Original Research Article

A retrospective study of d-dimer level comparison and its prognostic importance in hospitalized COVID-19 patients

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ABSTRACT

Introduction: Patients with covid-19 have an abnormal coagulation function and the association between D-dimer levels and the severity of COVID-19 is unclear. The study aimed to explore the association between the severity of COVID-19, influencing factors, and D-dimer levels in vaccinated and unvaccinated individuals.

Materials and Methods: In a retrospective study, all patients who are SARS-CoV-2 RNA PCR positive were assessed and detailed vaccine history and laboratory findings were collected. Data were analysed using SPSS version 27.

Result: Among 80 study participants, 46 (57.5%) were vaccinated with at least one or two doses and 34 (42.5%) were unvaccinated. 19 (23.8%) study participants were dependent on non-invasive ventilation and 43.8% were on mechanical ventilation. The median D dimer level at day 1 was comparatively higher among vaccinated (median =653.00) compared to their counterpart (median =531.50) and it was no statistically significant difference on day 1 among both the groups (p-value =0.422). Similarly, the median dimer level at day 5 was comparatively higher among vaccinated (median =944.50) compared to non-vaccinated. (median =934.00) and p value =0.422. The study reveals that 7(36.8%) of the vaccinated participants were on non-invasive ventilation and 12(63.2%) non-vaccinated individuals were on non-invasive ventilation and the association was found to be statistically significant (p-value =0.037). The severity of COVID-19 is higher among non-vaccinated (53.8%) than vaccinated (46.2%).

Conclusion: D-dimer levels were raised in both vaccinated and unvaccinated individuals. The vaccinated group was at less risk for complications and less need for intubation and mechanical ventilation. Though higher levels of D- dimer were recorded on day 1 and day 5 in vaccinated compared to non-vaccinated statistically it was not significant. We conclude D-dimer levels cannot be utilized as biomarkers for the severity of the disease in vaccinated and non-vaccinated individuals.

1. Introduction

The coronavirus is responsible for the COVID-19 continuing pandemic f severe acute respiratory syndrome. The virus has spread to become a global epidemic since it first appeared in Wuhan, China.[1] During the pandemic lot of patients needed critical care and the health system was almost on the brink of collapse, necessitating the need for risk stratification measures.[2] Therefore, the care of COVID-19 patients urgently requires effective, early indicators of clinical outcomes. D-dimer has been shown to be helpful in predicting the degree of disease in COVID-19 in a number of research studies.[2,3] D-dimer is produced when fibrin is broken down by a process called fibrinolysis. Elevated levels of D-dimer signify secondary fibrinolysis and a hypercoagulable condition in the body,

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which is very helpful for diagnosing thrombotic illness. A hypercoagulable state was reported in COVID-19 patients. [4]

But there is a lack of evidence on the effect of covid vaccination on the levels of D-dimer levels in individuals suffering from COVID-19. This study was taken up to discover and explore the association between the severity of COVID-19, influencing factors, and D-dimer levels in vaccinated and unvaccinated individuals.

2. Materials and Methods

A retrospective record-based study was conducted in a tertiary care hospital over a period of three months after getting clearance from the Ethics committee. All adults aged 18 years to 100 years diagnosed as COVID-19 and confirmed by SARS-CoV-2 RNA RTPCR or CBNAAT technique and all adults who had one or two doses of the ChAdOx1 nCoV-19 (Oxford Astra Zeneca) or covaxin (Bharat Biotech) were included in the study. Children and adolescents who had COVID -19 were excluded.

All the data pertaining to patients' demographics, detailed history, laboratory parameters like D-dimer, CRP, Procalcitonin, Lactate dehydrogenase, and Comorbid conditions including a history of myocardial infarction, hypertension, recurrent infections, liver disease, pulmonary disease, diabetes mellitus, and connective tissue disorders are all taken account.

Data were analysed by percentage, frequency, and chi-square test using SPSS version 27. Kolmogorov Smirnoff test was used to check the distribution of the data. Mann Whitney U test was used to compare D-dimer level day 1, and D-dimer level day 1 with vaccination status. The chi-square test was used to find the association between the study variable and vaccination status. P value <0.05 was considered to be statistically significant.

3. Results

A total of 80 patients were admitted during the period of study. Out of 80 study participants, 39 (48.8%) were female and 41(51.2%) were males. Among them, 46 (57.5%) were vaccinated with at least one or two doses and the remaining (42.5%) were unvaccinated. Only 19 (23.8%) study participants were on non-invasive ventilation (NIV) and 43.8% were on mechanical ventilation. Only 19 (23.8%) of the study participants had multiple organ dysfunction syndromes (MODS). Further study reveals that 39(48.8%) of the study participants were severely affected and 28.7% of study participants deceased due to COVID-19.

Table 1 compares the Dimer levels among vaccinated and non-vaccinated study participants. The study revealed that there is no statistically significant difference in D- dimer levels on day 1 among both the groups (p-value =0.422).

Table 2 shows the association of study variables with vaccination status. The study reveals that 7(36.8%) of the vaccinated study participants were on non-invasive ventilation and 12(63.2%) of the non-vaccinated study participants were on non-invasive ventilation and the association was found to be statistically significant (p-value =0.037). Further study reveals that the severity of COVID-19 is higher among non-vaccinated (53.8%) study participants compared to vaccinated (46.2%) and the association was statistically significant (p-value = 0.046).

4. Discussion

The D-dimer level is one of the metrics used to diagnose thrombosis in patients. Several studies have found that a three to fourfold increase in D-dimer and fibrinogen concentrations in the early stages of COVID-19 disease is associated with a bad prognosis. [5] Additionally, COVID-19 patients may experience a surge in D-dimer levels due to underlying illnesses such as diabetes, cancer, stroke, and pregnancy. [6–8]

COVID-19 immunization has been found to be successful in reducing hospitalization, and the severity of COVID-19 infection, and improving outcomes, particularly in high-risk individuals. Measuring D-dimer and coagulation markers from the beginning of the disease can be useful in monitoring the condition and ensuring effective care.

We noticed in our study the vaccinated group was at less risk for complications and less need for intubation and mechanical ventilation. The unvaccinated group fared poorly in terms of length of hospital stay, ICU admission, and mechanical ventilation. Our findings are consistent with earlier research that found unvaccinated patients have a higher risk of hospitalization. [9,10] Another community-based trial on elderly people in the United Kingdom found that immunization with either one dose of Pfizer or AstraZeneca vaccines reduced emergency care and hospital admission by 43% and 37%, respectively. [10]

In our study, D-dimer levels were raised in both vaccinated and unvaccinated people. Though higher levels of D- dimer were recorded on day 1 and day 5 in vaccinated compared to non-vaccinated statistically it was not significant (p-value =0.422). Vidali et al [3] found substantial elevations in D-dimer levels in critically ill COVID-19 patients in their comprehensive evaluation of 16 studies. D-dimer levels were considerably greater in COVID-19 patients compared to healthy controls and in COVID-19 patients with severe disease or a composite end-point compared to non-severe disease.

We conclude D-dimer levels cannot be used as a biomarker for the severity of the disease in vaccinated and non-vaccinated individuals. There are certain limitations to our study. Firstly, it is a retrospective study with a small sample size. Second, the interval between taking the vaccine and contracting the sickness was not addressed, which would have resulted in a better understanding. Thirdly, Co-

Table 1: Comparison of Dimer levels among vaccinated and non-vaccinated study participants, n=80

Study Variables	Vaccination status Median (IQR)		Mann – Whitney U Test statistic value	P - value
	Yes (n=46)	No (n=34)		
D – dimer day 1	653.00 (288.25,2114.25)	531.50 (317.50,1543.75)	699.500	0.422
D – dimer day 5	944.50 (287.25,2064.00)	934.00 (427.50, 2023)	751.500	0.767

*p value <0.05 is considered to be statistically significant

Table 2: Association of the study variables with vaccination status, n=80

Variables	Vaccination Status n (%)		P – value
	No (n=34)	Yes (n=46)	
Sex			
Female	20 (51.3)	19 (48.7)	0.121
Male	14 (34.1)	27 (65.9)	
Non-invasive ventilation			
No	22 (36.1)	39(63.9)	0.037*
Yes	12 (63.2)	7 (36.8)	
Mechanical ventilation			
No	17 (37.8)	28 (62.2)	0.333
Yes	17 (48.6)	18 (51.4)	
Severity of COVID-19			
Mild	5 (21.7)	18 (78.3)	
Moderate	8 (44.4)	10 (55.6)	0.046*
Severe	21 (53.8)	18 (46.2)	
Outcome			
Alive	22 (38.6)	35 (61.4)	0.266
Death	12 (52.2)	11 (47.8)	

*p value<0.05 is considered to be statistically significant

relation between D-dimer and COVID 19 patients with co-morbidities, with and without the vaccination status was not considered. This can also be an additional limitation Because our knowledge is limited, more research in this area is required to give light on the use of D-dimer in the monitoring and management of COVID-19.

5. Source of Funding

None.

6. Conflict of Interest

None.

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