



The Psychological Impact of COVID-19 pandemic on Adult Patients pre and post receiving COVID-19 vaccine at KAMC Vaccination center, Riyadh, April 2021 The Psychological Impact of COVID-19 Vaccination on the Adult Population of Saudi Arabia

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Abstract

Background: The COVID-19 pandemic was declared by the WHO on March 11, 2020. To limit the spread of the SARS-CoV-2 virus that caused the pandemic, Saudi Arabia took precautionary steps like many other countries. COVID-19 symptoms typically resemble those of a cold and include a cough, fever, dyspnea, anosmia, ageusia, and headache. Not only did the COVID-19 have an impact on physical health, but also on mental health. Numerous factors, regardless of age, including work-related stress, lockdowns, social isolation, and quarantine in response to contain SARS-CoV-2 have a negative impact on the mental health of large populations. Individuals and communities have been impacted by public health emergencies, which have led to strong emotions and unhealthy behaviors. The most common manifestations of psychological problems are disorders of anxiety, depression, and panic. Due to the rapid spread of the disease, persistent efforts were put into developing a vaccine as soon as possible. Despite the fact that vaccines have been widely disseminated and given to large populations, there is still vaccine hesitancy, which may be brought on by concerns about the effectiveness of the vaccines, early trials, and related side effects. The Kingdom of Saudi Arabia started the vaccination process in December 2020. BioNTech/Pfizer and AstraZeneca are the vaccines that are being used in Saudi Arabia. The most common side effect of the COVID-19 vaccines is mild to moderate pain at the injection site. Fatigue, headache, fever, chills, and myalgia have also been reported. The side effects are reported to last for one day. This study aims to assess the psychological impact of the COVID-19 vaccine on the adult population of Saudi Arabia.

Methodology: This study is a cross-sectional study. Target population is people living in Saudi Arabia who have received COVID-19 vaccines. Data collection was achieved by distributing an online questionnaire. Snowballing technique was used to recruit more participants. Different scales were used for the assessment of generalized anxiety disorder, depression and psychological well-being, which include the Generalized Anxiety Disorder (GAD-7), the Patient Health Questionnaire (PHQ-8), and the 5-item World Health Organization Well-Being Index (WHO-5).

Results: The study included 220 participants whose mental health was assessed before and after the COVID-19 vaccination. The majority of the participants were female (69.1%) and Saudi nationals (90%). There was no significant psychological impact of the COVID-19 vaccination on the participants ($p > 0.05$). However, the study found significant mental stress among the female participants as compared to the male participants.

Conclusion: The study found no significant impact of COVID-19 immunization on the mental health of the adult population of Saudi Arabia. The study also indicated that gender and level of education might have an impact on the psychological state of the adult population of Saudi Arabia.

Keywords: COVID-19, Generalized Anxiety Disorder, Depression, COVID-19 vaccine.

Introduction

The coronavirus disease 2019 (COVID-19) started spreading from Wuhan, China on December 31, 2019. Shortly after, the WHO announced the disease as a public health emergency on January 30, 2020. It was announced as a pandemic on March 11, 2020 and has been affecting people's mental health ever since. COVID-19 has been receiving unprecedented news and social media coverage^{[1],[2]}. COVID-19 may cause a severe respiratory infection. However, the symptoms can range from being asymptomatic to a potentially fatal viral pneumonia, which may progress to an acute respiratory distress syndrome. Common symptoms are usually cold like cough, fever, dyspnea, anosmia, ageusia, and headache. The disease may be complicated by septic shock and multi-organ failure^[2].

Due to the quick spread of the disease, schools and universities were closed, followed by malls and all public recreational areas in Saudi Arabia. A 24-hour lockdown was also implemented in most cities in Saudi Arabia. Citizens and residents were only allowed to go out for essentials such as groceries, pharmacies, or hospitals. These unusual circumstances affected the mental health of people as is reported by many studies. A study conducted in Saudi Arabia show that 17% of the population suffered from moderate to severe depression while 10% reported severe anxiety symptoms, and 12% showed moderate to severe stress levels. The study reported females, smokers, those living alone during lockdown, people with chronic medical issues, and healthcare providers as high-risk groups for the psychological impact of COVID-19 pandemic^[3].

Since COVID-19 was a rapidly spreading disease, efforts were put into developing a vaccine globally. The genetic sequence of SARS-CoV-2 was identified on January 11, 2020. This helped labs start vaccine trials. Since then multiple vaccines have been introduced^[4]. Over 200 vaccines have been developed by researchers^[5]. The vaccines that are currently being used are

Pfizer/BioNTech, AstraZeneca, Moderna, Johnson & Johnson, Novavax, and Sputnik V^[2].

BioNTech/Pfizer and AstraZeneca are the vaccines that are currently being used in Saudi Arabia. They are both 2-dose vaccines that are several weeks apart. Pfizer developed an mRNA in a lipid nanoparticle vaccine. The AstraZeneca vaccine is a non-replicating chimpanzee adenovirus-DNA vaccine. The most common side effect of the vaccines is mild to moderate pain at the injection site; other side effects include fatigue, headache, fever, chills, and myalgia and usually last for one day^{[5],[6]}.

The Kingdom of Saudi Arabia started the vaccination process in December 2020. The vaccination process was divided into three phases. The first phase targeted citizens and residents who are older than 65 years, obese with BMI >40, immunodeficient, suffering from two chronic diseases such as asthma, diabetes, chronic kidney disease, heart diseases, chronic obstructive pulmonary disease, and those with previous strokes. The second phase targeted people who are healthcare workers or >50 years and those who have one of the comorbidities listed above. The third phase targeted all citizens and residents who wanted to take the vaccine^[7].

The data available so far have shown that the vaccines currently available are effective against COVID-19, but only for a limited period of time. Studies demonstrate that the protective effect of vaccine against symptomatic disease is decreasing over time which prompted high demands of COVID-19 booster dose. Among vaccinated population, positive tests for SARSCoV 2 have been reduced. The effectiveness of booster was found to be seven days after the dose, as a result of high antibody level, however It is still not known when the optimal time to achieve the best protection against SARSCoV-2. A booster dose decreased the infection rate by more than a factor of 10 in beneficiaries, which will mean that they have about 5% lower susceptibility when compared to unvaccinated individuals.^[8,9]

Since the pandemic has been affecting people's mental health, our study aims to assess mental health before being vaccinated and after the first and second doses. We will be focusing on the National Guard's population.

Materials and Methods

This study is a cross-sectional study conducted on subjects living in different parts of Kingdom of Saudi Arabia who have received any type of COVID-19 vaccine. Patient Health Questionnaire-8 (PHQ-8) is an outcome-based health questionnaire adapted from the Patient Health Questionnaire-9 (PHQ-9). The main difference being that it is shorter and precludes the item on suicidal ideation^[1]. In the current study, performed in a general population of outpatient patients, suicidal ideation is not a foreseen primary concern.

PHQ-8 has been validated for use in both outpatient clinics as well as for population-based research studies for assessing depressive symptoms and has been shown identical in its scoring and predictive value for depression^[1,2]. The questionnaire used in this research was made on and filled out using Google Forms. Data collection was achieved by distributing the online questionnaire and encouraging participants to spread it further to achieve snowball sampling. The analysis of the collected data was done using IBM SPSS Statistics for Windows, Version 28.0. The study included anyone who was currently living in Saudi Arabia and was above 18 years of age. However, individuals who were not eligible to receive the COVID-19 vaccine, those who are unwilling to receive it, those who have already received the first dose and individuals under the age of 18 were excluded from this study. This criteria ensures that the research is focused on people who are both qualified to receive the COVID-19 vaccine and are eager to participate. In order to capture important demographics of our study's participants, we constructed a comprehensive questionnaire. Age range categories were created and spanned from

individuals aged 10-19 years old up to those aged 60 years and above. Participants were asked questions concerning their marital status including categorizations such as single, married, divorced or widowed. We also collected data on educational level attainment by allowing answer options varying between individuals holding high school degrees all the way up through PhDs. Lastly as well- Nationality was collected via participant self-reporting wherein they identified themselves as either Saudi Arabian national or non-Saudi. Following the completion of the main study, subjects were requested to divulge information regarding their current employment status, with a clear distinction made between healthcare workers and those who did not work in healthcare. This demographic data was imperative in providing insight into the cohort characteristics, and thereby facilitating an improved understanding of any potential impact on our research outcomes. We also asked the participants to fill out three types of screening tools for the assessment of generalized anxiety disorder and depression (GAD-7, PHQ-8, and WHO-5).

The study was conducted after obtaining approval from the institutional review board (IRB). The data needed for our research was collected using an online questionnaire, with consent obtained at the beginning. All the personal information of the participants was kept anonymous, and only the authors had access to the information obtained. Moreover, full confidentiality and privacy were maintained during the conduct of the study.

Results

Demographic Characteristics

220 participants from the Kingdom of Saudi Arabia were included in the final analysis. Of the total participants, 198 (90.0%) had Saudi nationality, while 22 (10.0%) had non-Saudi nationality. Of the total sample, most of the participants were female (n = 152, or 69.1%). Participants aged 10–19 were 7 (3.2%); participants aged 20–29 were 98 (44.5%); participants aged 30–39 were 19 (8.6%);

participants aged 40–49 were 18 (8.2%); participants aged 50–59 were 42 (19.1%); and 36 (16.4%) were 60+. The demographic information related to the overall effect of the COVID-19 vaccination on the participants' mental health is shown in Table 1. 120 (54.5%) participants were married, while 88 (40.0%) were single, 10 (4.5%) were divorced, and 2 (0.9%) were widowed. Among the participants, 133 (60.5%) had bachelor's degrees, and 41 (18.6%) had high

school diplomas. 29 (13.2%) had Master's degrees, and 17 (7.7%) had a PhD or equivalent. Of the total participants, 36.4% (n = 80) work in healthcare. 1.4% (n = 3) of the participants had completed one dose of COVID-19 vaccination, 63.2% (n = 139) had completed 2 doses, and 35.5% (n = 78) had completed three doses i.e., 2 doses of vaccination and one dose of booster.

Table 1: Demographic characteristics of participants

	n	Overall
Gender, n (%)		
	Female	152 (69.1)
	Male	68 (30.9)
Age, n (%)		
	10-19	7 (3.2)
	20-29	98 (44.5)
	30-39	19 (8.6)
	40-49	18 (8.2)
	50-59	42 (19.1)
	60+	36 (16.4)
Nationality, n (%)		
	Saudi	198 (90.0)
	Non-saudi	22 (10.0)
Marital Status, n (%)		
	Married	120 (54.5)
	Single	88 (40.0)
	Divorced	10 (4.5)
	Widowed	2 (0.9)
Highest level of education attained, n (%)		
	Bachelors	133 (60.5)
	High school Diploma	41 (18.6)
	Master's Degree	29 (13.2)
	PhD or equivalent	17 (7.7)
Do you work in healthcare?, n (%)		
	No	140 (63.6)
	Yes	80 (36.4)
Current COVID19 vaccine status?, n (%)		
	Completed one dose	3 (1.4)
	Completed two doses	139 (63.2)
	Completed three doses	78 (35.5)
GAD Prevalence, n (%)		
	GAD	129 (58.6)
PHQ, mean (SD)		0.1 (0.4)

GAD7 Scores grouped by vaccination dose

Figure 1 shows the GAD7 scores of the participants according to their COVID-19 vaccine status. Participants who had completed a single dose of vaccination had an average GAD7 score of 3.7 while participants who had completed two doses of COVID-19 vaccination had an average GAD7 score of 5.2 ± 4.9 . To add, the participants

who had completed two doses of vaccination and a booster dose had an average GAD7 score of 4.9 ± 4.6 . Overall the average GAD7 scores after the vaccination were 5.2 ± 4.9 ($p=0.524$). However, statistical analysis revealed no significant effect of COVID-19 vaccination on the mental health of participants.

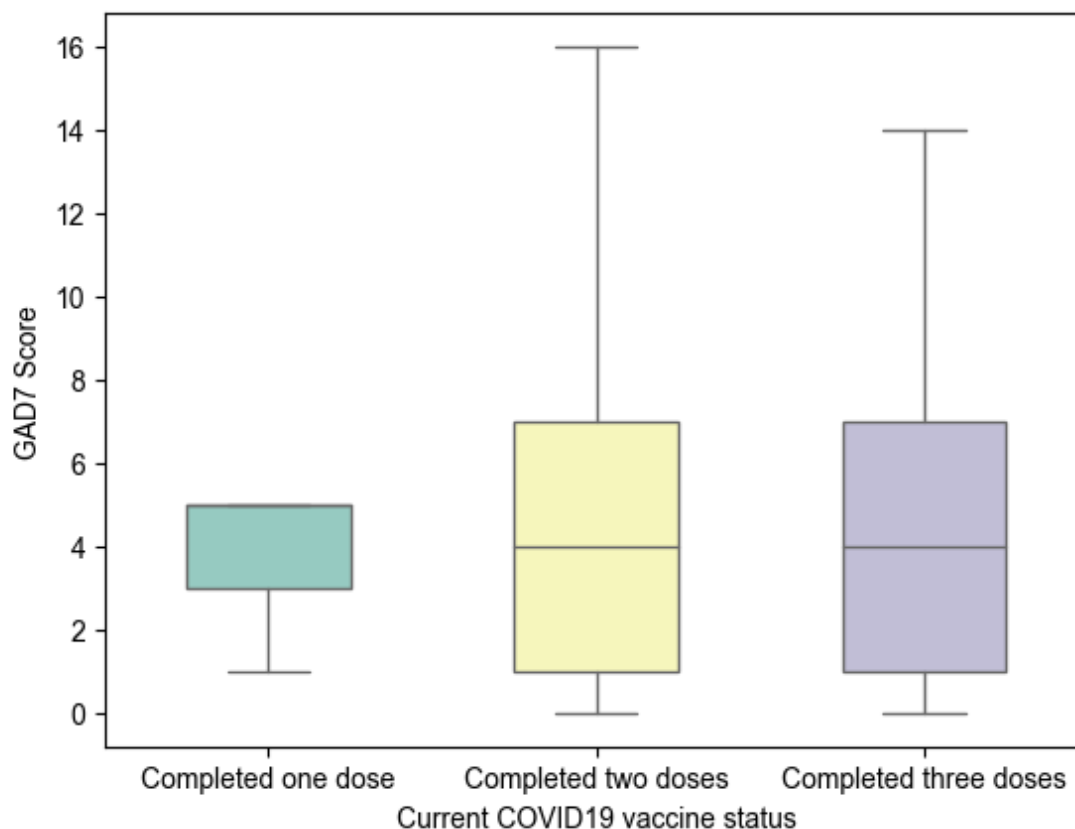


Figure 1: Boxplot of GAD7 scores according to COVID-19 vaccine status

PHQ8 Scores grouped by vaccination dose

Figure 2 shows the PHQ8 scores of the participants according to their COVID-19 vaccine status. The results showed that there was no significant difference in the mean PHQ8 scores before and after vaccination ($p = 0.267$).

Specifically, the mean PHQ8 scores after vaccination were 0.1 ± 0.4 . Further analysis of the data revealed that participants who received two doses of vaccination reported a mean PHQ8 score of 0.2 ± 0.4 , while those who also received the booster dose reported a mean PHQ8 score of 0.1 ± 0.3 .

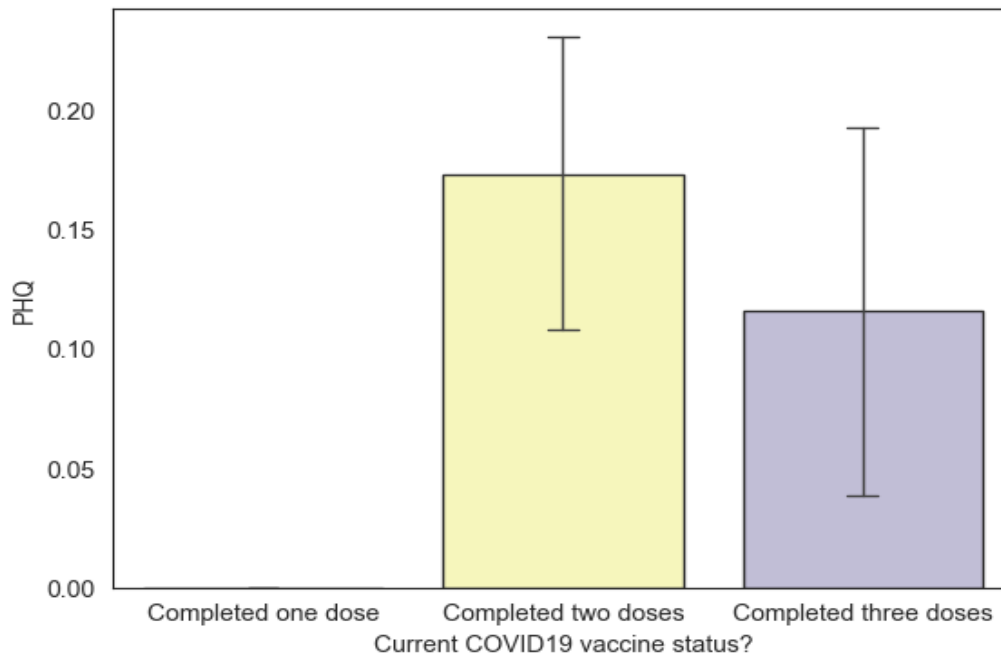


Figure 2: Barchart of PHQ8 scores according to COVID-19 vaccine status

WHO5 Scores grouped by vaccination dose

The COVID-19 vaccine status of participants are depicted in [Figure 3](#) along with their corresponding WHO5 scores. Based on the results of the study, the average WHO5 scores post COVID-19 vaccination were found to be 54.8 ± 23.2 ($p=0.152$). The analysis of subgroups revealed that participants who had completed two doses of COVID-19 vaccination had a mean WHO5 score of 53.1 ± 22.7 , while participants

who had completed three doses of vaccination, i.e., two doses of vaccination and a booster dose, had a significantly higher average WHO5 score of 57.9 ± 23.9 . These findings suggest that completing the full vaccination course with a booster dose may have a positive impact on mental health. However, the p-value of 0.152 indicates that these differences were not statistically significant.

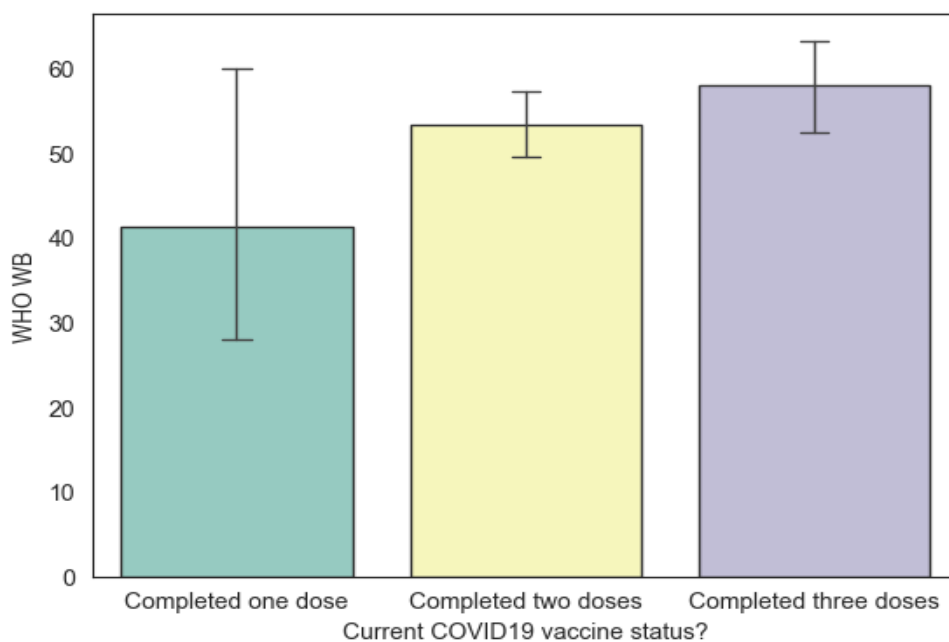


Figure 3: Barchart of WHO5 scores grouped according to COVID-19 vaccine status

Table 2: Mean GAD7, PHQ8 and WHO5 scores grouped by the vaccination dose status

	Grouped by Vaccine status				P-Value	Test
	Overall	Booster	Vaccinated			
n	220	78	142			
GAD7, mean (SD)	5.2 (4.9)	4.9 (4.6)	5.3 (5.1)	0.524	Two Sample T-test	
PHQ8, mean (SD)	0.1 (0.4)	0.1 (0.3)	0.2 (0.4)	0.267	Two Sample T-test	
WHO5, mean (SD)	54.8 (23.2)	57.9 (23.9)	53.1 (22.7)	0.152	Two Sample T-test	

COMPARING BOOSTER POPULATION VS NONE BOOSTER POPULATION IN THEIR SCORES FOR GAD7

GAD7, PHQ8 AND WHO5 SCORES IN DIFFERENT AGE GROUPS

The study also evaluated mental health using the GAD7, PHQ8, and WHO5 scales across different age groups using one-way ANOVA. The mean GAD7 scores for individuals aged 10-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, and 60 years and above were 6.1±1.6, 6.0±4.8, 8.1±6.3, 4.9±3.7, 4.5±5.4, and 2.3±3.2, respectively. The mean PHQ8 scores for individuals aged 10-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, and 60 years and above were 0.1±0.4, 0.2±0.4, 0.2±0.4, 0.0±0.0,

0.1±0.3, and 0.0±0.2, respectively. The mean WHO5 scores for the same age groups were 38.3±11.7, 50.9±21.3, 52.2±22.4, 52.2±25.3, 55.8±25.5, and 70.3±20.2, respectively.

The results of the one-way ANOVA showed that there were significant differences in the mean GAD7 scores among the different age groups (p<0.001). Additionally, the analysis revealed significant differences in the mean PHQ8 scores among the different age groups (p=0.002). The results also indicated that there were significant differences in the mean WHO5 scores among the different age groups (p<0.001). These findings suggest that age may be an important factor in mental health outcomes.

Table 3: Mean GAD7, PHQ8 and WHO5 scores grouped by age

	Grouped by Age								P-Value	Test
	Overall	10-19	20-29	30-39	40-49	50-59	60+			
n	220	7	98	19	18	42	36			
GAD7, mean (SD)	5.2 (4.9)	6.1 (1.6)	6.0 (4.8)	8.1 (6.3)	4.9 (3.7)	4.5 (5.4)	2.3 (3.2)	<0.001	One-way ANOVA	
PHQ8, mean (SD)	0.1 (0.4)	0.1 (0.4)	0.2 (0.4)	0.2 (0.4)	0.0 (0.0)	0.1 (0.3)	0.0 (0.2)	0.012	One-way ANOVA	
WHO5, mean (SD)	54.8 (23.2)	38.3 (11.7)	50.9 (21.3)	52.2 (22.4)	52.2 (25.3)	55.8 (25.5)	70.3 (20.2)	<0.001	One-way ANOVA	

GAD7, PHQ8 AND WHO5 SCORES ACCORDING TO GENDER

To evaluate and categorize GAD7, PHQ8, and WHO5 scores according to gender, a Two Sample T-test was utilized. When compared to males, in

the female cohort of 152 participants, significantly higher mean scores were observed for GAD7 (6.2±5.1 vs 3.0±3.7, p<0.001), PHQ8 (0.2±0.4 vs 0.1±0.3, p=0.015), and lower mean scores for WHO5 (50.4±22.0 vs 64.7±23.0, p<0.001).

Table 4: Mean GAD7, PHQ8 and WHO5 scores grouped by gender

	Grouped by Gender					Test
	Overall	Female	Male	P-Value		
n	220	152	68			
GAD7, mean (SD)	5.2 (4.9)	6.2 (5.1)	3.0 (3.7)	<0.001	Two Sample T-test	
PHQ8, mean (SD)	0.1 (0.4)	0.2 (0.4)	0.1 (0.3)	0.015	Two Sample T-test	
WHO5, mean (SD)	54.8 (23.2)	50.4 (22.0)	64.7 (23.0)	<0.001	Two Sample T-test	

GAD7, PHQ8 AND WHO5 SCORES ACCORDING TO LEVEL OF EDUCATION

In this study, we employed one-way ANOVA to assess and categorize GAD7, PHQ8, and WHO5 scores based on the level of education attained by the participants. The mean GAD7 scores (p=0.114) for participants with Bachelor's, High School Diploma, Master's, and PhD or equivalent degrees were found to be 5.3±5.1, 5.9±5.2, 3.3±3.1, and 6.2±5.0, respectively. The mean PHQ8 scores (p=0.163) for participants with Bachelor's, High School Diploma, Master's, and PhD or equivalent degrees were found to be

0.1±0.3, 0.2±0.4, 0.1±0.3, and 0.3±0.5, respectively. Furthermore, the mean WHO5 scores (p=0.004) for participants with Bachelor's, High School Diploma, Master's, and PhD or equivalent degrees were found to be 54.3±22.5, 46.1±23.4, 65.4±21.7, and 61.4±23.5, respectively. These findings suggest that the level of education may have an impact on mental health, with individuals with higher levels of education reporting higher levels of psychological well-being (p < 0.05).

Table 5: Mean GAD7, PHQ8 and WHO5 scores grouped by the level of education of participants

	Grouped by Highest level of education attained						Test
	Overall	Bachelors	High school Diploma	Master's Degree	PhD or equivalent	P-Value	
n	220	133	41	29	17		
GAD7, mean (SD)	5.2 (4.9)	5.3 (5.1)	5.9 (5.2)	3.3 (3.1)	6.2 (5.0)	0.114	One-way ANOVA
PHQ8, mean (SD)	0.1 (0.4)	0.1 (0.3)	0.2 (0.4)	0.1 (0.3)	0.3 (0.5)	0.163	One-way ANOVA
WHO5, mean (SD)	54.8 (23.2)	54.3 (22.5)	46.1 (23.4)	65.4 (21.7)	61.4 (23.5)	0.004	One-way ANOVA

GAD7, PHQ8 AND WHO5 SCORES ACCORDING TO THE PARTICIPANTS BEING HEALTHCARE WORKERS

Based on the results of a Two Sample T-test, there were no statistically significant differences in the mean GAD7 (p = 0.358), PHQ8 (p = 0.347), and WHO5 (p = 0.157) scores between healthcare workers (n = 140; GAD7: mean = 5.6±4.4, PHQ8:

mean = 0.2±0.4, WHO5: mean = 52.9±20.0) and non-healthcare workers (n = 80; GAD7: mean = 5.0±5.2, PHQ8: mean = 0.1±0.4, WHO5: mean = 55.9±24.8). These results suggest that the mental health of healthcare workers may not be significantly different from that of non-healthcare workers in the context of COVID-19 vaccination.

Table 6: Mean GAD7, PHQ8 and WHO5 scores grouped by whether the participants worked in healthcare or not

	Grouped by Do you work in healthcare?			P-Value	Test
	Overall	No	Yes		
n	220	140	80		
GAD7, mean (SD)	5.2 (4.9)	5.0 (5.2)	5.6 (4.4)	0.354	Two Sample T-test
PHQ8, mean (SD)	0.1 (0.4)	0.1 (0.4)	0.2 (0.4)	0.701	Two Sample T-test
WHO5, mean (SD)	54.8 (23.2)	55.9 (24.8)	52.9 (20.0)	0.315	Two Sample T-test

Discussion

Our study found no significant effect of COVID-19 vaccination on mental health of the adult population of Saudi Arabia; this suggests that other factors may be more important in influencing mental health outcomes during the pandemic. A study by Ng et al., concluded these factors to be inability to get home supplies or a doctor's appointment, feeling less financially secure or socially connected, and being female, when compared with their respective counterparts^[10]. The GAD7, PHQ8 and WHO5 scales were used to assess the mental health of the population after the first, second and booster dose of the vaccine.

A recent meta-analysis conducted by Lee et. al concludes a similar finding indicating that there is no significant association between COVID-19 vaccination and depression as well as anxiety^[11]. The meta-analysis included 6 studies and concluded only a 4% reduction in distress after receiving the vaccine shown in overall studies.

However, there are studies that are inconsistent with our findings; they indicate a positive influence of the COVID-19 vaccine on the mental health of individuals^{[12], [13]}. A prior study on the Greek population however, concluded an association between mental health and COVID-19 vaccination^[14]. Earlier studies have also implied that the group opting for COVID-19 vaccination has more psychological anguish^{[15], [16]}. The mental and psychological outcomes of COVID-19 vaccination are important since they may lead to

hesitation and rejection of the vaccine^[17]. According to a systematic review by Sallam that estimated vaccine acceptance rates in 33 countries, the Middle East, Africa, Russia, and many European nations had the lowest acceptance rates^[18], which can be attributed to lower trust and greater mental stress among the people. A survey by Al-Mohaithef and Padhi indicated that Saudi Arabia had a 64.7% acceptance rate for the COVID-19 vaccine^[19].

The levels of mistrust and distress among people at the beginning of COVID-19 mass vaccinations were high, and this was due to a lack of information and the spread of misinformation regarding the COVID-19 vaccination^[20]. However, previous studies suggest that while accessing the information on the COVID-19 vaccine can be beneficial in providing relief from psychological stress, it can also have adverse effects as the spread of false news can elevate anxiety levels. Conversely, getting accurate data has been found to reduce individuals' psychological stress^[21].

Furthermore, the effect of the COVID-19 vaccine on different population groups, such as groups based on age, gender, education level, and whether or not the participant is a healthcare worker was assessed. The results of the study showed that among different age groups, the highest GAD7 scores were seen among people between 30-39 years of age, and the lowest GAD7 scores were observed in people who were 60 years or older. Similarly, on the WHO5 scale, the

highest scores indicating good well-being were reported among the same age group of 60 years or older participants, however, the lowest scores were observed in the age group of 10-19 years old. This is supported by the observation that the lifestyles of school-going and college students were affected the most due to COVID-19, whereas, the least impact was on the elderly, who were already staying in their homes for most of the day^[22].

Moreover, the other age groups of 20-29, 40-49 and 50-59 years had mean GAD7 scores of 6.0, 4.9, and 4.5 respectively. A general trend is noted in this data, indicating higher GAD7 scores in people from younger and middle age groups. This can be explained by the impact of COVID-19 on the daily routines of these age groups since COVID-19 affected work and academics and people are mentally stressed mainly due to school closure, the pandemic, and relationships, which is not the case with older age groups^[23]. In our study, a stronger correlation between SARS-CoV-2 vaccination and decreased symptoms of anxiety and/or depression was found in older individuals. These findings support earlier research that found that these groups are more susceptible to COVID-19 and more likely to express a desire to receive a COVID-19 vaccination, and so they have low GAD7 scores, indicating less anxiety in this age group^{[24],[25]}.

Among males and females, higher GAD7 and PHQ8 scores were seen in females, indicating worse anxiety and depression symptoms than males, and higher scores on the WHO5 scale were seen among the males, indicating better mental well-being. We should take other factors into account that might be causing the higher levels of anxiety symptoms in females, including but not limited to hormonal imbalance, menstrual cycle changes, etc.^[26]. A study by McLean et al. suggests that men have a 2- to 3-times lower likelihood than women to meet lifetime criteria for GAD^[27]. Furthermore, no significant association could be found between the education status of the participants and the anxiety and depression

symptoms. A study by Molarius et al., found such association suggesting that people with low and medium levels of education were less likely to experience psychological distress than people with high levels of education^[28]. Participants who had a higher level of education were found to have significantly higher mean WHO5 scores, indicating better wellbeing. To add, our study revealed a lack of significant correlation between the mental state evaluated by GAD7, PHQ8, and WHO5 and the participants' profession, specifically whether they worked in healthcare or not, which contrasts with the results of prior studies and highlights the need for further research.

A recent study by Sugihara et al., has indicated a slightly positive effect of vaccination on the mental health of healthcare professionals^[15]; however our study was limited due to a small sample size. It has also been suggested that due to the overwhelming stress during the pandemic, the mental health of healthcare providers remains compromised^[29]. According to a systematic review based on studies published up to April 2021, there was no solid evidence to support higher prevalence rates of mental stress among healthcare workers^[30].

According to our study, there may be a slight association between completing three doses of the COVID-19 vaccine and higher levels of anxiety, as measured by the GAD-7 scale. However, it is important to note that this difference is relatively small and may not be statistically significant. The strength of this study is that it focuses specifically on healthcare workers, who are a particularly important population to study given their increased risk of exposure to COVID-19^[31]. Additionally, the study uses standardized measures of anxiety (the GAD-7 scale) and depression (the PHQ scale), which allows for more accurate comparisons between individuals and across different studies. Moreover, it investigates the association between the COVID-19 vaccine dose and anxiety levels, which is an important area of research given the recent global

pandemic. This study also provides some initial insights into potential differences in anxiety levels based on COVID-19 vaccine dose, which could help inform future research and public health interventions.

The limitation of this study is that it includes small sample size participants, which may not represent the entire population. Additionally, the study only measures anxiety levels using the GAD7 scale. It does not take into account other potential factors that could contribute to anxiety levels, such as pre-existing mental health conditions or external stressors [32]. Another limitation is that in this study, we only looked at the association between COVID-19 vaccine dose and anxiety levels at one point in time. It is possible that anxiety levels could change over time or in response to different factors, so further research would be needed to explore these potential changes.

Conclusion

Our study demonstrates that there is no significant effect of the COVID-19 vaccination on the mental health of the participants. Age, education levels, gender, marital status, and being healthcare workers may be important factors to consider when interpreting the mental health state of individuals. In this study showcase that individuals with higher levels of education reported higher levels of psychological well-being. Further, the study also concludes that the female cohort had higher stress levels as compared to the male participants. However, this study is limited by a small sample size, so further research is required in this aspect to make a definitive conclusion about the effect of COVID-19 vaccination on the mental health of the people of Saudi Arabia.

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