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Expected Viscosity After COVID-19 Vaccination, Hyperviscosity and Previous COVID-19

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COVID-19 vaccine is the hope for containment of disease outbreak. The post vaccination adverse effect is an important consideration. The clot after vaccination is an emerging important clinical problem in some vaccine recipients.[1] The cause of post vaccination blood clot is not known. It is proposed that the problem might be due to immunopathological process.[2] Here, the authors used a mathematical model estimation to predict blood viscosity change after COVID-19 vaccination. For model development, the primary data source are a) data from a recent publication on neutralization antibody titers after COVID-19 vaccination are used[3] and b) data from a previous on relationship between immunoglobulin dose and serum viscosity.[4]

According to the referencing publication,[3] the reciprocal half—maximal binding titer change after vaccination is different in different recipient groups (without previous COVID-19, with previous asymptomatic COVID-19 and with previous symptomatic COVID-19).[3] Regarding the previous report on immunoglobulin dose and serum viscosity, the lowest normal immununoglobulin concentration and viscosity are 545 mg/dl and 1.5 cp, respectively. These normal values are used as background value, pre-COVID-19 vaccination, for all cases in the present study. If there is an increased level of immunoglobulin to 6,160 mg/dl or 1.1 added mg/dl, the final viscosity will be 2.6 cp.[4] Hence, the viscosity change is equal to + 1.1 cp/ + 5615 mg/dl. For estimating post vaccination viscosity change, the change of reciprocal titer is transformed into concentration. Then derived concentration change value is used for further calculated for viscosity change and final expected viscosity. For modeling, final expected viscosity will be equal to "pre-vaccination viscosity normal value + [1.1 × (transformed concentration)/5615]." According to the study, viscosity increases in all groups after vaccination (Table 1). Given the hyperviscosity occurs at a viscosity higher than 5.0 cp,[5] it seems that there will be no problem in any vaccine recipient without previous COVID-19. However, hyperviscosity is likely to occur in any recipient who has previous COVID-19. Based on this preliminary study, it is suggested that screening for possible previous COVID-19 before COVID-19 vaccination might be necessary for prevention of unwanted blood thrombohemostasis adverse effect.

Table 1. Expected Viscosity After COVID-19 Vaccination.

Groups	Post vaccination titer increasing (times)*	Expected concentration change (mg/dl)	Expected viscosity (cp)
Without previous COVID-19	22.5	12,262.5	3.9
With previous asymptomatic COVID-19 with previous	150	81,750	17.5
With previous symptomatic COVID-19	100	54,500	12.1

*Data according to Saadat et al.[3]

According to this preliminary mathematical model study, a closed monitoring for post COVID-19 vaccination hyperviscosity problem is required. The cases with previous symptomatic COVID-19 have a higher expected viscosity than those with asymptomatic COVID-19 or without previous infection. Nevertheless, there is no primary data on severity of group with previous symptomatic COVID-19. In conclusion, the present work give a relative novelty focusing on viscosity after

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COVID-19 vaccination, however, it needs randomized controlled study to prove. Recipients who have previously infected COVID-19 could be divided according to severity in order to explore viscosity increases among infectors with different disease stage should be assessed in further study.

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