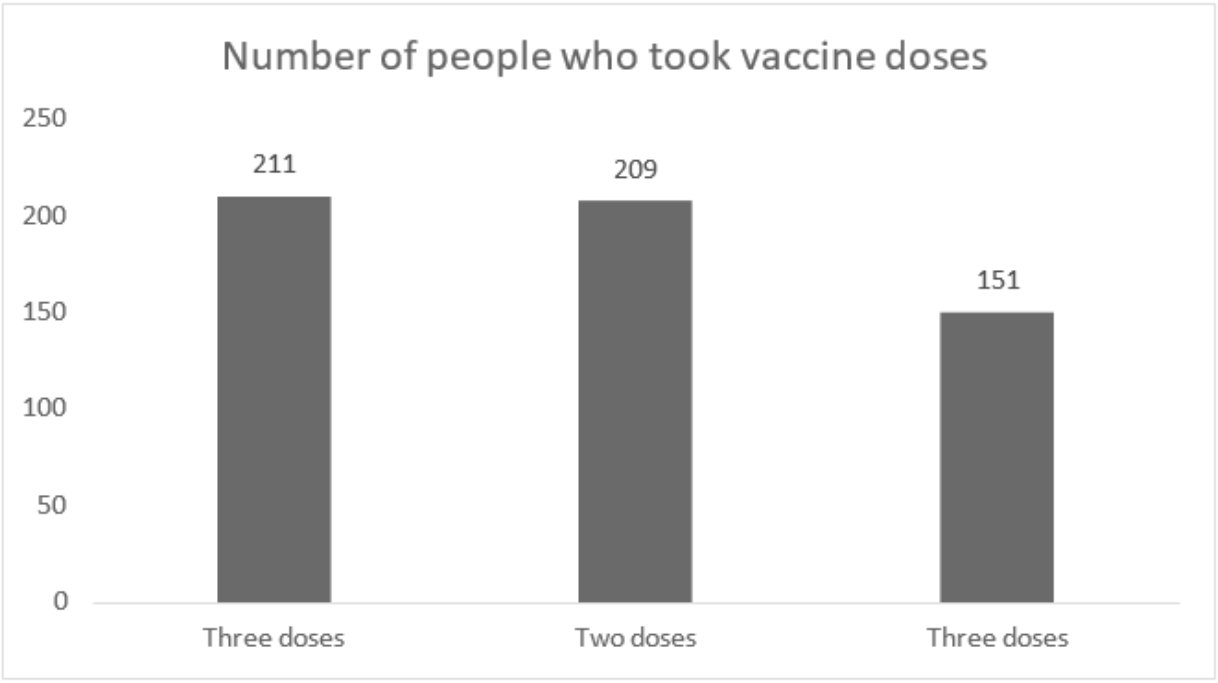


Figure 1: Flow chart for study participants.



Graph 1: Number of participants who complained of anxiety divided based on vaccine doses.

	Population
Gender	
Men	330 (39.0%)
Women	517 (61.0%)
Age	
<18	45 (5.3%)
18-30	558 (65.9%)
31-40	62 (7.3%)
41-50	100 (11.8%)
51-60	77 (9.1%)
61-70	3 (0.4%)
>70	2 (0.2%)
Educational level	
Illiterate	0 (0.0%)
Elementary education	3 (0.4%)
Middle education	20(2.4%)
Secondary education	191 (22.6%)
Bachelor's or equivalent	590 (69.7%)
Master's and above	43 (5.1%)
Diabetes	28 (3.3%)
Hypertension	22 (2.6%)
Asthma	12 (1.4%)
Thyroid disease	9 (1.1%)
Hyperlipidemia	3 (0.4%)
Cardiovascular disease	1 (0.1%)
COVID-19 infection	360 (42.5%)

Table 1: Demographic factors and characteristics of the sample population.

	First dose	Two doses	Three doses
Pfizer	737 (87.0%)	631 (75.6%)	459 (71.3%)
AstraZeneca	102 (12.1%)	142 (17.0%)	80 (12.4%)
Moderna	8 (0.9%)	62 (7.4%)	103 (16.0%)
Total	847 (100%)	835 (100%)	642 (100%)

Table 2: Distribution of sample population according to type of the vaccine and number of doses.

In multivariate logistic regression analysis, we have found some interesting links between anxiety and a few different factors.

Gender: We found that women have higher odds of experiencing anxiety compared to men, with an odds ratio (OR) of 2.638. This result is statistically significant ($p<0.001$). The 95% confidence interval (CI) ranges from 1.802 to 3.864, solidifying our result validity even more.

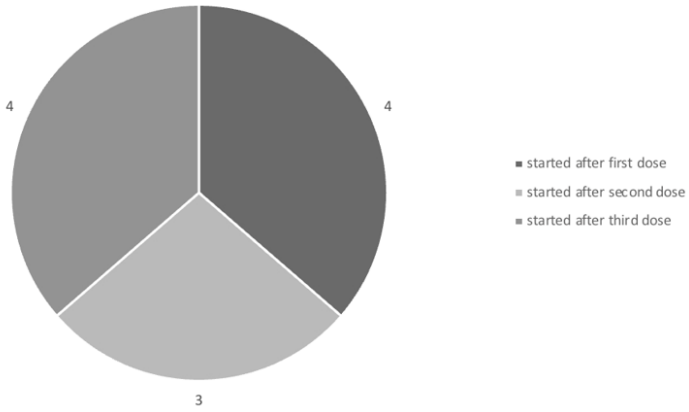
Hypertension: Hypertensive patients demonstrated higher odds of experiencing anxiety compared to those without hypertension, with an OR of 0.378. This result is statistically significant ($p=0.045$). The 95% CI for this finding ranging from 0.110 to 0.975.

COVID-19 infection: Table suggested that Individuals who had been infected with COVID-19 were found to have lower odds of experiencing anxiety compared to those who were not infected, with an OR of 0.678. And the result is statistically significant ($p=0.022$). With 95% CI ranges from 0.486 to 0.946.

Vaccination: The association between receiving two doses of the vaccine and experiencing anxiety was not statistically significant ($p=0.284$), with an OR of 0.416. However, receiving three doses of the vaccine was significantly associated with increased odds of experiencing anxiety ($p=0.039$), with an OR of 1.5. The 95% CI was found to range from 1.020 to 2.207.

Additional variables evaluated in this analysis did not show a statistically significant association with anxiety. It appears that being a woman, having hypertension, or a previous infection with COVID-19 is significantly associated with a higher likelihood of experiencing anxiety. In addition to that people who took three doses showed a significant correlation with anxiety as a symptom after vaccination, where people who took three doses are more likely to exhibit anxiety than people who took two doses only.

Moreover, we asked other questions to study objects regarding anxiety. Data collected showed that 211 subjects in our study complained about anxiety after the vaccine which represents 24% of people included in it. 22 persons said it began before the vaccine, 97 stated that it started after the vaccine, 71 experienced anxiety before the vaccine but got worse after vaccination, and 21 persons said it started after vaccination but was caused by reasons other than the vaccine (Table 5).



Graph 2: Anxiety appearance according to vaccine doses in hypertensive participants.

When we asked the patients after which dose the anxiety started to appear the following answers were reported: 48 people said it appeared after the first dose, 54 said after two doses, and 67 of them reported it started after three doses.

All the patients reported other complaints linked with anxiety like fatigue (77.3%), increased heart rate (54.5%), tremor (42.2%), increased respiratory rate (41.2%), and sweating (40.8%). When we asked the patients "Is anxiety still present until now?" 76.3% stated that the symptom was still present at the time of the survey. 12.3% said it disappeared after days. In 6.2%, it disappeared through 7-12 months, and 5.2% stated that it disappeared in 1-6 months after its appearance.

Discussion

This study sheds light on the association between the COVID-19 vaccine and anxiety. We came across a significant result with the vaccine dose that showed 24.9% following the first dose-developed anxiety, 25.0% and 23.4% participants following the second and third doses, respectively (Table 3 and Graph 1). Interestingly, our result revealed that 10.4% experienced anxiety before the vaccine, 45.9% after the vaccine, 33.6% before the vaccine but got worse with the vaccine, and 09.9% before the vaccine but for other reasons unrelated to the vaccine (Table 5), even though we figured out that several previous studies have proven the effect of lockdowns during the COVID-19 pandemic on anxiety.

Additionally, we found a study conducted among Italian students shows an increase in the anxiety number of their sample by 50% during the lockdown, and 60% of those who already have a high level of anxiety trait get a bad prognosis throughout the lockdown in the pandemic [9]. In addition, we came across a study that established that both pandemic intensity and lockdown, considered contour able factors, correlate with increasing anxiety [10]. Moreover, we found a study applied in Saudi Arabia confirmed increasing anxiety at different levels during the COVID-19 lockdown [11]. The result was 18.4% with mild anxiety, 11.4% with moderate anxiety, and 8.2% with severe anxiety [11]. This makes us think that the only reason for anxiety was the lockdown, but acutely, we determine that our results have proved that besides the lockdown there is an association between the COVID-19 vaccine and anxiety because of the significant result with the third dose (P-value; 0.039) (Table 4) which was after the lockdown period. While the first dose was during the lockdown period, which made it misguided with the lockdown reason.

We found a study stating that according to a study's Probit analysis, women are nearly 20% more likely than men to develop anxiety [9]. In addition to that, we found out two studies have shown that the prevalence of anxiety disorder in women is twice as high as in men [12,13]. Furthermore, we figured out in previous studies carried out in China and Saudi Arabia during the COVID-19 lockdown period to measure the level of anxiety, a significant result was reported: women have a higher level of anxiety than men ($p < 0.001$), moreover, women have shown a higher level of anxiety than men in percent of 5.3, respectively [10,11]. This supports our result that vaccinated women are more prone to anxiety than vaccinated males by P-value; <0.001 (Table 4).

Interestingly, our findings revealed an association between hypertension and anxiety disorders. We found that hypertension participants are more likely to have anxiety with a P-value; 0.045 (Table 4) than another comorbidity, which shows an insignificant P-value (diabetes, asthma, thyroid disease, hyperlipidemia, and cardiovascular disease). To extent, all the participants with hypertension experienced anxiety after the vaccine (5 out of 11), or they previously had anxiety, but it worsened after the vaccine (6 out of 11) (Graph 2), indicating a dual effect of hypertension and vaccine on anxiety in need for further investigation.

	Exhibit anxiety	**Asymptomatic**	**Total**
First dose	211	636	847
Two doses	209	626	835
Three doses	151	493	644

Table 3: Prevalence of subjects that complained of anxiety compared to doses of the vaccine.

	P-value	Odds ratio	Confidence interval [upper; lower]
Gender (Women)	**<0.001**	2.638	[1.802; 3.864]
Age	0.078		
18-30	0.999	1542303492.2	-
31-40	0.999	2904468101.8	-
41-50	0.999	2569432392.6	-
51-60	0.999	1178662084.0	-
61-70	0.999	8329045954.7	-
> 70	0.999	1429601670.6	-
Diabetes	0.299	0.625	[0.257; 1.519]
Hypertension	**0.045**	0.378	[0.110; 0.975]
Asthma	0.104	0.363	[0.107; 1.232]
Thyroid diseases	0.154	0.338	[0.076; 1.499]
Hyperlipidemia	0.999	1287448293.8	-
Cardiovascular diseases	1.000	7008217349.5	-
COVID-19 infection	**0.022**	0.678	[0.486; 0.946]
Two doses	0.284	0.416	[0.083; 2.069]
Three doses	**0.039**	1.500	[1.020; 2.207]

Table 4: Binary logistic regression for anxiety association with other factors.

Started before the vaccination	22 (10.4%)
Started after the vaccination	97 (45.9%)
Started before the vaccination but got worse after the vaccine	71 (33.6%)
Started after the vaccination but for reasons unrelated to the vaccine	21 (09.9%)

Table 5: Onset of anxiety in relation to vaccination among all participants.

Moreover, we found a previous study assessing the symptoms of anxiety among hypertension patients found that hypertensive patients experienced anxiety symptoms by 56 % [14]. Moreover, we found a community-based study shows nearly 12% of hypertensive patients developed anxiety symptoms [15].

Remarkably, a significant P-value (0.022) (Table 4) in our data demonstrated the correlation between anxiety and the patient who gets infected with the coronavirus. Additionally, we came across several other previous studies that have established a connection between anxiety and COVID-19 infection, which lends credence to our findings. Furthermore, we found a study demonstrating that there is a small association (P-value <0.001) between the symptoms of depression and anxiety following the SARS-CoV-2 infection [16]. Moreover, we found a follow-up study was carried out to look into how COVID-19 affected survivors' psychopathology. They assess symptoms of multiple psychological diseases, including anxiety, the results according to BDI were (χ^2=42.15, p=<0.001) and (χ^2=36.11, p=<0.001) for both clinical state anxiety and clinical trait anxiety, respectively [17]. Additionally, we found in a previous prospective cohort that anxiety following a COVID-19 infection was found to be significantly correlated (aOR=1.072; 95% CI=1.012-1.134) [18].

Lastly, we found that there is no specific age group showing a significant association with anxiety (Table 4).

Strengths

This study has several strengths. We found several previous studies have established a link between coronavirus infection and

anxiety. However, no previous research has studied the association between COVID-19 vaccination and anxiety; hence, it is considered a trending topic. Additionally, our sample was chosen randomly from all over the Kingdom of Saudi Arabia to ensure that the population was appropriately represented. Furthermore, there is no conflict.

Limitations

This study has several limitations. The primary constraint of the current investigation is its cross-sectional design, which precludes the interpretation of connections between variables. Furthermore, the data may disproportionately represent more affluent populations because they are self-reported using a survey conducted online.

Conclusion

This study provides insight into anxiety after exposure to the COVID-19 vaccine, so the study contributes to understanding the effect of the COVID-19 vaccine and its connection to anxiety. We found that the COVID-19 vaccine has a relationship and is linked to anxiety, so more studies should be done on the effect of COVID-19 vaccines and neurological symptoms. Therefore, more studies should be done on the post-COVID-19 vaccine effect and neurological symptoms.

Disclosure

Author Contributions: Conceptualization, R.H.A and O.H.A.; methodology, H.S.A.; software, S.F.A; validation, G.O.A; data analysis, S.F.A.; resources, R.H.A, O.H.A and R.M.A.; data curation, F.S.A; writing—original draft preparation, R.H.A, O.H.A, S.F.A, R.M.A, H.S.A, and F.S.A.; writing—review and editing, R.H.A, G.O.A, and A.I; supervision, G.O.A and A.I.

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Institutional Review Board Statement: The ethics committee at Taif University recently reviewed your request to obtain the committee's approval of the research proposal shown below. The committee is accredited by the National Committee for Bioethics with No. (HAO-02-T-105) and the committee considered that the proposal fulfils the requirements of Taif University and accordingly ethical approval was granted (from August 23) for one year only Any changes to these approved conditions have to be reported to the committee.

Data Availability Statement: All the data were included within the article.

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Conflict of Interests

The authors declare no conflict of interest.

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