Quantification of anti-SARS-CoV-2 antibody after 2nd and 3rd Dose of Vaccination among Health Care Worker

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A thesis submitted in the partial fulfillment of the requirements for the degree of MPH (Public Health)

One Health Institute

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March 2023.

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List of Abbreviations

HCW	Health Care Worker
RT-PCR	Real Time Polymerase Chain Reaction
ARDS	Acute Respiratory Distress Syndrome
CMP	Chittagong metropolitan
CVASU	Chattogram Veterinary and Animal Sciences University
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
ICTV	International Committee on Taxonomy of Viruses
PHEIC	Public health emergency of international concern
ELISA	Enzyme linked immunosorbent assay
ICT	Immunochromatographic test
GMC	Geometric mean concentration
WHO	World health Organization
NSP	Non-structural protein
ORF	Open reading frame
GMT	Geometric mean titer
ICT	Immunochromatography
CDC	Centre for disease control
CPL	Clinical pathology laboratory
RAD	Rapid antigen detection
IgG	Immunoglobulin G
IgM	Immunoglobulin M
ASAb	Anti-spike antibody
Nab	Neutralizing antibody
IPC	Infection Prevention Control

ABSTRACT

Introduction: The decision of quick vaccination against covid-19 has possibly minimized the SARS-CoV-2 transmission globally. This effective strategy expedites the development of the immune system among the susceptible. However, frontline healthcare workers (HCWs) are supposed to be more susceptible to infection due to working closely with the patients. It is relatively unknown about the durability of their immune response to covid-19 after receiving a set of covid-19 vaccine doses. Seroprevalence studies that quantify the serum level of e.g. Immunoglobulin G(IgG) and/or Immunoglobulin M (IgM) can be effective in this regard. Therefore, this thesis intended to estimate the prevalence of antibodies and quantify the titer and its durability among vaccinated HCWs.

Methods and Materials: Blood samples e.g. heparinized blood specimens (6mL) were collected from 530 healthcare workers from different government and non-government hospitals in Chattagram Metropolitan Area to attain the objectives. The clinical test was performed at the clinical pathology laboratory (CPL) of Chattogram Veterinary and Animal Sciences University (CVASU) within three hours of sample collection. Qualitative ELISA test was executed to determine the presence of antibody (IgG) in the serum sample, and its level was quantified following the method SARS-CoV-2 S1-RBD IgG (DiaSino® Laboratories Co., Ltd. Zhengzhou, China, Ref: DS207704). An Immunochromatographic (ICT) test was also executed to compare with ELISA test results. Association of different variables with the prevalence and titer of antibody was statistically evaluated using STATA-11.

Results: antibodies were detected in 99.62% of the study population using the qualitative ELISA test, and 61.13% in ICT test. It was revealed that the prevalence of antibodies increased with the increased number of vaccine doses ($p=0.05$). Similarly, a statistically significant increase in the titer of antibodies with receiving the higher dose of Covid-19 vaccine was observed in a quantitative ELISA test ($p<0.001$). Enough antibody titer upto 8 months and onwards after receiving the second dose was found in 71.50 % population. Moreover, the findings revealed that prevalence of antibody development is 1.7 times higher in the symptomatic infected population compared to asymptomatic infected population (OR: 1.7; CI:0.971-3.082; $p<0.05$). However, a significant association between

antibody titer development with different potential variables e.g. gender, comorbidities and immunosuppressant were not observed.

Conclusion: this thesis emphasizes the role of vaccines in antibody production against SARS-CoV-2 and a robust antibody durability after 2nd dose of vaccination. Therefore, the findings of this thesis would help policy makers to develop a new vaccination strategy regarding the booster dose.

Key words: Seroprevalence, anti SARS-Cov-2 antibody, mean titer; IgG/Ig.