

Breakthrough Infections of COVID-19 among Vaccinated Healthcare Workers in a Tertiary Care Hospital in Northern Kerala, India

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Abstract

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is rapidly spreading both in India and across the world and healthcare workers are at increased risk of contracting this infection due to their constant exposure status. This study aims to assess the breakthrough infections among vaccinated health care workers in a tertiary care centre. A cross sectional study was conducted for a period of one year among vaccinated healthcare workers who turned positive two weeks post complete vaccination. 82 (4.73%) out of 1732 vaccinated healthcare workers (2 doses) developed breakthrough COVID-19 infection of which 70.7% were females and the mean age was 35.5 years. 52.4% (n=43) were doctors, 30.5% nurses (n=25) and 15.9% were allied health professionals. 67 (81.7%) had mild symptoms, 10 (12.19%) were asymptomatic, 5 (6.09%) were hospitalised with none requiring ventilator support. 43.1% of infections occurred 6-9 months post vaccination. 23.7% acquired infection from fellow healthcare workers, 12.2% from household contacts, 46.3% from patients/bystanders, and 18.2% were from unknown sources. Proper understanding and analysis of the breakthrough COVID-19 infections can help in taking appropriate infection control practices as well as improving the overall health status of healthcare workers during this pandemic.

Keywords: Breakthrough infection, COVID-19, Vaccine, Healthcare workers

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) started as an outbreak in the Chinese city of Wuhan in December 2019, from where it rapidly spread and went on to become one of the biggest pandemics of recent times.¹ It continues to wreak its havoc in India and across the world with new strains developing ever so often. Healthcare workers (HCWs) are at increased risk of contracting COVID-19 due to direct or indirect exposure to COVID-19 patients, and require special attention.² Protecting Healthcare workers is a prime concern during this pandemic and hence were prioritised to receive COVID vaccination when it was introduced in India in January 2021.³

According to CDC "breakthrough" case is when a person tests positive for COVID-19 at least two weeks after becoming fully vaccinated.⁴ Though AZD1222/Covishield coronavirus vaccine has an efficacy of 80% (when both doses taken 6-8 weeks apart),⁵ breakthrough infections have occurred and this invariably can increase the secondary transmission from HCWs to patients, family members, and the community. It is the need of the hour to assess breakthrough infections of COVID-19 among vaccinated HCWs in order to take necessary precautions as well as stress the importance of standard precautions in controlling the spread of this pandemic.

MATERIALS AND METHODS

A descriptive cross sectional study was conducted, after obtaining approval from Institutional Ethics Committee in which all vaccinated health care workers of KMCT Medical College, Kozhikode who turned positive during a period of one year from January 15, 2021 to January 15, 2022 were included. A list of all HCWs who turned positive during the study period was obtained from hospital administration database and self administered questionnaires were provided to them after taking verbal consent. Consecutive sampling was done and a sample size of 82 was obtained based on the hospital database. Those who had taken only the first dose of vaccine and those who tested positive within 2 weeks following complete vaccination were

excluded since it does not define breakthrough infection. All were diagnosed positive either by reverse-transcriptase–polymerase-chain-reaction (RT-PCR) assays or by antigen-detecting rapid diagnostic testing (Ag-RDT). Data regarding name, age, gender, date of vaccination, type of vaccine, comorbidities and severity of infection were obtained.

All HCW in our institute had taken AZD1222/Covishield coronavirus vaccine, 2 doses intramuscularly 1 month apart according to MoHFW (Government of India) guidelines.⁶ Major comorbidities included in questionnaire were DM, HTN, CKD, CLD, CHD and cancer.⁷ Covid 19 clinical severity was assessed according to MoHFW guidelines in which infection was classified as mild, moderate and severe. Mild disease included upper respiratory symptoms and/or fever without shortness of breath or hypoxia. Anyone with respiratory rate >24/minute, SpO₂ 90%-93% on room air was considered having moderate illness. Severe disease was defined as anyone with respiratory rate >30/min, breathlessness and SpO₂<90% on room air.⁸

Descriptive statistics comprising percentage was used. Data was plotted on Microsoft Excel 2019 for analysis. Informed verbal consent was obtained from all participants. Confidentiality was ensured and maintained throughout the study.

RESULTS

Out of 1732 vaccinated health care workers in our institution, 82 (4.73%) had breakthrough COVID-19 infection during our study period. 70.7% (n=58) were females and 29.3% (n=24) males with a mean age of 35.5 years (+/- 7.5). HCWs who had breakthrough infections included 52.4% (n=43) doctors, 30.5% nurses (n=25), 15.9% allied health professionals of which 9 had prior comorbidities (Diabetes mellitus or hypertension).

Out of 82, 72 (87.8%) HCW were symptomatic and the most common symptoms were upper respiratory congestion (57%), headache (45%), loss of taste and smell (33%) and myalgia (43%). Only 5 (6.09%) were hospitalised with none requiring ventilator support. One out of the 5 hospitalised cases had comorbidities (both

DM and HTN). Average time period of positivity post vaccination is given in Fig. 1 with a confidence interval of 95%.

23.17% (n=19) acquired infection from fellow HCWs, 46.3% (n=38) acquired infection following exposure in general out patient department/wards where they had history of contact with patients/bystanders who later turned positive. 12.2% (n=10) had history of a positive household contact. In 18.3% (n=15) it was not possible to trace the contact and was suspected to have obtained infection from sources outside the hospital.

DISCUSSION

Vaccines continue to be the major weapons in the fight against the deadly COVID-19 pandemic. Massive vaccination drive had begun in India from January 2021 and HCWs were the first to be included. Two major vaccines AZD1222/ Covishield coronavirus vaccine with efficacy of 80% and BBV152/Covaxin with efficacy of 69% were implemented in India.⁵

Breakthrough infection is a matter of grave concern but adequate data regarding these infections are not available in real world setting. In a study conducted by Berwerk M et al. at a medical facility in Israel 2.6% SARS-CoV-2 breakthrough infections were documented.⁹ This is comparable to our study where 4.73% breakthrough infections

were reported. Out of these 82.9% were doctors and nurses showing that these group of people continue to be at the risk of acquiring infection the most during this pandemic.

Although 82.7% were symptomatic, the symptoms were mild in nature including upper respiratory tract congestion, headache, myalgia, loss of taste and smell. Only 6.08% were hospitalised with no one requiring ventilator support. This is in concurrence to the study conducted by Tyagi K et al. in Delhi where out of the 15 breakthrough infections only one required hospitalisation and all others had mild COVID-19 symptoms.¹⁰ This highlights the importance of COVID-19 vaccination in high-risk settings such as tertiary care hospitals where fully vaccinated people are less likely to develop serious illness than those who are unvaccinated and even when they do develop symptoms, they tend to be less severe leading to lesser hospitalisations and mortality even among those with comorbidities.¹¹ Majority of the infections (43.9%) occurred 6-9 months post vaccination. This maybe due to the waning antibody titres.

Proper standard precaution practices also play an important role along with vaccination in keeping the infection at bay and also to reduce secondary transmission. The 23.17% of vaccinated HCWs who acquired infection from fellow healthcare workers in this study could

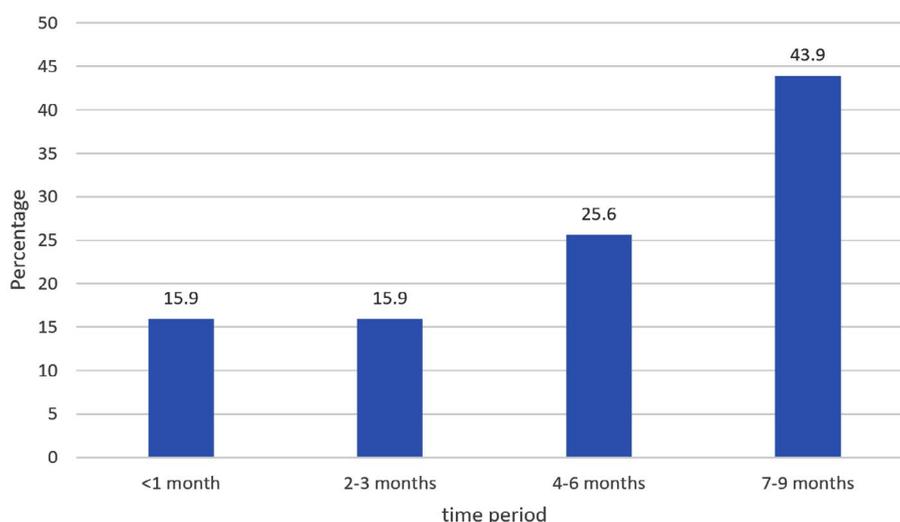


Fig. 1. Time period of positivity post vaccination.

have been avoided if proper standard precautions were followed. Similar picture was seen in the study by Berwerk M et al. where 30% of the cases had acquired infection from fellow healthcare workers.⁹ This also warns us against the false sense of security which accompanies complete vaccination leading to lax in standard precaution practices despite the extensive training on hospital infection control practices that were given at the start of the pandemic. Wong ELY et al. in a study among nurses in Hongkong showed that the respondents did not fully comply with the standard precautions when they were involved in medical care. Their compliance was relatively low when having proper patient handling (54%) and performing invasive procedures (46%).¹² Proper and continued education and training regarding this should be given to the HCWs which all hospitals should endeavour to implement.

The low rate of breakthrough infections as well as the reduced severity further strengthens the importance of vaccination in curbing this disease and highlights the need for mass vaccination campaigns through a close collaboration between occupational and public health stakeholder.¹³ Private medical colleges being major stakeholders which employ a host of doctors, nurses and other cadre of providers, the Government of India has advised the states to proactively engage with them and facilitate the vaccination process.⁶ Proper understanding and analysis of the breakthrough COVID-19 infections can help in taking appropriate infection control practices, facilitating adequate training and ensuring complete immunization coverage in healthcare setup in order to improve the overall health status of healthcare workers during this pandemic.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial,

direct and intellectual contribution to the work, and approved it for publication.

FUNDING

None.

DATA AVAILABILITY

All data generated or analyzed during this study are included in the manuscript.

ETHICS STATEMENT

This study was approved by the Institutional Ethics Committee, KMCT Medical College, India with Ref. No. KMCT/RP2022/IEC/04.

INFORMED CONSENT

A informed consent was obtained from the participants before enrolling in the study.

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