

Original Research Article

COVID-19 infection among nursing personnel: a retrospective survey in Kolkata, West Bengal

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ABSTRACT

Background: During this COVID-19 pandemic the health care workers are at greatest risk of exposure and subsequently developing SARS-CoV-2 infection. Multiple factors determine the severity of illness and its prognosis. This study aims to assess the incidence and severity of COVID-19 infection among the nursing personnel in Kolkata, West Bengal and determines the factors in severity of COVID-19 infection in the reported positive case.

Methods: A cross sectional survey was carried out among 858 nursing personnel in Kolkata, West Bengal from April 2021 to March 2022. Demographic and clinical data were collected through semi structured questionnaire and they were tested for validity and reliability before data collection.

Results: Result showed that 12.9% nursing personnel are COVID-19 affected. 66.7% belonged to the age group 18-25 years, 100% female and 73% were single. Out of 111 COVID-19 affected, 36.9% were fully vaccinated and 8.1% were partially vaccinated before COVID-19 infection, 16.2% were having comorbidity. Exposure source was not known for 74.8% and from the 25.2% known exposure cases 53.6% developed symptoms in <1 week. 45.9% suffered 2-3 weeks and 33.3% were having some post COVID-19 health problem. Data revealed that severity of illness was significantly associated with comorbidity ($X^2=5.820$) and vaccination status ($X^2=7.058$). Post COVID-19 health problem was significantly associated with age ($X^2=12.586$), comorbidity ($X^2=12.538$) and vaccination status ($X^2=17.838$).

Conclusions: Occurrence and severity of COVID-19 infection is less in vaccinated cases. Age, comorbidity and vaccination are the important factors in severity and developing post COVID-19 health problem.

Keywords: COVID-19 infection, Vaccination, Severity, Post COVID health problem, Nursing personnel

INTRODUCTION

COVID-19 infection caused by Novel Corona Virus is unique because of its very contagious nature and a global concern since December 2019.¹ It has become a significant health problem as the number of affected cases has escalated rapidly worldwide. World Health Organization (WHO) declared COVID-19 outbreak a global pandemic on March 11, 2020 as there was more than 118,000 cases in 114 countries with 4,291 deaths.² The second largest COVID-19 infection rate was in India with significant death rate.³ Healthcare workers are

considered as the highest risk population of developing COVID-19 infection due to their occupational exposure and nurses being the most commonly infected personnel. Bandopadhyay et al reported in a systematic review where they included literature until 8th May 2020 that 152888 infections and 1413 deaths. Infections were mainly common in women (71.6%) and (38.6%) were nurse, but deaths were mainly common in men (70.8%) and (51.4%) were doctors.⁴ 90,000 healthcare workers have been infected by COVID-19 and more than 260 nurses have lost their lives due to COVID-19 infection till 5th June 2020 as reported by Sabetian.⁵

The spread of highly infectious COVID-19 is tried to control by adopting COVID appropriate behavior and by immunization. Since January 16, 2021, two vaccines namely ChAdOx1 nCoV-19 recombinant – Covishield or whole viron inactivated vero cell vaccine or BBV1523 – Covaxin are permitted by Government of India (GOI) for clinical use. First priority was given to the healthcare workers (HCWs) and Front line workers (FLWs) due to the greater risk for contracting the infection, and if infected, they may also transmit the infection to others.⁶

Both the COVID-19 vaccines are considered as safe and effective though a certain percentage reported post-vaccination infections (PVIs). Victor reported 679 (9.6%) breakthrough infection among 7080 fully vaccinated HCWs.⁷ Antonelli reported (0.5%) positive case after first dose and (0.2%) positive case after second dose of vaccination in a study between 8th December, 2020, to 4th July 2021.⁸

Direct and indirect exposure to COVID-19 patients made the nursing personnel more vulnerable to get COVID-19 infection and demand special attention. Hence this retrospective survey was aimed to assess the incidence of COVID-19 infection among the nursing personnel, their vaccination status, and adoption of COVID appropriate behavior, clinical manifestation, management and severity of the infection. Determining the factors associated with severity of infection was also a secondary objective.

METHODS

This study was a non-experimental cross sectional retrospective survey research which was conducted among nursing personnel of Kolkata from April 2021 to March 2022. Non-probability convenient sampling technique was adopted to collect data from 858 subjects. The present study was carried out after getting ethical permission from the Institutional Ethics Committee. Informed consent was taken and anonymity was maintained. Data were collected from a government hospital and a private hospital in Kolkata. A semi structured questionnaire and record analysis performa were developed to collect data in following sections: socio-demographic characteristics, incidence of COVID-19 infection, vaccination status, adherence in Covid appropriate behavior, source of infection, duration of exposure, clinical manifestation, pharmacological and non-pharmacological management and severity of infection in terms of O₂ saturation, duration of suffering and post recovery health problem. Content validity of the tool was established from five experts. There was ninety five percent to cent percent agreement on different items of the tool. Reliability of the tool was established through test re-test ($r=0.91$) and inter-rater method (degree of agreement was 90-100% in different items). Hence the tool was considered as highly reliable. In the present study disease severity was assessed in terms of levels of oxygen saturations during the disease. Data was

organized and calculated through Statistical package for social sciences (SPSS) 26.00 version. Both descriptive and inferential statistics were used to analysis the data. Sample characteristics were described through frequency and percentage. Chi-square was calculated to determine associations between severities of illness with selected variables.

RESULTS

Out of 858 samples 111 (12.9%) samples were reported COVID-19 infection (Figure 1). Socio-demographic data of the COVID affected participants revealed that, majority (66.7%) of the nursing personnel were belonged to 18-25 years age group. All were female and 73% single. Majority (37%) of the participants were nursing student (Table 1).

Table 1: Socio-demographic characteristics of COVID-19 positive participants (n1=111).

Variables	Frequency	Percentage
Age (years)	18-25	74
	26-35	19
	36-45	12
	46-55	6
Marital status	Single	81
	Married	30
Educational status	HS	51
	Graduate	52
	Post-graduate	8
Occupation	Nursing student	41
	Nursing staff	39
	Sister tutor	26
	Sister In charge	5

** n1-denotes to number of Covid-19 affected participants.

Data in Table 2 showed that 36.9% participants were fully vaccinated and 8.1% were partially vaccinated at the time of COVID-19 infection. Source of COVID infection was not known for 74.8% cases. From 25.2% known cases, duration of exposure and symptom development was less than 1 week in 53.6% cases. Co morbidity was present in 16.2% cases only. Among the participants with comorbidity 44.44% affected participants are obese. History of Asthma is present in 44.44% DM in 22.22% (Figure 2). 46% of the affected participants were suffered 2-3 weeks and 33% developed post Covid health problems (Table 2).

In COVID appropriate behavior, 45.1% participants were using N-95 mask and 32.4% were using both double mask (Surgical + N-95). 76.5% participants washed their hands more than 3 times in duty hour 81.1% used to

sanitize their hand with hand sanitizer more than 3 times in duty hour. 15.3% participants used personal vehicle as mode of transport and 76.6% not allowed any domestic help (Table 3).

Participants were having sore-throat (72.1%), fever (88.3%), cough (83.8%), runny nose (57.7%), SOB

(27%), chills (23.4%), fatigue (77.5%), malaise (81.1%), anorexia (68.5%), chest tightness (28.8%), nausea (23.4%), vomiting (18%), diarrhea (24.3%), muscle ache (61.3%), Joint ache (44.1%), headache (78.4%), seizure (0.9%), dizziness (35.1%), loss of ability to smell (77.5%) and loss of ability to taste (73.9%) as clinical manifestations (Figure 3).

Table 2: Vaccination status and COVID-19 infection details of affected participants (n1=111).

Variables		Frequency	%
Vaccination status during COVID infection	Full vaccinated (2 dose)	41	36.9
	Partial vaccinated (1 dose)	9	8.1
	Not vaccinated	61	55
Sources of COVID infection	Known	28	25.2
	Not known	83	74.8
Duration of exposure*	<1 week	15	53.6
	>1 week	13	46.4
Presence of co-morbidity	Yes	18	16.2
	No	93	83.8
Duration of suffering	< 2 weeks	44	40
	2–3 weeks	51	46
	>3 weeks	16	14
Post COVID health problems	Yes	37	33
	No	74	67

Table 3: COVID appropriate behavior of the affected participants (n1=111).

Uses of mask	Surgical	25	22.5
	N-95	50	45.1
	Double (Surgical + N-95)	36	32.4
Frequency of hand washing in duty times	2 times	7	6.3
	3 times	19	17.1
	>3 times	85	76.5
Frequency of hand sanitization in duty times	≤3 times	21	18.9
	>3 times	90	81.1
Vehicle used	Public	94	84.7
	Personal	17	15.3
Domestic help	Allowed	26	23.4
	Not allowed	85	76.6

Table 4: COVID management of participants (n1=111).

Variables	Frequency	%
Ivermectin	57	51.4
Doxycycline	57	51.4
Azithral	10	9
PCM	95	85.6
Zincovit	70	63.1
Vitamin C	39	35.1
Cough syrup	48	43.2
Anti-allergic	35	31.5
Steroid	3	2.7

** Data are not mutually exclusive.

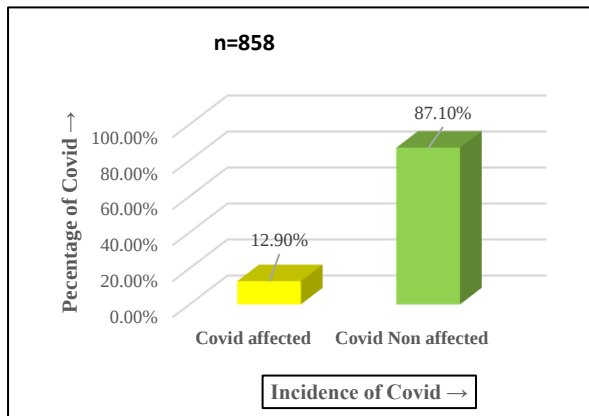


Figure 1: COVID-19 infection among participants.

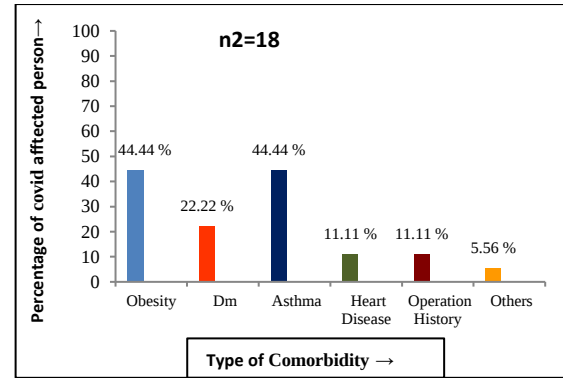


Figure 2: Co morbidity details of COVID affected participants.

** Data are not mutually exclusive. ** n₂= 18, denotes to persons having co-morbidity among Covid affected participants.

Table 5: Association between Oxygen saturation with selected variables of COVID affected participants (n₁=111).

Variables		Oxygen saturation		Chi value	df	P value
		≤94%	>94%			
Age (years)	≤20	18	11	3.619	2	0.164
	21–40	34	35			
	>40	4	9			
Marital status	Single	45	36	3.125	1	0.077
	Married	11	19			
Category of nursing personnel	Nursing student	24	17	3.874	3	0.275
	Nursing staff	20	19			
	Nursing faculty	9	17			
	Nursing In-charge	3	2			
Comorbidity	Yes	4	13	5.820*	1	0.016
	No	52	42			
Vaccination status at the time of COVID-19 infection	Completely vaccinated	13	26	7.058*	2	0.029
	Partially vaccinated	7	5			
	Pre vaccinated	36	24			
Source of exposure	Known	17	11	1.578	1	0.209
	Unknown	39	44			
Duration of suffering (weeks)	<2	25	19	1.299	2	0.522
	2–3	23	28			
	>3	8	8			

Table 6: Association between post COVID-19 health problems with selected variables of COVID affected participants (n₁=111).

Variables		Post Covid health problems		Chi value	df	P value
		Yes	No			
Age (years)	≤20	4	25	12.586*	2	0.002
	21–40	24	45			
	>40	9	4			
Marital status	Single	17	64	20.556*	1	0.000
	Married	20	10			
Category of nursing personnel	Nursing student	5	36	14.132*	3	0.003
	Nursing staff	16	23			
	Nursing faculty	13	13			
	Nursing in-charge	3	2			

Continued.

Variables		Post Covid health problems		Chi value	df	P value
		Yes	No			
Comorbidity	Yes	12	5	12.538*	1	0.0
	No	25	69			
Vaccination status at the time of infection	Completely vaccinated	23	16	17.838*	2	0.000
	Partially vaccinated	2	10			
	Pre vaccinated	12	48			
Source of exposure	Known	11	17	0.597	1	0.440
	Unknown	26	57			
Duration of suffering (weeks)	<2	12	32	4.597	2	0.100
	2-3	16	35			
	>3	9	7			

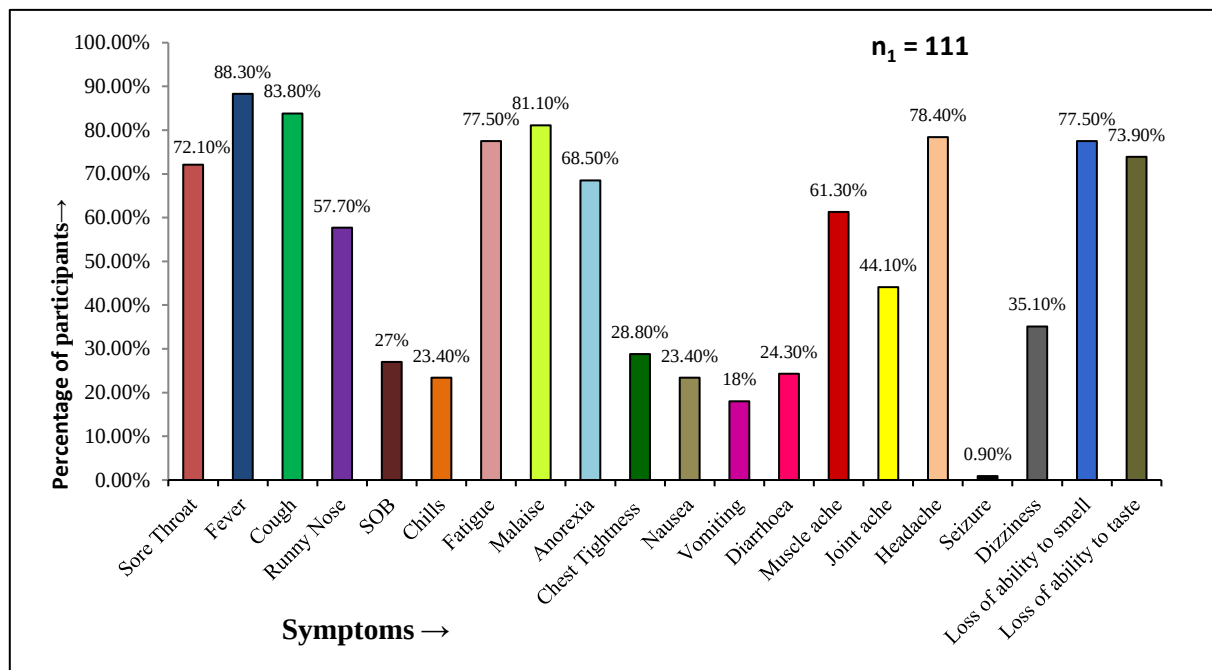


Figure 3: COVID-19 related symptoms of participants.

** N are not mutually exclusive.

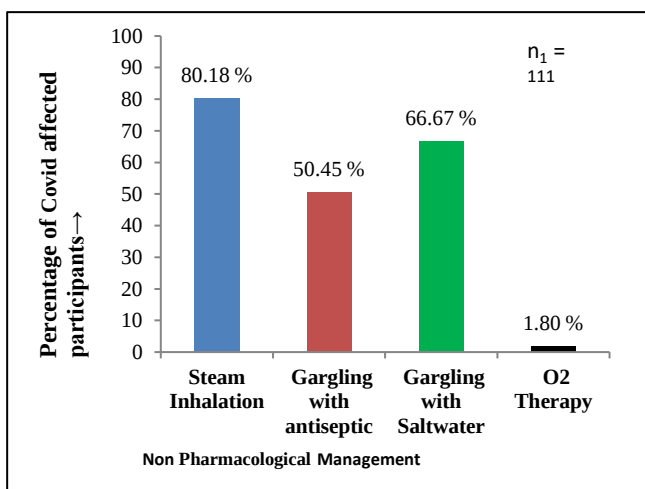


Figure 4: Non-pharmacological management of COVID affected participants.

** N is not mutually exclusive.

51.4% participants were taken Ivermectin and Doxycycline to treat COVID-19 infection. Azithral was taken by 9% participants. Other medicines used were PCM (85.6%), Zincovit (63.1%), Vitamin C (35.1%), cough syrup (43.2%) and antiallergic drug (31.5%). Steroid was taken by 2.7% of the participants (Table 4). 80.18% participants used to take regular steam inhalation, 50.45% used to gargle with antiseptic solution and 66.67% used to gargle with salt water. Oxygen administration was required in 2.7% of the affected cases (Figure 4).

Chi square value in the table-5 showed that there was significant association between Oxygen saturation with comorbidities ($X^2=5.820$) and vaccination status ($X^2=7.058$). Post covid health problem was significantly associated with age ($X^2=12.586$), marital status ($X^2=20.556$), category of nursing personnel ($X^2=14.132$), comorbidity ($X^2=12.538$) and vaccination status ($X^2=17.838$) (Table 6).

DISCUSSION

COVID-19 infection is highly contagious in nature and affected many healthcare workers mainly because of their occupational exposure worldwide. The present study found that out of 858, 12.9% nursing personnel were affected by COVID-19 infection and 66.7% belonged to 18-25 years age group which contradicts the report of Sabetian that the highest frequency of infected cases was among the age group of 25-45 years old.⁵ Though people of any age can be infected by Novel Corona Virus but the risk increases with age.⁹

In the present study, at the time of COVID-19 infection 36.9% participants were fully vaccinated, 8.1% were partially vaccinated and 55% were not vaccinated. Not vaccinated persons were mainly nursing students and they were at home (remote villages) during vaccination period. They were infected immediately after returning from home. As per CDC and WHO, vaccines can be a protection for many people from getting sick with COVID-19 but there can a vaccine breakthrough infection because no vaccine is 100% effective. Vaccine effectiveness against symptomatic COVID-19 after first dose was 54.4%.¹⁰ Primary immunization with two doses of vaccine provided limited protection against symptomatic disease caused by the omicron variant.¹¹ Chandan reported pooled proportion of COVID-19 infections 2.3% among 132922 partially vaccinated, 1.3% in 155673 fully vaccinated and 10.1% in 17505 unvaccinated health care workers.¹²

The present study found that 25.2% participants reported known source of exposure. In another study Silva reported 43% documented exposure history among 578 personnel.¹³ In 53.6% cases, symptoms developed within less than 1 week from the day of exposure. Lauer also reported 5.1 days median incubation period of Novel corona virus.¹⁴

16.2% participants were having co-morbidity, among them 44.44% were obese and having history of Asthma. 22.22% participants were having DM. Yang reported hypertension (21.1%) and diabetes (9.7%) were the most common comorbidities, followed by cardiovascular disease (8.4%) and respiratory system disease (1.5%).¹⁵

In this present study 46% of the participants suffered 2-3 weeks but the symptoms can sometimes persist for months.¹⁶ 33% of the participants developed post COVID health problem. This finding was supported by Goertz that fatigue and dyspnea are the most prevalent persistent health problems after SARS-CoV-2 infection.¹⁷

The data in the present study depicted good adherence in covid appropriate behavior namely using mask -45.1% N-95 mask and 32.4% - double mask (Surgical + N-95), 76.5% frequent hand washing, 81.1% frequent hand sanitization, 15.3% used personal vehicle and 76.6% avoiding domestic help. This finding was supported by

Khathlan that 78.6% washed hand, 47.44% wear mask always as recommended.¹⁸ Uses of personal vehicles and avoidance of public transport (80%) was the most dominant transport behavior in the COVID-19 pandemic period.

The data revealed that fever (88.3%), cough (83.8%), malaise (81.1%), fatigue (77.5%), headache (78.4%), inability to smell (77.5%) and taste (73.9%) sore-throat (72.1%), were the most prominent clinical features in the COVID affected participants. As per CDC guidelines patient may develop fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhoea as symptoms 2-14 days after exposure to the virus.¹⁹

The present study found that 51.4% participants were taken Ivermectin and Doxycycline to treat COVID-19 infection. Other common medicines used were PCM (85.6%), Zincovit (63.1%), Vitamin C (35.1%), cough syrup (43.2%) and antiallergic drug (31.5%). These findings also support Clinical Guidance for Management of Adult COVID-19 Patients by ICMR Govt. of India.²⁰

Findings of this study revealed significant association between Oxygen saturation with comorbidity ($X^2=5.820$) and vaccination status($X^2=7.058$). Post COVID-19 health problem was significantly associated with age ($X^2=12.586$), marital status ($X^2=20.556$), category of nursing personnel ($X^2=14.132$), comorbidity ($X^2=12.538$) and vaccination status ($X^2=17.838$). Sanyaolu also reported that patients with COVID-19 disease who are old and having comorbidities are more likely to develop a more severe course and progression of the disease.²¹ Kuodi also reported substantial decrease in reporting the most common post-acute COVID-19 symptoms in case of double dose vaccination.²²

This study has several strengths and limitations. Firstly, the sample size is small and only nursing personnel were selected so generalization of the findings is not possible. Secondly, data used in the analysis of this study were self-reported and few are only record analysis so, chances of bias are there. Despite these limitations, we believe the study does provide useful insights about the impact of the pandemic on this population in India. Consequently, we believe the findings are useful to provide further guidance to Nursing Educators and other policy maker.

CONCLUSION

Though occurrence of COVID-19 infection is common in nursing personnel but the severity of the disease is less in vaccinated cases and persons with no comorbidity. Age, comorbidity and vaccination are the important factors in developing post COVID-19 health problem.

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