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ORIGINAL ARTICLE

ICU Stay and Mortality Between Vaccinated and Non-Vaccinated Patients of Covid-19; A comparative Study

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ABSTRACT

Objective: The aim of this study is to compare the ICU stay and mortality in vaccinated and non-vaccinated covid-19 patients.

Study Design: A Retrospective/ Comparative study

Place and Duration: The study was conducted in Medicine department of Fauji Foundation Hospital Rawalpindi, duration of six months from October 2020 to March 2021.

Methods: Total 120 patients of both genders had coronavirus disease were presented in this study. Patients were aged between 22-80 years. Demographical details of patients including age, sex, body mass index, residency and socio-economic status were recorded after taking informed written consent. Patients were admitted in COVID 19 ward. Chest X-rays of both groups were taken. There were 50 vaccinated patients in group I and 70 non-vaccinated patients in group II. Co-morbidities among both groups were assessed. Recovery and outcomes among both groups were calculated in terms of mortality and reduction in severity of disease. Complete data was analyzed by SPSS 24.0 version.

Results: There were 80 (66.7%) patients were males (35 in group I and 45 in group II) and 40 (33.3%) were females (15 in group I and 25 in group II). Mean age of the vaccinated patients was 46.21 ±9.67 years with mean BMI 32.12 ±6.33 kg/m^2 and in group II mean age was 45.13 ±21.54 years with mean BMI 33.11±11.37 kg/m^2. 34 (68%) were educated in group I and in group II 35 (50%) patients were literate. Severity of disease among non-vaccinated patients was high found in 55 (78.6%) cases as compared to vaccinated cases 17 (34%). Co-morbidities were diabetes mellitus, hypertension, ischaemic heart and chronic lung disease. Most of the patients 90 (75%) had bilateral lung involvement and interstitial infiltrates 105 (87.5%). Fever, cough and dyspnea were the most common symptom found in both groups. Recovery among patients of group I was greater 40 (80%) as compared to non-vaccinated 27 (38.6%). Frequency of poor outcomes hospitalization 9 (12.9%), ICU admission 11 (15.8%) and mortality 23 (32.9%) among non-vaccinated patients were significantly higher as compared to vaccinated patients in which hospitalization 2 (4%), ICU admission 3 (6%) and mortality was found in 5 (10%) cases.

Conclusion: According to the findings of this study, vaccination against coronavirus disease is both efficacious and beneficial in reducing disease severity. Except for this, immunization can reduce the frequency of poor outcomes (hospitalization, ICU admission, and mortality), and individuals should be made aware of the importance of becoming vaccinated as soon as possible.

Keywords: COVID 19, Vaccination, Pandemic, Mortality

INTRODUCTION

Immunity against SARS-CoV-2 virus producing COVID-19, established after infection, was demonstrated to be varied in its duration and efficiency. [1,2] Vaccines examined in trials were observed to achieve considerable immunity in both previously infected and naïve people and varied from 92 percent for recorded infection, 87 percent for hospitalization, and 92 percent for severe disease. [3-7]

The second wave of the pandemic in India, commencing March 2021, featured individuals presenting in increasing numbers with more severe sickness at hospitals. At the same time, as part of the vaccination program that was initiated w.e.f 16 Jan 2021, most healthcare and frontline personnel of the Indian Armed Forces had been vaccinated with COVISHIELD® (made by Serum institute of India pvt ltd, Pune, India) (manufactured by Serum institute of India pvt ltd, Pune, India). COVISHIELD (ChAdOx1 nCoV-19) is an adenovirus vector-nonreplicating viral vaccine carrying recombinant spike protein of SARS-CoV-2. The process of vaccinating its older (>65yrs) clients and those above 45 years with comorbidities was being performed thereafter. Studies had found numerous parameters to be related with mortality in COVID-19. [8-10]

A specific worry for COVID-19 vaccines is that a vaccine with great efficacy against COVID-19 disease (VEDIS) but low efficacy against SARS-CoV-2 infection (VESUSC), would largely convert symptomatic infections to asymptomatic infections. Furthermore, if the vaccination does not lower infectiousness (VEINF = 0), it might in theory lead to increased spread of SARS-CoV-2. [11,12] This is especially relevant in settings such as the US where the testing and diagnosis of infection is primarily symptom-driven; individuals with asymptomatic infection are less likely to be diagnosed and therefore may spread infection more readily than diagnosed and socially-isolated

symptomatic individuals. The worry is heightened by extensive evidence pointing to the role that asymptomatic and pre-symptomatic cases play in transmission of SARS-CoV-2, with peak infectiousness often occurring prior to the development of symptoms. [13] Moderna and Pfizer have 95% VEDIS in their vaccines, while VESUSC and VESYMP remain unclear. Due to insufficient data from completed studies, there is no way to estimate VEINF for these vaccinations.

Many mathematical models have already predicted the population impact of hypothetical COVID-19 vaccines in order to better understand epidemic dynamics.[14] To date, almost all of the research has focused on vaccine priority groups[15], and no one has looked at the population-level impact of "symptom avoiding" vaccines with high VDIS but low VSUSC and VEINF scores. As a result, it's possible that the modeling estimates of achieving over 80% population efficacy with 40% coverage are unduly optimistic. [16] It's important to note that past research hasn't taken into account vaccination rollouts that begin during an outbreak, which could diminish the vaccine's overall effectiveness.

The aim of this study is to compare the severity of disease and ICU stay in vaccinated and non-vaccinated covid-19 patients.

MATERIAL AND METHODS

This retrospective/comparative study was conducted at Medicine department of Fauji Foundation Hospital Rawalpindi duration of six months from October 2020 to March 2021.

The study was comprised of 120 patients of corona virus disease. Detailed demographics of cases age, sex and body mass index were recorded after taking informed written consent. Pregnant women and those did not give written consent were excluded from this study.

Patients were aged between 22-80 years. There were 50 vaccinated patients in group I and 70 non-vaccinated patients in group II. Chest X-ray of both groups was taken. A variety of SARS-CoV-2 PCR tests were used in participating centres, and cycle threshold (Ct) values were reported according to specific gene targets, but were also compared to the lowest Ct value of any gene target chosen as a surrogate for viral load. Local anti-Spike antibody tests were conducted with the help of two commercial kits: the Liaison SARS-CoV-2-S1/S2-IgG (Diasorin, Saluggia, Italy) with a positive cut-off of >15 units/mL, and the Architect AdviseDx SARS-CoV-2-IgG-II (Abbott, Lake Forest, IL, USA) with a positive cut-off of >50 units/mL. In order to detect variations of concern in accessible samples, viral genome sequencing was undertaken, with findings classed as wild-type, B.1.1.7, B.1.351, or other variants of concern.

Co-morbidities among both groups were assessed. Recovery and outcomes among both groups were calculated in terms of mortality and reduction in severity of disease. Complete data was analyzed by SPSS 24.0 version. Frequencies and percentages were used for categorical variables.

RESULTS

There were 80 (66.7%) patients were males (35 in group I and 45 in group II) and 40 (33.3%) were females (15 in group I and 25 in group II). Mean age of the vaccinated patients was 46.21 ±9.67 years with mean BMI 32.12 ±6.33 kg/m^2 and in group II mean age was 45.13 ±21.54 years with mean BMI 33.11±11.37 kg/m^2. 34 (68%) were educated in group I and in group II 35 (50%) patients were literate. Travelling and outdoor work was the most common cause of disease among patients.(table 1)

Table 1: Baseline details of enrolled cases

Characteristics	Group I (n=50)	Group II (n=70)
Mean age (years)	46.21 ±9.67	45.13 ±21.54
Mean BMI (kg/m^2)	32.12 ±6.33	33.11±11.37
Gender		
Male	35 (70%)	45 (64.3%)
Female	15 (30%)	25 (35.7%)
Literacy		
Yes	34 (68%)	35 (50%)
No	16 (32%)	35 (50%)
Cause of Disease		
Travelling	26 (52%)	34 (48.6%)
Outdoor work	13 (26%)	26 (37.1%)
Gathering	11 (22%)	10 (14.3%)

Severity of disease among non-vaccinated patients was high found in 55 (78.6%) cases as compared to vaccinated cases 17 (34%). Co-morbidities were diabetes mellitus, hypertension, ischaemic heart and chronic lung disease. (table 2)

Table 2: Comparison of severity and co-morbidities among patients of both groups

Characteristics	Vaccinated (n=70)	Non-Vaccinated (n=100)
Severity of Diseases		
Yes	17 (34%)	55 (78.6%)
No	33 (66%)	15 (21.4%)
Co-morbidities		
Diabetes mellitus	21 (42%)	32 (45.7%)
Hypertension	14 (28%)	18 (25.7%)
Ischaemic heart disease	10 (20%)	13 (18.6%)
Chronic lung disease	5 (10%)	7 (10%)

Most of the patients 90 (75%) had bilateral lung involvement and interstitial infiltrates 105 (87.5%). Fever, cough and dyspnea were the most common symptom found in both groups. (table 3)

Table 3: Association of X-ray results and symptoms among enrolled cases

Characteristics	Vaccinated (n=50)	Non-Vaccinated (n=70)
X-ray Results		
Bilateral infiltrates	35	55
interstitial infiltrates	40	65
consolidation	6	9
unilateral infiltrates	3	5
Symptoms		
Fever	31	48
Cough	21	35
Dyspnea	13	23
Myalgia	7	11
Vomiting	5	8
Headache	4	4

Recovery among patients of group I was greater 40 (80%) as compared to non-vaccinated 27 (38.6%). (table 4)

Table 4: Comparison of efficacy among both groups

Characteristics	Vaccinated (n=50)	Non-Vaccinated (n=70)
Effectiveness		
Yes	40 (80%)	27 (38.6%)
No	10 (20%)	43 (61.4%)

Frequency of poor outcomes hospitalization 9 (12.9%), ICU admission 11 (15.8%) and mortality 23 (32.9%) among non-vaccinated patients were significantly higher as compared to vaccinated patients in which hospitalization 2 (4%), ICU admission 3 (6%) and mortality was found in 5 (10%) cases.(table 5)

Table 5: Comparison of adverse outcomes between both groups

Characteristics	Vaccinated (n=50)	Non-Vaccinated (n=70)
Adverse Outcomes		
Hospitalization	2 (4%)	9 (12.9%)
ICU admission	3 (6%)	11 (15.8%)
Mortality	5 (10%)	23 (32.9%)

DISCUSSION

There have been substantial morbidity and death from COVID-19 outbreaks across the globe, along with a deterioration in personal and social well-being. SARS-CoV-2 infection has killed many people, but most people are still at risk [17]. As a result, the creation of vaccinations has long been considered a key objective. A record-breaking rate of vaccine development has been maintained thus far; highly protective vaccines are now readily available for purchase. This study, which contains a comprehensive description, examined 120 mRNA COVID-19-vaccinated patients who suffered a significant breakthrough infection that necessitated hospitalization.

In this retrospective study 50 vaccinated and 70 non vaccinated patients of both genders were presented. Majority of the patients 80 (66.7%) were males and only 40 (33.3%) cases were females. Mean age of the vaccinated patients was 46.21 ±9.67 years with mean BMI 32.12 ±6.33 kg/m^2 and in group II mean age was 45.13 ±21.54 years with mean BMI 33.11±11.37 kg/m^2.Our findings were comparable to the previous studies.[18,19]. 34 (68%) were educated in group I and in group II 35 (50%) patients were literate. Travelling and outdoor work was the most common cause of disease among patients. Different previous researches on this pandemic disease presented same results to our study.[20] Most of the patients 90 (75%) had bilateral lung involvement and interstitial infiltrates 105 (87.5%). Fever, cough and dyspnea were the most common symptom found in both groups.[21,22]

Severity of disease among non-vaccinated patients was high found in 55 (78.6%) cases as compared to vaccinated cases 17 (34%). Co-morbidities were diabetes mellitus, hypertension, ischaemic heart and chronic lung disease. In individuals with co-morbidities, vaccine effectiveness may be decreased, or the risk of co-morbidity exacerbation following a breakthrough infection may be higher. [23]

In our study recovery among patients of group I was greater 40 (80%) as compared to non-vaccinated 27 (38.6%). These results presented that vaccination against pandemic disease was effective and helpful. According to our findings, non-pharmaceutical approaches may be needed to slow down the pandemic and boost the efficiency of vaccination campaigns.[25,26] A similar result has been reached by other modeling teams: vaccines that reduce susceptibility to infection will have a higher impact than those that modify the disease itself will have. [27] Frequency of poor outcomes hospitalization 9 (12.9%), ICU admission 11 (15.8%) and mortality 23 (32.9%) among non-vaccinated patients were significantly higher as compared to vaccinated patients in which hospitalization 2 (4%), ICU admission 3 (6%) and mortality was found in 5 (10%) cases.[28,29]

The weak population immunity to COVID-19 necessitates immunization to reduce disease burden and future outbreaks [30]. There's no doubt that a vaccine might help reduce the number of hospitalizations and fatalities caused by severe COVID-19 in those with comorbid conditions and risk factors. Public health resources must be deployed by the incoming administration in order to accomplish the goal of distributing 100 million vaccine doses over 100 days to the US population [31].

Because vaccines with distinct efficacy profiles may show comparable efficacy in clinical research, but have very different effects on the general population, the results of this analysis show that understanding the efficacy profile of the vaccination is critical. Vaccines that protect against COVID-19 disease but not against SARS-CoV-2 infection, and thus shift symptoms to asymptomatic infections, will prevent fewer infections than vaccines that reduce infection susceptibility, and will necessitate a larger and faster vaccination rollout to achieve the same population impact as vaccines that reduce susceptibility. [32]

CONCLUSION

According to the findings of this study, vaccination against coronavirus disease is both efficacious and beneficial in reducing disease severity. Except for this, immunization can reduce the frequency of poor outcomes (hospitalization, ICU admission, and mortality), and individuals should be made aware of the importance of becoming vaccinated as soon as possible.

REFERENCE

1. Vasileiou E., Simpson C.R., Shi T. Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: a national prospective cohort study. Lancet (London, England) 2021 Apr 23;397(10285)
2. Dagan N., Barda N., Kepten E. BNT162b2 mRNA covid-19 vaccine in a nationwide mass vaccination setting. N Engl J Med. 2021 Apr 15;384(15):1412–1423.
3. Saadat S., Rikhtegaran Tehrani Z., Logue J. Binding and neutralization antibody titers after a single vaccine dose in health care workers previously infected with SARS-CoV-2. JAMA - J Am Med Assoc. 2021;325:1467–1469. American Medical Association.
4. Ebinger J.E., Fert-Bober J., Printsev I. Antibody responses to the BNT162b2 mRNA vaccine in individuals previously infected with SARS-CoV-2. Nat Med. 2021;27:981–984.
5. Baden L.R., El Sahly H.M., Essink B. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. N Engl J Med. 2021 Feb 4;384(5):403–416.

6. Polack F.P., Thomas S.J., Kitchin N. Safety and efficacy of the BNT162b2 mRNA covid-19 vaccine. N Engl J Med. 2020 Dec 31;383(27):2603–2615.
7. Voysey M., Clemens S.A.C., Madhi S.A. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. Lancet. 2021 Jan 9;397(10269):99–111.
8. Estiri H, Strasser ZH, Klann JG, Naseri P, Wagholikar KB, Murphy SN. Predicting COVID-19 Mortality with Electronic Medical Records.
9. Rastad H., Karim H., Ejtahed H.-S. Risk and predictors of in-hospital mortality from COVID-19 in patients with diabetes and cardiovascular disease. Diabetol Metab Syndrome. 2020 Jul 6;12(1):57.
10. Mehraeen E., Karimi A., Barzegary A. Predictors of mortality in patients with COVID-19–a systematic review. Eur J Integr Med. 2020 Dec 1;40:101226.
11. Eumann Mesas A., Cavero-Redondo, Aparecido Sarriá Cabrera M., Maffei de Andrade S., Sequí-Dominguez I., Martínez-Vizcaíno V.I. 2020. Predictors of In-Hospital COVID-19 Mortality: A Comprehensive Systematic Review and Meta-Analysis Exploring Differences by Age, Sex and Health Conditions.
12. Trecarichi E.M., Mazzitelli M., Serapide F. Clinical characteristics and predictors of mortality associated with COVID-19 in elderly patients from a long-term care facility. Sci Rep. 2020 Dec 1;10(1)
13. Mehrotra, D. V. et al. Clinical endpoints for evaluating efficacy in COVID-19 vaccine trials. Ann. Intern. Med. 20, 2 (2020).
14. Buitrago-Garcia, D. et al. Occurrence and transmission potential of asymptomatic and presymptomatic SARS-CoV-2 infections: A living systematic review and meta-analysis. PLoS Med. 17, e1003346.
15. Bubar, K. M. et al. Model-informed COVID-19 vaccine prioritization strategies by age and serostatus. Sci. 371(6532), 916–921 (2021).
16. Matrajt, L., Eaton, J., Leung, T. & Brown, E. R. Vaccine optimization for COVID-19: who to vaccinate first?. Sci. Adv. 7(6), eabf1374 (2021).
17. World Health Organization. Coronavirus disease (COVID-2019) press briefings. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/media-resources/press-briefings. Accessed 21 June 2020.
18. Muthukrishnan J, Vardhan V, Mangalesh S, et al. Vaccination status and COVID-19 related mortality: A hospital based cross sectional study. Med J Armed Forces India. 2021;77(Suppl 2):S278-S282. doi:10.1016/j.mjafi.2021.06.034
19. Brosh-Nissimov T, Orenbuch-Harroch E, Chowers M, et al. BNT162b2 vaccine breakthrough: clinical characteristics of 152 fully vaccinated hospitalized COVID-19 patients in Israel [published online ahead of print, 2021 Jul 7]. Clin Microbiol Infect. 2021;S1198-743X(21)00367-0.
20. Iffat Khanum, Fatima Samar, Yousuf Fatimah, Awan Safia, Aziz Adil, Habib Kiren, Nasir Nosheen, Mahmood Faisal, Jamil Bushra. Role of awake prone positioning in patients with moderate-to-severe COVID-19: an experience from a developing country. Monaldi Archives for Chest Disease 2021; 91:1561
21. François Touchon, Youssef Trigui, Eloi Prud'homme, Laurent Lefebvre, Alais Giraud, Anne-Marie Dols, Stéphanie Martinez, Marie Bernardi, Camille Begne, Pascal Granier, Pascal Chanez, Jean-Marie Forel, Laurent Papazian, Xavier Elharrar. (2021) Awake prone positioning for hypoxaemic respiratory failure: past, COVID-19 and perspectives. European Respiratory Review 30:160, 210022.
22. Karagiannidis C., Mostert C., Hentschker C., Voshaar T., Malzahn J., Schillinger G. Case characteristics, resource use, and outcomes of 10 021 patients with COVID-19 admitted to 920 German hospitals: an observational study. Lancet Respir Med. 2020;8:853–862.
23. Coppo A, Bellani G, Winterton D, Di Pierro M, Soria A, Faverio P, et al. Feasibility and physiological effects of prone positioning in non-intubated patients with acute respiratory failure due to COVID-19 (PRON-COVID): A prospective cohort study. Lancet Respir Med 2020;8:765-74
24. Matrajt, L., Eaton, J., Leung, T. & Brown, E. R. Vaccine optimization for COVID-19: who to vaccinate first?. Sci. Adv. 7(6), eabf1374 (2021).
25. Moghadas, S. M. et al. The impact of vaccination on COVID-19 outbreaks in the United States. Clin. Infect. Dis. ciab079
26. Hogan, A. B. et al. Modelling the Allocation and Impact of a COVID-19 Vaccine (Imperial College London, 2020).
27. Sartini C, Tresoldi M, Scarpellini P, Tettamanti A, Carcò F, Landoni G, et al. Respiratory parameters in patients with COVID-19 after using noninvasive ventilation in the prone position outside the intensive care unit. JAMA 2020;323:2338-40. Available from: https://jamanetwork.com/journals/jama/fullarticle/2766291. [Last accessed on 2020 May 22].
28. Elharrar X, Trigui Y, Dols A-M, Touchon F, Martinez S, Prud'homme E, et al. Use of prone positioning in nonintubated patients with COVID-19 and hypoxemic acute respiratory failure. JAMA 2020;323:2336-8. Available from: https://jamanetwork.com/journals/jama/fullarticle/2766292. [Last accessed on 2020 May 22]
29. Elharrar X, Trigui Y, Dols A-M, Touchon F, Martinez S, Prud'homme E, et al. Use of prone positioning in nonintubated patients with COVID-19 and hypoxemic acute respiratory failure. JAMA 2020;323:2336-8. Available from: https://jamanetwork.com/journals/jama/fullarticle/2766292. [Last accessed on 2020 May 22]
30. Sullivan. Biden details plan to combat coronavirus pandemic in first 100 days. Available at: https://www.cnn.com/2020/12/08/politics/biden-100-million-vaccines-100-days/index.html. Accessed 2 January 2021.
31. World Health Organization (WHO) 2021. Evaluation of COVID-19 Vaccine Effectiveness; p. 70.