

## Assessment of Risk Factors for COVID-19 in Medical Interns at a Dedicated COVID-19 Hospital: A Case Control Study

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Received: 29-04-2022 / Revised: 18-05-2022 / Accepted: 30-05-2022

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Conflict of interest: Nil

### Abstract

**Background/Justification:** In spite of considerable efficacy, breakthrough infection after covishield vaccine is not uncommon. This study was conducted to see the risk factors for infection among medical interns after covid vaccination and factors associated with it, so that corrective measures could be taken to further reduce the transmission.

**Objective:** To observe the risk factors for covid -19 infection among the medical interns in a dedicated covid-19 hospital after vaccination.

**Secondary objective:** To observe the correct and consistent use of PPE among interns doing covid duty, to observe overcrowding at the place of work/stay, to observe that whether they are using any kind of preventive measures in terms of breathing exercise or vitamin supplement.

**Method:** Data collection was done using online questionnaire administration and telephonic discussion. A hospital-based case control study was done.

**Results:** Rate of covid 19 infection was 11% among the medical interns. Inconsistent use of PPE, overcrowding at the place of work were associated with infection. Other than PPE and covid appropriated behaviour breathing exercise/ pranayam did show some protective effect.

**Keywords:** Efficacy, Breakthrough infection, Transmission, Pranayama, case control study, PPE (personal protective equipment).

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### Introduction

Vaccines for Covid -19 have shown considerable efficacy in clinical trials and effectiveness in vaccination programme data, but some people, mostly health care worker still become infected with SARS-CoV-2 after vaccination[1-3]. This study aimed to identify risk factors for post-vaccination SARS-CoV-2 infection among medical interns who are exposed to covid-19 positive patients in a dedicated covid

hospital. They are at increased risk of infection and transmitting the disease to other colleagues or family members [2-4]. Fully vaccinated asymptomatic health care workers have been found to transmit the covid-19 infection to family members, roommates or contacts[5-6] Based on experience with other viruses spread by respiratory droplets, the consistent use of recommended personal protective

equipment (PPE) is critical to reducing transmission[7-8]. Health care workers contribute to nearly 1/5<sup>th</sup> of total covid-19 infections, therefore every health facility has a potential role in the transmission chain of covid-19[9-10].

During the second wave of covid-19 in Bihar, our hospital was a dedicated covid-19 hospital from April 2021 to July 2021. Interns were posted in Emergency, ICU, covid ward and vaccination duty. This study was done to see the Covid-19 risk factors and preventive factors among the medical interns working in different departments of a dedicated covid hospital. Understanding the risk factors as well as preventive factors is important to prevent the future infection in similar hospital settings. Case control study design was done to compare the factors among the two groups.[11]

**Primary Objective:** To observe the risk factors for covid -19 infection among the medical interns in a dedicated covid-19 hospital after vaccination (Covishield).

**Secondary objective:**

- To observe the correct and consistent use of PPE among interns doing covid duty.
- To observe overcrowding at the place of work / stay.
- To observe if they are using any kind of preventive measure in terms of breathing exercise or vitamin supplement.

## Methods

**Study Population:** Medical interns, who had received both doses of covid-19 vaccination at least 14 days earlier before getting tested positive/negative for covid-19 in a dedicated covid hospital, who also got exposed to confirm covid 19 positive cases (within 1 meter of distance) and also stayed in the hostel premises post vaccination and did not have a travel history post vaccination till getting tested for Covid-19.

**Study design-** A hospital-based Case control study was done. Data collection done from August 2021 to October 2021. Age and sex matched four controls were recruited per case.

## Definition/Eligibility criteria

### Case and control

**Case:** Medical interns working in this dedicated covid hospital, who are exposed to a confirmed case and tested positive for covid-19 (who received both doses of vaccination till April 30, 2021) were recruited as cases.

**Control:** Medical intern working in the same hospital (Who has received both doses of Covid-19 vaccine till April 30, 2021) and exposed to confirmed cases but who are not being classified as a suspected or probable or confirmed COVID-19 case.

**Exposure to confirmed covid-19 case** is defined as coming in close contact with the confirmed covid-19 case, i.e., less than 1 meter for 15 minutes or more.

### Exclusion criteria:

1. Those who earlier tested positive for Covid-19 before vaccination
2. History of travel after 2<sup>nd</sup> dose of vaccine.

**Data collection:** Data collection was done using google forms form August 2021 to October 2021 on basic demographic information, Comorbid condition, place of stay, travel history, use of PPE, IPC measures, whether removing mask for eating/taking tea at workplace, overcrowding in the workplace/hostel, taking any prophylactic medicine, practicing breathing exercises/pranayama. If found positive symptoms were also asked as per WHO scale. Data analysis was done in epi-info.

## Result

There were 514 medical students including interns of which 496 were above the age of 18 at the time of study. Out of total 496

only 216 received the 2<sup>nd</sup> dose of covishield. Among the 216 who received both doses of covishield 96 were interns who worked in the hospital during the 2<sup>nd</sup> wave of covid-19 and did not have a travel history after 2<sup>nd</sup> dose of vaccination. Cases and control were selected from this population only, who were residing in hostel, exposed to confirmed covid -19 cases after vaccination. A total of 19 interns had been tested positive for COVID-19 before vaccination. They were excluded from the study. A total of 11 interns tested positive after taking both doses of covid-19 vaccination. They were never tested positive earlier. Time interval from the 2<sup>nd</sup> dose of vaccine till the confirmation of diagnosis ranged from 27 days to 41 days in cases and 24 to 51 days in controls. Diagnosis was confirmed by positive RTPCR in nine cases and among two cases it was confirmed by RAT. Of all the cases 4 were ambulatory with no limitation. Seven cases were asymptomatic. They got tested as routine screening procedure being followed by the Hospital administration. Rate of covid-19 infection among medical interns who were working in the hospital and staying in Hostel was 11.11 percent. There was total 11 cases for which 44 control were selected (age and gender matched). Of the 11 cases 6 were female and 5 were male. There were 24 female controls, and 20 controls were males.

There was no difference in BMI of both cases and controls. Chronic lung disease was present in one of the cases and one control was hypothyroid. Infection prevention practices were not similar among cases and controls. Among the cases 54.5% (6 out of 11 cases) wore PPE as recommended, whereas 90% (40 out of 44 controls) wore PPE as recommended. Total 72% of cases (8/11) cases followed hand hygiene and 95% (42/44) controls followed hand hygiene. Overcrowding was seen among 54.5% of cases sometimes whereas only 5% controls were exposed to overcrowding. Occasional removal of mask was seen in 27.2% of cases for taking tea water, etc. at workplace whereas only 4.5% controls did this at any point of time at workplace after vaccination. Similar training on IPC was given to all the interns. They were asked about preventive measures also. Any prophylactic medicine was taken by 54% of cases and 59 % of controls. It was similar in both cases and controls. Yoga /Pranayama was practiced by 9% cases and 45% of controls where difference was statistically significant ( $p < .05$ ). However, when it was further analysed for type of yoga/duration of yoga no significant difference was observed, may be due to very small sample size. There was no difference between the cases and control in taking vitamin C or any other supplements.

**Table 1: Basic demographic information**

Variables	Categories	Cases (11)	Controls (44)
Age	Mean	22	21.12
Sex	Male	5	20
	Female	6	24
BMI	All	24.29	23.03
Comorbidities	Chronic lung disease	1	0
	others	0	1

**Table 2: Infection Prevention Practices**

Variable	Types of response	Cases (11)	Controls (44)	Chi-square df (p-value)	Fisher exact (P-value)
Use of PPE	Always as	6	40	.003	.01

	recommended				
	Sometimes not	5	4	1	
Follow hand hygiene	Always recommended	8	42	.01	.049
	Sometimes not	3	2	1	
Exposed to Overcrowding at workplace/Hostel rooms	Exposed always	0	0	.0002	.003
	Exposed sometimes	6	2	0	
	Exposed Never	5	42		
Removing mask at workplace for taking water/tea/snack	Never	3	2	.01	.049
	Sometimes	8	42	1	

**Table 3: Other Preventive Measures**

variable	Response	Cases	Controls	Chi (Significance)	df	Fisher exact (significance)
Taken any prophylactic medicine	Yes	6	26	1	1	1
	No	5	18			
Practicing any form of breathing exercise/ pranayama	Every day-5 day a week	1	20	0.02	1	0.03
	Never/Occasional	10	24			
Type of breathing exercise /pranayama	Anulom /vilom	1	18	.7	1	1
	Sudarshan kriya	0	2			
Time spent in pranayama	5-10 mnts	1	4	.06	1	.2
	>10mnts	0	16			
Taking any vitamin supplement	Yes	6	22	.78	1	1
	No	5	22			
Type of vitamin supplement	Vitamin C	8	30	.21	1	.33
	Any other	3	14			

### Discussion

This study aims to see the correct and consistent use of PPE among fully vaccinated medical interns, overcrowding at place of stay or work and preventive measures used by medical interns to stay protected from covid-19.

There is enough evidence from earlier studies that vaccination alone does not reduce infection and transmission of

Covid-19[12-14]. A recent investigation by the US Centers for Disease Control and Prevention of an outbreak of COVID-19 in a prison in Texas showed the equal presence of infectious virus in the nasopharynx of vaccinated and unvaccinated individuals[15-16]. Studies in other parts of globe observed no major differences between vaccinated and unvaccinated individuals in terms of SARS-CoV-2 viral loads in the

nasopharynx, among asymptomatic infection also. Thus, the current evidence suggests that vaccination status should not replace mitigation practices such as mask wearing, physical distancing, and contact-tracing investigations, even within highly vaccinated populations[17-18]. Vaccine effectiveness studies have shown that COVID-19 vaccines decrease symptomatic and severe disease, hospitalisations and intensive care unit admissions. However, the impact of vaccination on transmissibility of SARS-CoV-2 is not confirmed. In this study also we see 11.11% cases of infection after 2 doses of vaccine in less than 2 months period. This number may increase after longer follow up period. Overcrowding significantly increases the risk of transmission. Overcrowding occurs when the number of individuals exceeds the space available, resulting in adverse health outcomes, such as infectious diseases. Crowding increases the intensity and duration of exposure to pathogens and the risk of transmission. For highly infectious agents such as SARS-Cov-2 even temporary crowding at workplace will increase the chances of infection [15]. We did not take into account antibody status of cases and control because both were vaccinated. We excluded those who had tested positive for covid-19 infection before vaccination. Non-differential misclassification may be there. There was no significant difference between cases and controls with respect to those having direct contact with the patient or his materials, surroundings, and following hand hygiene. The majority of interns reported that they had close contact (within 1 meter) with the patients since their admission and it was not significantly different in cases and controls. All the interns received similar training in IPC through physical demonstration and video demonstration. However repeated trainings are needed to reinforce the importance of correct and consistent use of PPE. Not All the interns who had exposure with COVID-19

patients were using PPE correctly. Few of them had occasional removal of mask for taking tea/water with colleagues/juniors/seniors who tested positive later on. Few of them practiced some form of breathing exercise /pranayama that seems to be protective. However, because of small sample size and no direct observation of this practice, protective effect of pranayama may be overemphasized. Few studies have shown the protective effect of pranayama in pandemic. Effect of 1 month of integrated yoga intervention has reported to significant improvement in the psychological states as well as in the viral loads in patients suffering from HIV-1 infection. Yoga is coming up as a powerful tool for stress management and improvement in psychological health among HIV/AIDS patients. These findings are suggestive of potential complementary role for yoga in the management of communicable diseases. systematic special tailor-made asana practices, dedicated pranayamas, meditation, and mantras could provide a broad-spectrum immune build up in the body so that viral infection could be averted and/or its virulence reduced[18-19].

Yoga/Pranayama/Sudarshan Kriya has been beneficial in improving the clinical outcomes of various communicable and non-communicable diseases[20-21].

#### **Conclusion and recommendation:**

Adequate availability of PPE, IPC training of HCWs is important for preventing COVID-19 but do not completely reduce the risk among HCWs. If health care workers were trained and if they take adequate precautions, then the risk of getting an infection is minimized. Strict adherence to PPE at workplace may be followed. Repeated training on appropriate usage and disposal of PPE may be ensured. Overcrowding at workplace may be ensured using mike system or guarded entry. In consistent use of PPE is associated with long work hours. This may be taken care of by dividing the duty hours

among others. Training on Yoga and pranayama may be done regularly to medical students as The National Medical Commission (NMC) has introduced yoga training in the MBBS foundation course. This training will be compulsory for an hour every day for at least a period of 10 days. This needs to be ensured and followed up regularly for optimum results.

**Limitation of the study:** Sample size was small. Non differential misclassification for both cases and controls may be present as antibody status was never measured. Information bias cannot be ruled out.

Ethical approval was obtained from the institute Ethics committee.

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