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Effectiveness of Different COVID-19 Vaccines in the United Arab Emirates: A Retrospective Cross-sectional Study

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ABSTRACT

Background: *The COVID-19 virus continues to represent a threat to global healthcare systems. The novel strains, such as Delta and Omicron, possibly further increase transmission concerns. Despite widespread vaccine availability in the United Arab Emirates (UAE), vaccine hesitancy exists due to safety concerns, misinformation, and socioeconomic issues. We, in this study, aim to analyze the factors that could influence COVID-19 vaccination status and compare the efficacy of existing vaccines (Pfizer, Sinopharm, and AstraZeneca) in preventing hospitalization.*

Methods: *We conducted a cross-sectional retrospective study at the Al Towar Primary Health Centre in Dubai, UAE, from March to December 2022. We obtained demographics, comorbidities, BMI, vaccination status, and hospitalization outcomes from Dubai Health Authority (DHA) electronic health records (Epic/SALAMA, Nabidh) and supplemented with structured phone interviews. Vaccinated individuals got at least one dose of any UAE-approved vaccination. We conducted the analysis with Jamovi software (version 2.3.28), employing Pearson's chi-square and Fisher's exact tests.*

Results: *Out of the 500 patients we included, 446 were vaccinated and 54 were unvaccinated. The unvaccinated group had considerably more females (76.6% vs. 53.5%, $p < 0.01$), as well as higher rates of morbid obesity and chronic kidney disease. Individuals who had not been vaccinated had approximately three times the rate of hospitalization (10.6% vs. 3.6%, $p = 0.054$). No significant difference in hospitalization was seen for vaccination various types (Pfizer, Sinopharm, and AstraZeneca).*

Conclusion: *Vaccination considerably reduces severe COVID-19 outcomes, while unvaccinated people are more likely to be hospitalized. Our findings are consistent with global evidence of vaccine efficacy, and future measures should address sociocultural barriers, target high-risk groups, and challenge disinformation to increase adoption.*

Keywords
Effectiveness, COVID-19, Vaccines, UAE.

Introduction
First identified in Wuhan, China, coronavirus disease-2019 (COVID-19) is still posing a threat to healthcare systems around the world [1]. Certain COVID-19 variants, like Delta and Omicron, have emerged as a result of insufficient public health mitigation efforts and the high transmission rate of the virus [2,3]. According to earlier research on vaccination acceptability in the United Arab Emirates (UAE), healthcare workers had a low vaccination rate of 24.7% for influenza [4] and a very low vaccination rate of 6.3% for human papillomavirus among women, despite 79.5% of them considering getting the vaccine in the future [5]. Hesitancy can stem from a variety of reasons, including the need to acquire immunity through natural infection, safety concerns, and conspiracy ideas [6,7].

Similar to the previously mentioned concerns, studies have revealed a considerable level of public reluctance to receive the COVID-19 vaccination in the future [8-10]. As a result, it may be difficult to build up enough herd immunity to stop the infection's spread. Some characteristics have been linked to higher readiness to receive the vaccine, including being male, having more education, and believing that there is a high risk of getting COVID-19 [9,10]. In particular, a recent survey conducted in the UAE revealed that 21% of people were "a little" eager to receive the COVID-19 vaccine, while 25% of people were unwilling to have it done [11]. An effective vaccination is essential for reducing the illness burden, but patients' safety shouldn't be compromised throughout the post-marketing phase or during the research process.

Following Phase III clinical studies in July 2020, which demonstrated a 79% effectiveness rate, the UAE authorized the use of the BBIBP-CorV (Sinopharm) inactivated entire COVID-19 virus vaccine in December 2020 [12]. A large-scale retrospective trial in Abu Dhabi, UAE, then showed that the vaccination was efficient in minimizing hospitalizations and deaths after infection by up to 80% and 97%, respectively [13]. The Food and Drug Authority (FDA) declared the Pfizer-BioNTech messenger RNA vaccine to be 95% effective, which led to its approval for use in the United Arab Emirates in May 2021 [14]. In addition to Sinopharm and Pfizer BioNTech, three more COVID-19 vaccines—Modera, Oxford/AstraZeneca, and Sputnik—were instantly dispersed throughout the UAE, reaching approximately 97.97% of those who had received all recommended vaccinations by May 2022 [15].

However, there is lack of sufficient data about vaccine effectiveness from the Middle East countries including the UAE. Thus, we conducted this study to assess different factors that could be associated with vaccination status and effectiveness of various vaccines available in the country including Pfizer, Sinopharm, and AstraZeneca in order to guide future public health campaigns and international and local guidelines.

Methods

Study Design and Population

This cross-sectional retrospective observational study was conducted at Al Towar Primary Health Centre in Dubai, United Arab Emirates, between March 1, 2022, and December 31, 2022. The study aimed to compare COVID-19 morbidity outcomes between vaccinated and unvaccinated adults. A total of 500 participants were selected via computer-generated randomization from a pool of 800 eligible adults visiting the center, ensuring a representative and unbiased sample.

Data Sources and Collection

Data were extracted from medical records in Dubai Health Authority (DHA) systems, including the Epic/SALAMA and Nabidh platforms. Missing variables (e.g., vaccination status, comorbidities, or hospitalization details) were supplemented through structured telephone interviews. Vaccination status was categorized as "vaccinated" (received at least one dose of any UAE-authorized COVID-19 vaccine) or "unvaccinated." Outcomes included SARS-CoV-2 infection rates and hospitalization frequencies.

Variables and Measurements

The primary outcome was assessed as laboratory-confirmed COVID-19 infection, defined by positive PCR or antigen test results documented in medical records. The secondary outcome focused on hospitalization attributed to COVID-19, operationalized as inpatient admissions requiring ≥24 hours of care for acute infection management. Covariates included demographic characteristics (age and gender), clinical variables such as body mass index (BMI) categorized into underweight (<19.9 kg/m²), normal (20–24.9 kg/m²), overweight (25–29.9 kg/m²), obese (30–39.9 kg/m²), and morbidly obese (≥40 kg/m²), alongside comorbidities (diabetes mellitus, hypertension, chronic lung disease, and chronic kidney disease). Exposure variables comprised vaccination status (classified as unvaccinated or vaccinated) and, for vaccinated participants, the specific vaccine type received (Pfizer-BioNTech, AstraZeneca, or Sinopharm), as recorded in health records or self-reported during follow-ups. Statistical Analysis

All analyses were performed by a DHA-licensed biostatistician using Jamovi software (version 2.3.28). Associations between vaccination status and categorical outcomes (e.g., infection rates, hospitalization) were assessed using Pearson's chi-square test. For variables with sparse data (e.g., chronic kidney disease), Fisher's exact test was applied. Demographic and clinical characteristics were compared between groups using frequency distributions. Statistical significance was defined as $p < 0.05$.

Ethical Considerations

The study protocol was approved by the Dubai Health Authority Ethics Board. Participant data were anonymized, and informed consent was waived due to the retrospective use of de-identified medical records.

Results

Our study examined 500 subjects, including 446 vaccinated adults and 54 unvaccinated individuals. The disparities between the two groups were examined concerning demographic parameters, comorbidities, body mass index (BMI), and hospitalization outcomes.

Concerning age distribution, while the disparity between vaccinated and unvaccinated groups was not statistically significant ($P = 0.329$) as shown in Table 1 and Figure 1, distinct patterns occurred. The predominant age group among vaccinated participants was 26–35 years (25.2%), followed closely by those aged 36–45 years (24.3%) and 46–55 years (18.2%). Lower percentages were noted in individuals aged 18–25 (10.6%), 56–65 (12.1%), and over 66 (9.7%). Unvaccinated people were predominantly found in the 36–45 age group (36.2%), followed by the 26–35 (17.0%) and 46–55 (17.0%) age groups. The cohort aged 18–25 represented merely 4.3% of the unvaccinated population, whereas the older demographics, 56–65 and 66+, accounted for 10.6% and 14.9%, respectively.

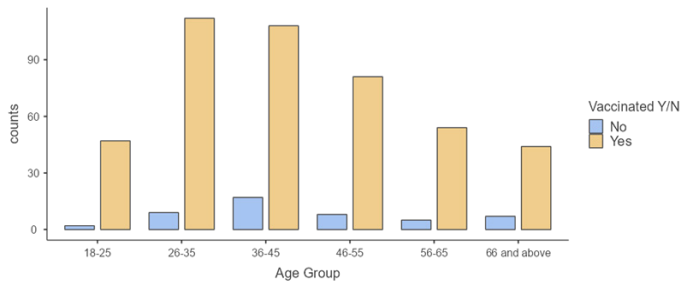

Figure 1: Age Group Distribution by Vaccination Status.

A notable significance value in gender distribution was detected between the two groups (P < 0.01). The unvaccinated cohort was predominantly female, constituting 76.6%, whilst men represented just 23.4% (Figure 2). The vaccinated group exhibited a more equitable gender distribution, with females constituting 53.5% and males 46.5% (Table 1).

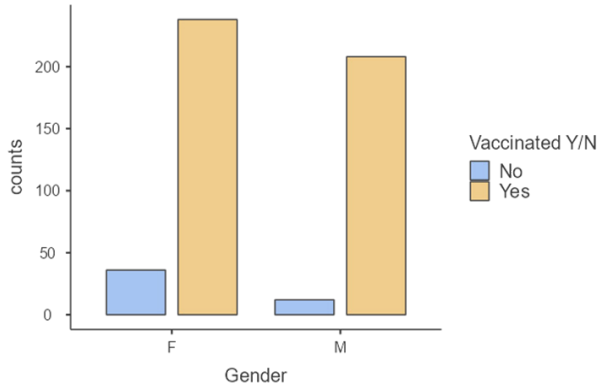

Figure 2: Gender Distribution by Vaccination Status.

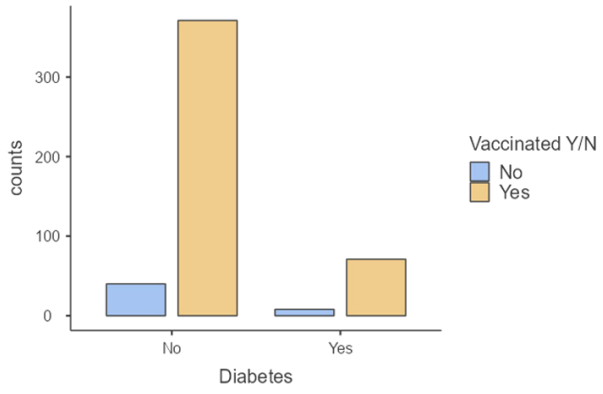

Figure 3: Diabetes Prevalence by Vaccination Status.

The prevalence of diabetes and hypertension has shown no significant variations between the groups regarding comorbidities, as shown in Table 1. Diabetes was observed in 17.0% of unprotected participants and 15.7% of vaccinated participants (P = 0.887), whilst hypertension was present in 23.4% of the unvaccinated group and 19.6% of the vaccinated group (P = 0.6) (Figures 3, 4). The incidence of chronic lung disorders, including asthma and COPD, was minimal in both groups—4.3% in the unvaccinated cohort compared to 3.1% in the vaccinated cohort—showing no statistical significance (P = 0.718) (Figure 5). Chronic kidney disease (CKD) was much more prevalent among unvaccinated persons, affecting 6.4% compared to 0.7% in the vaccinated group (P < 0.01), suggesting a potentially significant correlation between immunization status and renal health (Figure 6).

Table 1: Demographic and Clinical Characteristics of Vaccinated vs. Unvaccinated Participants.

		Vaccinated_Y/N				
		Not Vaccinated		Vaccinated		P Value
		Count	Column Valid N%	Count	Column Valid N%	
Age Group	18-25	2	4.3%	47	10.6%	P=0.329
	26-35	9	17.0%	112	25.2%	
	36-45	17	36.2%	108	24.3%	
	46-55	8	17.0%	81	18.2%	
	56-65	5	10.6%	54	12.1%	
	66 and above	7	14.9%	44	9.7%	
Gender	F	36	76.6%	238	53.5%	P=0.005
	M	12	23.4%	208	46.5%	
BMI	Morbid obesity 40 and more	6	12.8%	15	3.4%	P=0.026
	normal 20-25	8	23.4%	118	28.3%	
	obesity 30-39.9	13	27.7%	138	31.0%	
	overweight 25.1-29.9	16	34.0%	149	33.5%	
	underweight 19.9 and below	1	2.1%	17	3.8%	
Diabetes	No	40	83.0%	371	84.3%	P=0.887
	Yes	8	17.0%	71	15.7%	
HTN	No	37	76.6%	354	80.5%	P=0.6
	Yes	11	23.4%	88	19.6%	
Lung disease (asthma, COPD)	No	46	95.7%	426	98.8%	P=0.718
	Yes	2	4.3%	14	3.1%	
CKD	No	45	93.6%	438	99.3%	P<0.01
	Yes	3	6.4%	3	0.7%	

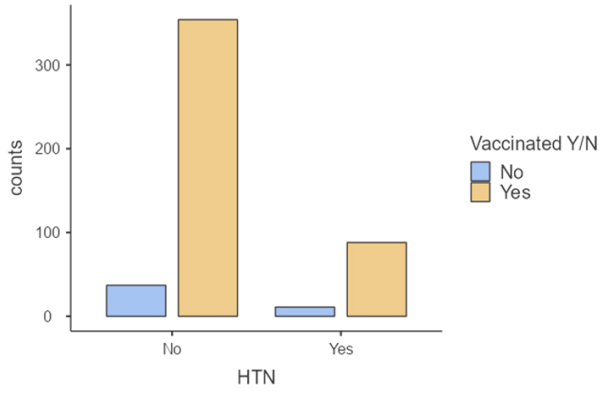

Figure 4: HTN Prevalence by Vaccination Status.

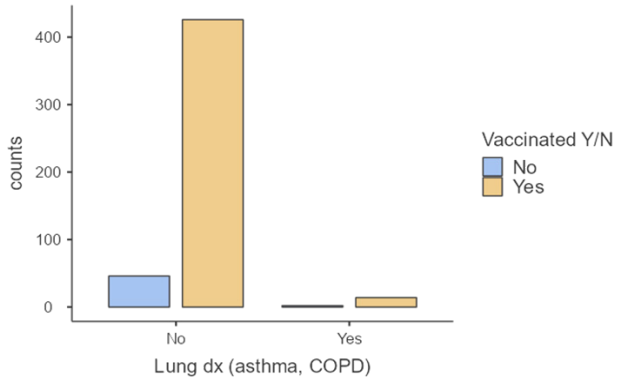

Figure 5: Lung Disease Prevalence by Vaccination Status.

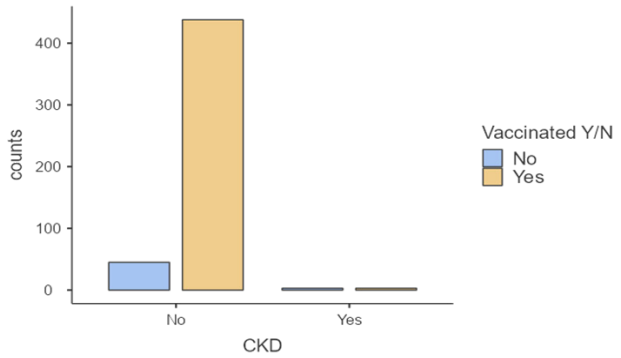

Figure 6: CKD Prevalence by Vaccination Status.

Hospitalization rates showed no statistically significant clinically pertinent distinction. Hospitalization due to COVID-19 was markedly more prevalent among the unvaccinated, with 10.6% necessitating inpatient care compared to only 3.6% of vaccinated persons (P = 0.054) (Table 2). The disparity was further emphasized by the general distribution: of the 21 total hospitalizations documented in the study, 5 were in the unvaccinated cohort and 17 in the vaccinated cohort. In comparison, 429 vaccinated persons and 42 unvaccinated individuals did not necessitate hospitalization, leading to 96.4% of the vaccinated avoiding hospitalization compared to 89.4% of the unvaccinated.

Table 2: COVID-19 Outcomes by Vaccination Status (Hospitalization, Admission Reason, and Discharge).

		Vaccinated Y/N				
		Not Vaccinated		Vaccinated		P value
		Count	Column Valid N%	Count	Column Valid N%	
Hospitalization Y/N	No	43	89.4%	429	96.4%	P=0.054
	Yes	5	10.6%	17	3.6%	
Reason for hospital admission Y/N	No	46	95.8%	434	97.3%	P=0.558
	Yes	2	4.16%	12	2.7%	
Discharge home	No	42	87.5%	371	83.18%	P= 0.125
	Yes	6	12.5%	75	16.82%	

In terms of type of vaccination, 446 vaccinated patients were vaccinated with three types of vaccines: Pfizer-BioNtech (n= 265), AstraZeneca (n= 14), and Sinopharm (n= 167). Our analysis showed no statistically significant difference between the type of vaccine and patient hospitalization (p=0.343) (Table 3, Figure 7).

Table 3: Hospitalization according to the type of vaccination.

Hospitalization	Yes	No	P value
Pfizer-BioNtech	8	257	
AstraZeneca	0	14	0.343
Sinopharm	9	158	

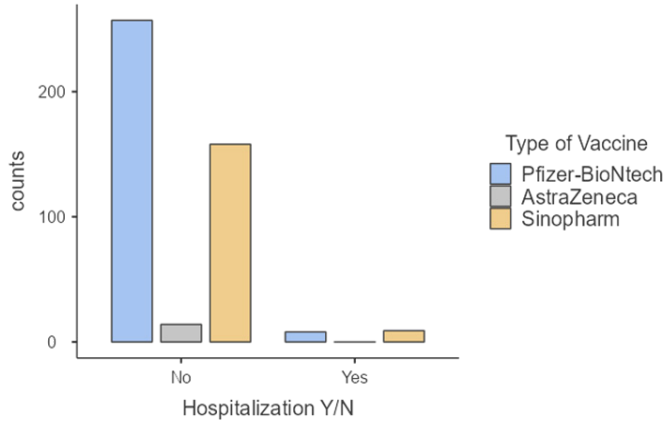

Figure 7: Hospitalization Outcomes by COVID-19 Vaccine Type.

Discussion

Our study included 500 adults who visited Al Towar primary health center, including 446 vaccinated adults and 54 unvaccinated persons. The differences between the two groups were investigated in terms of demographic data, comorbidities, body mass index (BMI), and hospitalization outcomes. We found that the unvaccinated group had a significantly higher female predominance. Additionally, there were no appreciable differences in age or other comorbidities between the two groups, but the unvaccinated group had significantly higher rates of morbid obesity and CKD. Unvaccinated patients had almost three times the hospitalization rates for COVID-19 (10.6% vs. 3.6%, P = 0.054). No significant difference was found between different types of vaccine (Pfizer, AstraZeneca, Sinopharm).

Gender and Vaccine Hesitancy

Vaccine hesitancy has led to a considerable increase in concerns regarding vaccination coverage and its impact on disease control. Our study supports evidence from around the world that vaccination acceptability varies by gender. The significant female predominance of unvaccinated people (76.6%) could be caused by a variety of societal, financial, and healthcare-access issues. According to other studies, women express more concerns about vaccination safety because they are afraid of side effects, worry about how it will affect their fertility, or have mistrust for pharmaceutical interventions [16,17]. This is especially true for women who live in lower-income or job-insecure environments. Conversely, men's reluctance is frequently associated with conspiracy theory believing or a sense of invulnerability to COVID-19 [16].

A prior study conducted in Ecuador found that rural residents, women, indigenous people, those with lower educational attainment, those who were underemployed or economically inactive, and those with the lowest level of economic income had a lower likelihood of receiving two or more doses of vaccination [17]. These findings could be supporting to the need for public health campaigns correcting misinformation and considering this gender differences. In the UAE, a study of 669 students at the University of Sharjah found that 31.8% of them were hesitant to get vaccinated with no gender difference between vaccinated and unvaccinated groups. Fear of adverse effects, doubts about the effectiveness of vaccines, and a perceived lack of access to immunization locations were the main factors contributing to this reluctance [18]. Vaccines have faced popular skepticism on numerous occasions, most recently contributing to measles outbreaks [6]. That study also suggested that reluctance was likely influenced by personal tales of negative social experiences, worries about the effectiveness of vaccines, and a tendency to overestimate risks relative to benefits [18].

Comorbidities

It is important to note that those with preexisting medical conditions must receive all recommended vaccinations since they are more susceptible to serious illness or death from COVID-19. Our findings showed insignificant difference in comorbidity distribution among vaccinated and unvaccinated groups except for CKD. In a prior survey of older persons with chronic diseases who were more likely to have COVID-19 problems, the authors analyzed their expectations regarding vaccination safety and efficacy and whether they were connected with known or suspected causes to vaccine hesitancy. Bivariate analysis found that vaccine hesitancy was associated with younger age (<60), Black race, poor income, lower educational attainment, higher comorbidity, and greater expressed complacency about developing COVID-19 with higher vaccine hesitancy [19]. It is critical to approach vulnerable individuals with chronic diseases and target them through primary healthcare practitioners, as those in greatest need of vaccination lack trust in vaccination.

Hospitalization Outcome After Vaccination

Our findings support the existing evidence of the role of vaccination in mitigating disease severity as the unvaccinated individuals had a higher COVID-19 hospitalization rate (10.6%) than those who were vaccinated (3.6%) [20,21]. A previous large-scale study in the United States comprised 41,552 hospital admissions from persons 50 years of age and older who had COVID-like symptoms and had undergone SARS-CoV-2 testing. Across a range of high-risk categories, full vaccination showed a considerable (81–95%) reduction in COVID-related hospitalizations and emergency visits, with similar outcomes for the Pfizer and Moderna vaccines [22].

A meta-analysis that aimed to compare three COVID-19 vaccines, the Pfizer-BioNTech, Moderna, and AstraZeneca (ChAdOx1) vaccines, revealed an overall 89% effectiveness against hospitalization following the second dosage. Authors observed no statistically significant differences between the individual vaccine effectiveness of Pfizer-BioNTech, Moderna, and AstraZeneca, which were 88%, 91%, and 91%, respectively [23]. Additionally, a pooled data from several studies showed an 86% effectiveness rate (OR = 0.14, 95% CI: 0.03–0.60) which is further supporting our findings [23]. Notably, the effectiveness of vaccines may be understated since those who have declined vaccination are also less likely to undergo a diagnostic test.

Limitations and Future Directions

The limited sample size in the unvaccinated group may limit the generalizability of our findings. Furthermore, causal associations were not possible in our study due to the implemented cross-sectional design. Although they were not evaluated, factors that might affect vaccination status and results include underlying health habits, healthcare availability, and reasons for vaccine hesitation. The long-term efficacy of COVID-19 vaccinations against new strains can be investigated, in future research, especially in high-risk groups such people with chronic kidney disease or morbid obesity. In order to ensure that public confidence in vaccinations is not undermined by false information, longitudinal research evaluating shifts in public perception following a pandemic could help guide preparedness plans for upcoming health emergencies.

Conclusion

Our findings suggest that vaccination significantly reduces severe COVID-19 outcomes, as unvaccinated individuals are more likely to require hospitalization. Our findings are consistent with global evidence of vaccine efficacy, so future research might focus on eliminating misinformation and identifying high-risk groups. These findings could help public health campaigns by highlighting the significance of immunization in reducing illness severity.

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