

RESEARCH ARTICLE



## Risk of Exposure, Impact and Bio Safety Measure among Healthcare Workers in Covid19 Infection, In a Tertiary Care Teaching Hospital, Kolkata

Dr. Urvashi Agarwal<sup>1</sup>, Dr. Sujay Ranjan Deb<sup>2</sup>, Dr. Arpan Dutta Roy<sup>3</sup>, Dr. Debkishore Gupta<sup>4</sup>, Dr. Sayantan Ghosh<sup>5</sup>, Dr. Berlin P Kurian<sup>6</sup>, Dr. Jerin S Shaji<sup>7</sup>, Dr. Prolay Paul<sup>8</sup>

<sup>1</sup>MBBS, PGDHM (Symbiosis), Pune MBA in Hospital and Health Science Management (BITS, Pilani) Medical Superintendent Ruby General Hospital, Kolkata

<sup>2</sup>Dy. Medical Director, Ruby General Hospital, Kolkata

<sup>3</sup>Chief Clinical Pharmacologist, NABH Assessor (QCI) HOPE, Ruby General Hospital, Kolkata

<sup>4</sup>MBBS,MD, PG DipID, PDF (USA), FCMID (Netherlands), Consultant & Head- Clinical Microbiology & Infectious Diseases. Head-Infection Prevention & Control, Ruby General Hospital, Faculty, DNB Microbiology Assessor-NABL, NABH, WHO Patient Safety

<sup>5,6,7,8</sup> Pharm D Intern, Department of Pharmacy Practice, SAC College of Pharmacy, Karnataka

### Abstract:

Healthcare workers are the front liners in war against COVID 19 pandemic. Since this fight against the pandemic started, thousands of health care workers have been infected with many paying the ultimate price with their lives in a bid to provide health care service to COVID 19 patients. Currently many are either in quarantine or in isolation. Still many are working with fear of virus and in under poor conditions without adequate protections. The potential for high exposure is generally higher in health care workers due to increased hospitalization, longer time exposure, failure to implement effective personal health protection, lack of training, monitoring of infection control protection mechanism. This has led to shortage of workforce in the health sector. Exposure to COVID 19 in the health care setting depends on the health care worker's understanding of the infectious nature of the virus, the routes by which the virus is acquired, the techniques that are most hazardous and the safe working environment and practice. This work is therefore aimed at providing relevant information on the risk of exposure, the impact of virus on the health care workers and the required bio safety measures needed to keep the workers safe in the organization. Broad Academic area of work: Service Quality Excellence in Health care

**Keywords:** PPE (Personal protective equipments), BMW (Bio medical waste), donning and doffing (process of using and discarding PPEs), HCW (Health care workers), Nosocomial infection (Hospital acquired infection), Covid 19.



## Introduction

Health care workers are the front liners in the fight against corona virus disease –2019 (COVID—19) and their safety should be an urgent focus in all health care organization. This virus has infected more than ten million people worldwide leaving lakhs of people dead across 188 countries across the globe. The health care workers are at an increased risk of contracting COVID 19 while intense occupational exposure associated with aerosol generating procedures demanding the necessity of use of personal protective equipment, high transmission efficiency of the causative agent would also lead to infection beyond such settings. It has been found that COVID 19 positivity rate is doubled among the health care workers across the country among which doctors, nurses and paramedical staffs are highest (Data from Union Health ministry). Health care workers are the precious resource and it is of utmost importance to protect them from this deadly disease. Much emphasis is needed on protocol and SOP building in the field of infection control, adequate supply of protective gears, donning and doffing of the PPE kit, containment measures taken in the area of residence of health care workers etc.<sup>1</sup>

In our country the situation is quite alarming and there should be more prophylactic measures to be taken to protect this resource, The data published by Union Ministry of Health is informative and gives a picture about the risk exposure status and outcome of the health care workers. States like Maharashtra, Karnataka, Tamilnadu, West Bengal, Delhi, and Gujrat are some of the most affected state though the entire picture of the country is quite concern raising as far as the health care workers safety is concerned.

**Table 1-The Covid infection and number of deaths in respective states**

State	Number of Infection	Number of death
Maharashtra	24, 484	292
Karnataka	12,260	46
Tamilnadu	11, 169	49

Delhi	8363	51
West Bengal	5126	21
Gujrat	3177	35
Telangana	2074	01
Haryana	2434	09
Rajasthan	2398	11
Orissa	2185	02
Madhya Pradesh	2092	17
UP	1650	6
Jharkhand	1275	2
Andhra	994	14

\*Data source: [www.dailyrounds.org](http://www.dailyrounds.org)

The data which shown here are a large number of COVID 19 infection and even death of health care workers in different states of the country and is indeed a matter of serious concern. Public health experts all across the nation believe that such risk to health care workers can jeopardize India's pandemic of SARS COV -19 virus.<sup>2</sup>

In my organization starting from April 2020 the situation is as follows:

There is no mortality as of now. A risk categorization and assessment tool kit will be used to identify the risk in different categories of health care workers and to identify the gaps in the process in order to mitigate the risk of getting infection. Simultaneously questioner will be developed to measure the social, psychological, financial and adverse health impact among the health care workers of the organization and lastly prophylactic measures to be highlighted in order to minimise the biosafety hazard among the health care workers. So with this background it is necessary to protect the health care workers in my organization with a favourable outcome in combating the disease of COVID 19.<sup>3</sup>

### Aim:

To assess the risk of exposure and impacts of COVID19 infection in healthcare workers and biosafety measure, in a tertiary care teaching hospital, Kolkata

## Objective:

- Primary objective –

Assessment of risk of COVID 19 infection and its impact among the healthcare workers.

- Secondary objective –

Intervention by implementing different biosafety measures to mitigate the risk of COVID 19 among the healthcare workers

The objective of this work is also to improve the prophylactic measures to prevent COVID 19 infection among the health care workers in my organization by implementing the followings:

- a) Strict adherence to infection control protocols of the hospital among the staff
- b) Supply of personal protective gears among the staff and its rational usage to prevent unnecessary wastage
- c) Monitoring the practice of infection control on daily basis
- d) Training across all the level of staff regarding awareness of COVID 19 infection and its protection

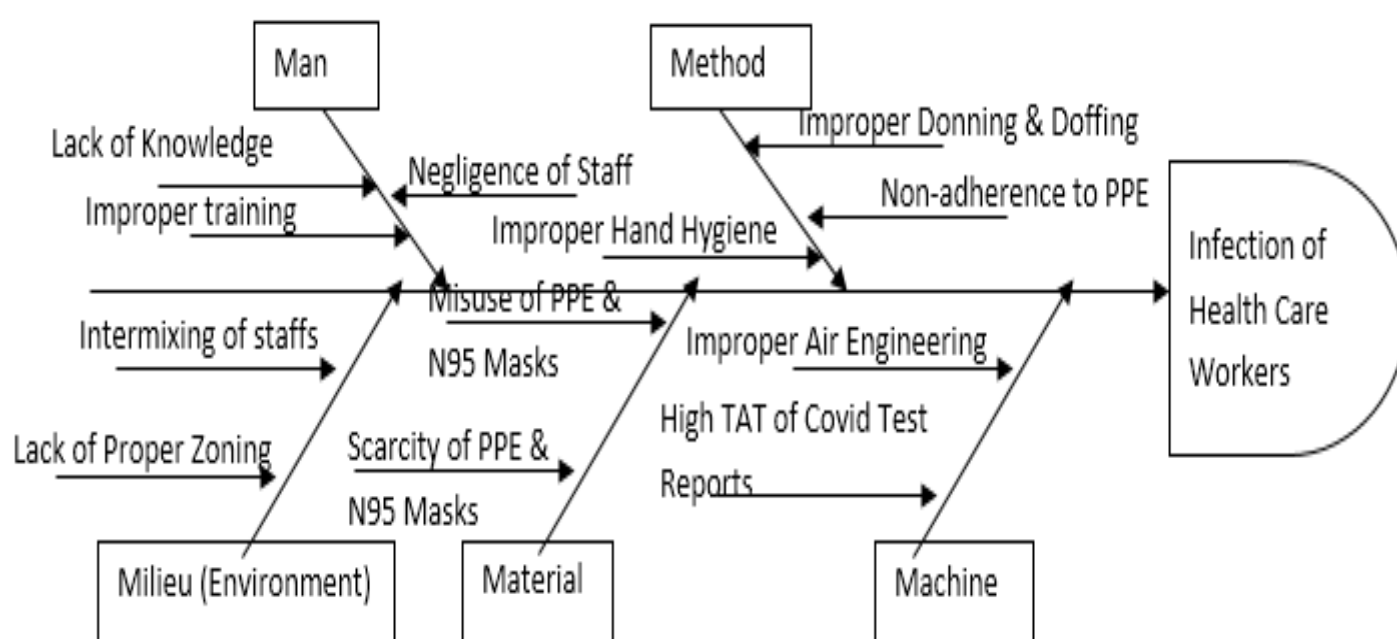
- e) Divide the hospital into green, yellow and red zone to prevent staff mixing
- f) To improve the air quality of high alert and red zone areas
- g) Staff safety and treatment facility

## Methodology-

This is a prospective interventional study, conducted in a tertiary care teaching hospital of Kolkata. In this study we have identified HCW working in COVID zone. Based on this finding, category wise (Doctors, Nurses and Other staffs) risk assessment has been done with the help of **ASSESSMENT CHECKLIST FOR HEALTH CARE WORKER EXPOSE TO COVID 19** (Ref – CDC). Data collection of risk assessment has been done by daily round, then this hardcopy data has been transcribed in softcopy database for further analysis. Based on this data a gap analysis has been done with proper observation and recommendation.

A fish bone analysis has been done based on the observation that we found in our site visit and rounds in different yellow and red zones of the hospital.

Figure-01



**Results:**

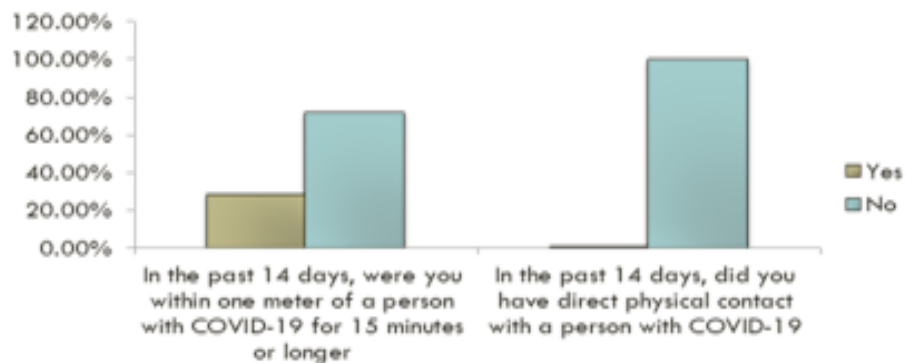
Result- Based on staff interview and observations (n= 60)

**(Table 2)****HEALTHCARE WORKER ACTIVITIES & EXPOSURE**

Healthcare Worker Activities & Exposure	Yes	No
Direct skin-to-skin exposure to a COVID-19 patient?	0%	100%
Any direct exposure to a COVID-19 patient's respiratory secretions or bodily fluid?	16.67%	83.33%
Any percutaneous exposure with material potentially contaminated with body fluid, blood, or respiratory secretions?	1.67%	98.33%
Within one meter of a COVID-19 patient, While not wearing appropriate PPE	91.67%	8.33%
Provided direct care to a COVID-19 patient, While not wearing appropriate PPE	48.33%	51.67%
Performed or assist with any aerosol-generating procedure (AGP) on a COVID-19 patient, or were you present in the room when one was performed, While not wearing appropriate PPE	68.33%	31.67%
Handled body fluid or other specimens from a COVID-19 patient, While not wearing appropriate PPE	0%	100%
Direct contact with environment where a COVID-19 patient received care, While not wearing PPE	86.67%	13.33%
Failed to perform hand hygiene after providing direct patient care?	23.33%	76.67%
Failed to perform hand hygiene after removing your PPE?	56.67%	43.33%

**Table 3 (% of community exposure)****% OF COMMUNITY EXPOSURE**

Community Exposure	Yes	No
In the past 14 days, were you within one meter of a person with COVID-19 for 15 minutes or longer	28.33%	71.67%
In the past 14 days, did you have direct physical contact with a person with COVID-19	0%	100%

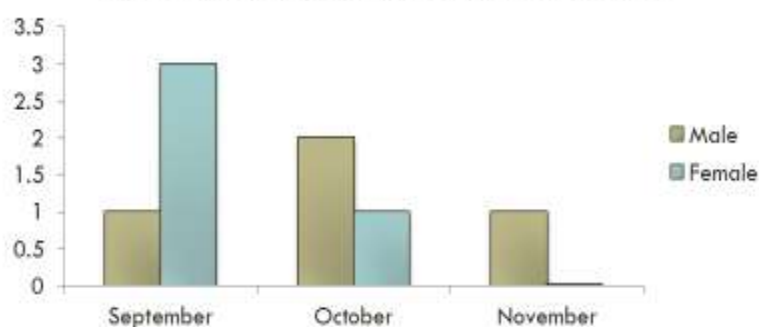


**Table 4 (Gender wise distribution of affected population/month)**

### GENDER WISE DISTRIBUTION OF AFFECTED POPULATION /MONTH

Month	Affected Male	Affected Female
September	1	3
October	2	1
November	1	0

**Gender wise distribution of affected population /month**

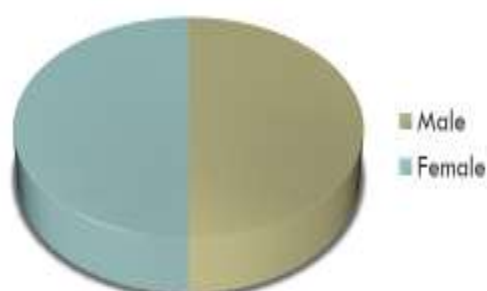


**Table 5 (Gender wise distribution of total affected population)**

### GENDER WISE DISTRIBUTION OF TOTAL AFFECTED POPULATION

Gender	Total No. Affected	% Affected
Male	4	50%
Female	4	50%

**Gender wise distribution of total affected population (%)**

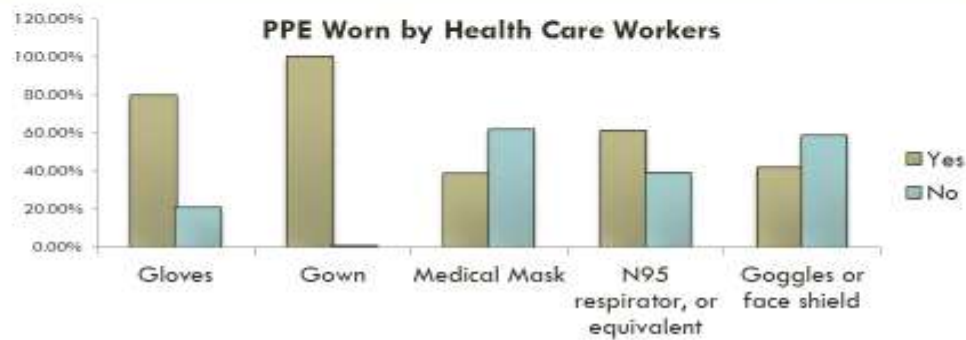




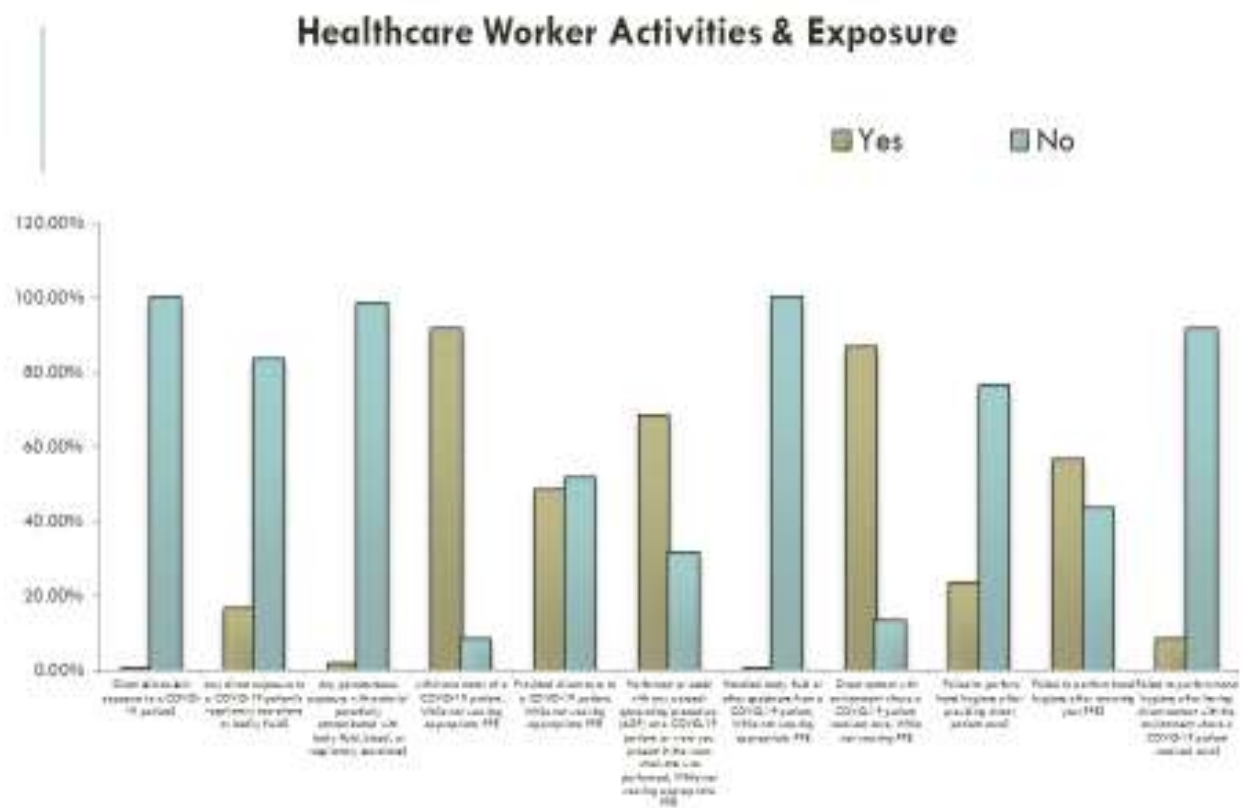
**Table 6 (PPE Worn by HCW)**

## PPE WORN BY HEALTH CARE WORKERS

PPE	Yes	No
Gloves	79.31%	20.69%
Gown	100%	0%
Medical Mask	38.33%	61.67%
N95 Respirator, or Equivalent	61.02%	38.98%
Goggles or Face Shield	41.67%	58.33%



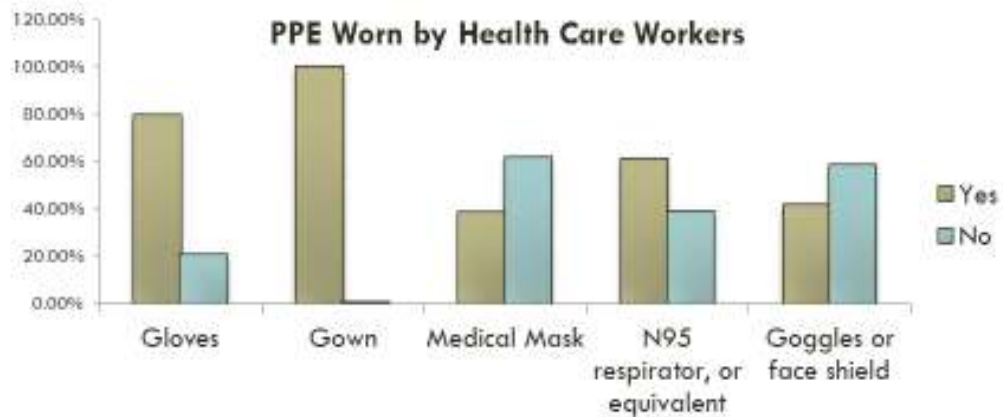
**Table 7 :( HWCs activities and exposure)**



**Table 8 (% Of PPE worn by HCWs)**

## PPE WORN BY HEALTH CARE WORKERS

PPE	Yes	No
Gloves	79.31%	20.69%
Gown	100%	0%
Medical Mask	38.33%	61.67%
N95 Respirator, or Equivalent	61.02%	38.98%
Goggles or Face Shield	41.67%	58.33%

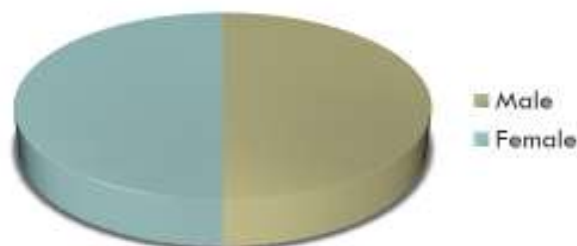


**Table 9 (Gender wise distribution of total affected population)**

## GENDER WISE DISTRIBUTION OF TOTAL AFFECTED POPULATION

Gender	Total No. Affected	% Affected
Male	4	50%
Female	4	50%

**Gender wise distribution of total affected population (%)**



**Table 10(Gender wise distribution of affected population/month)**

## GENDER WISE DISTRIBUTION OF AFFECTED POPULATION /MONTH

Month	Affected Male	Affected Female
September	1	3
October	2	1
November	1	0

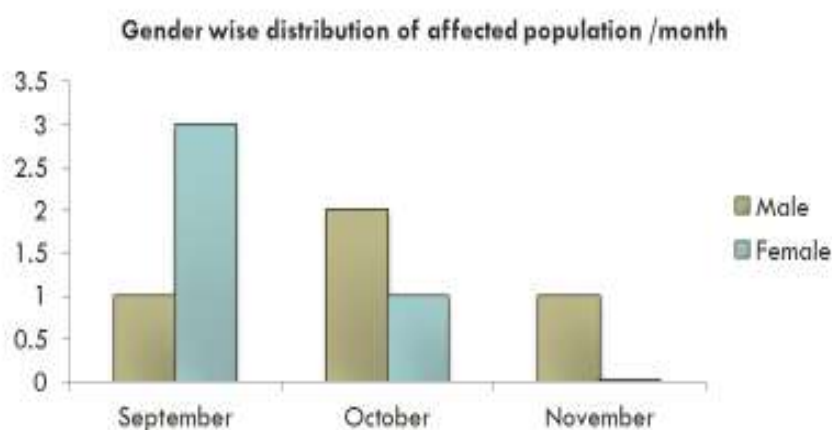
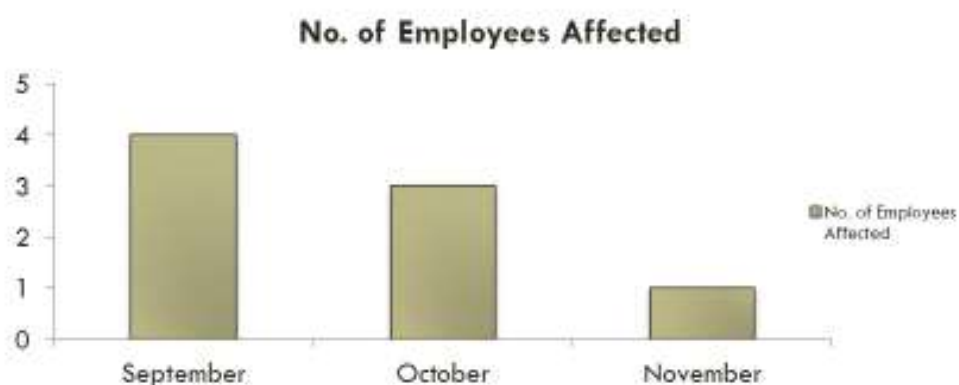


Table 11 (Number of employees affected /month)

## NO. OF EMPLOYEES AFFECTED/MONTH

Month	No. of Affected Employees
September	4
October	3
November	1



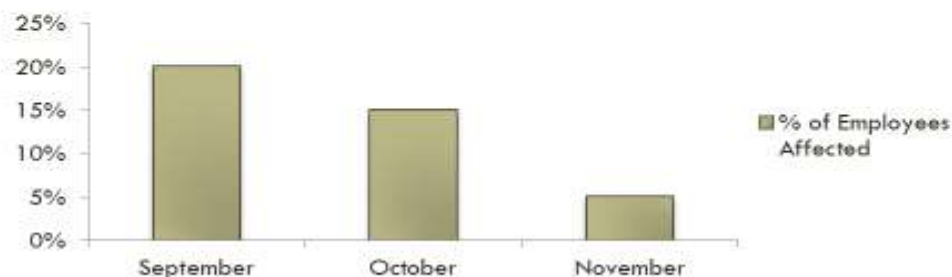


**Table12 (% of employees affected /month)**

## PERCENTAGE OF EMPLOYEES AFFECTED

Month	Total Strength	No. of Employees Affected	% of Employees Affected
September	20	4	20%
October	20	3	15%
November	20	1	5%

**% of Employees Affected**

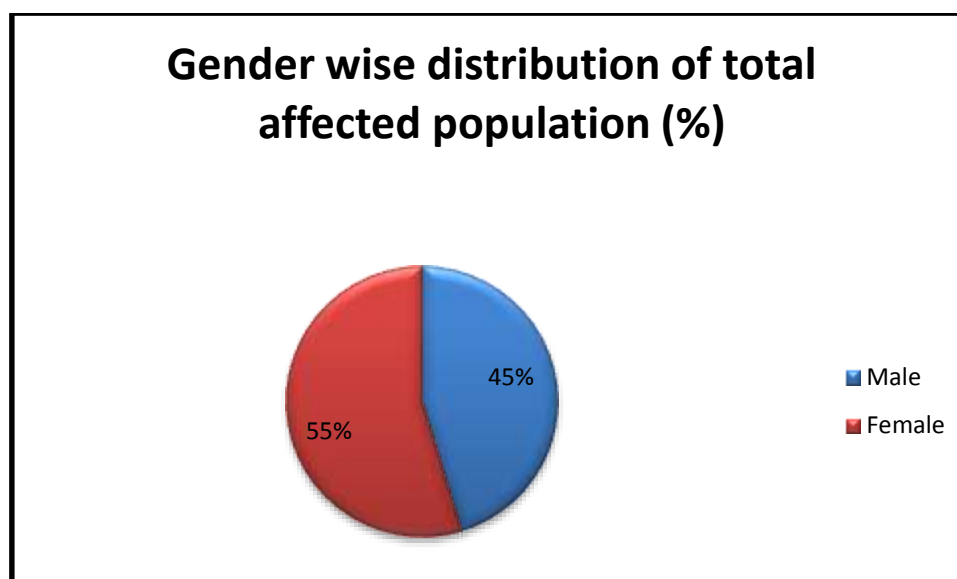


### Result across the hospital

Gender wise distribution of total affected population (Table 13)

Gender	Total no affected	% Affected
MALE	82	45%
FEMALE	99	55%

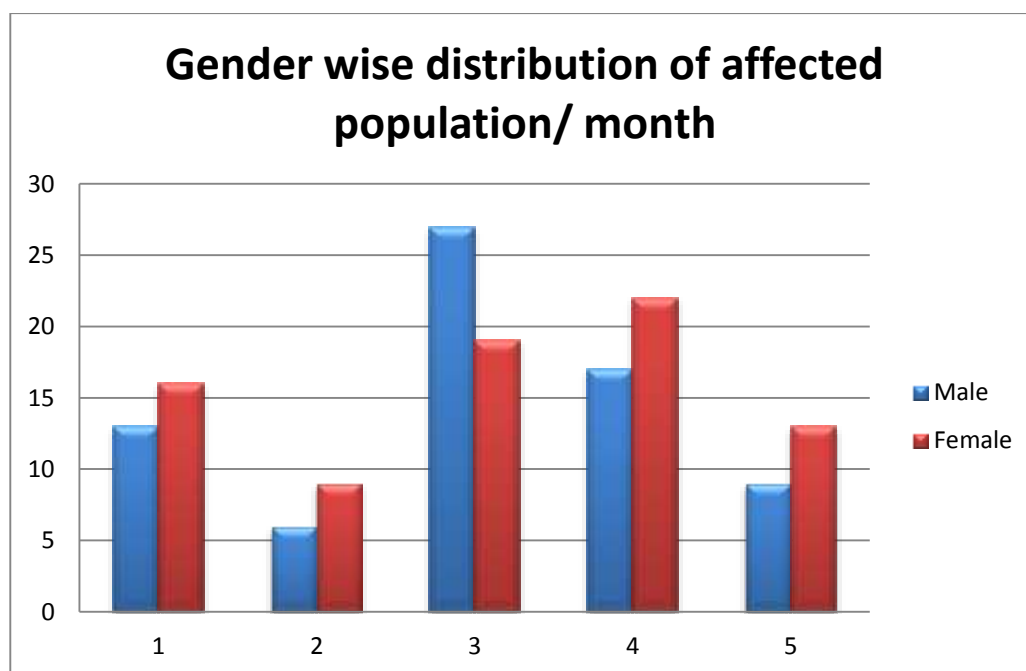
Graphical representation of Gender wise distribution of total affected population



**Gender wise distribution of affected population/ month (Table 14)**

Sr. No	Month	Affected male	Affected female
1	July	13	16
2	August	6	9
3	September	27	19
4	October	17	22
5	November	9	13

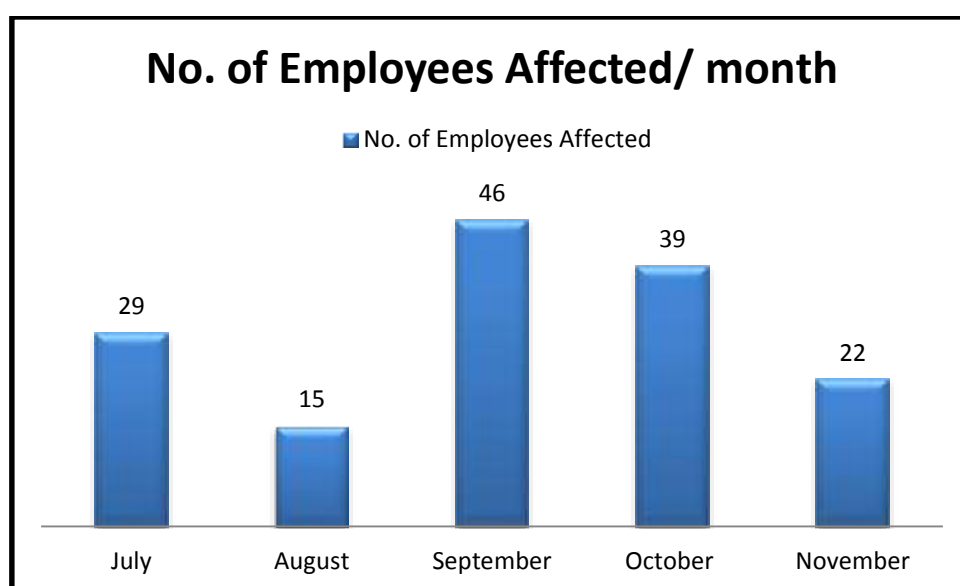
**Graphical representation of gender wise distribution of affected population/ month**



**No. of Employees Affected/ month (Table 15)**

Sr. No.	Month	No. of Employees Affected
1	July	29
2	August	15
3	September	46
4	October	39
5	November	22

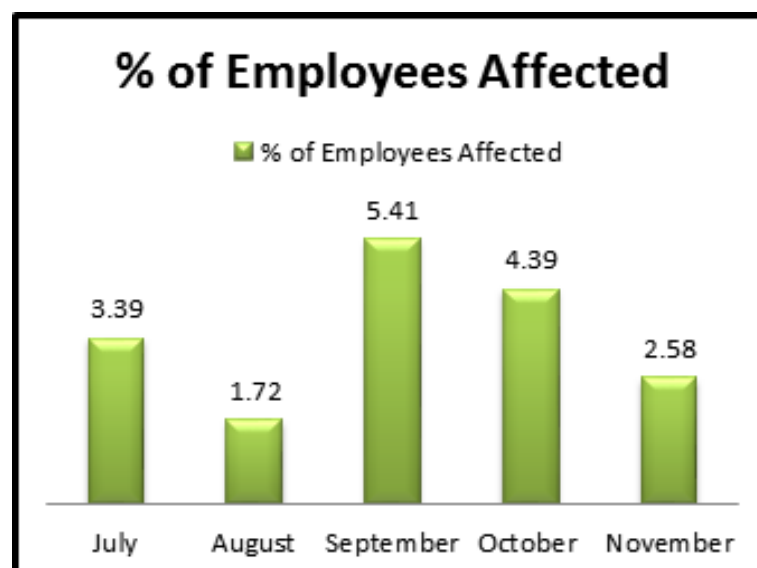
### Graphical representation of No. of Employees Affected/ month



### Percentage (%) of Employees Affected (Table 16)

Month	Total Strength	No. of Employees Affected	% of Employees Affected
July	854	29	3.395784543
August	870	15	1.724137931
September	850	46	5.411764706
October	888	39	4.391891892
November	850	22	2.588235294

### Graphical representation of percentage (%) of Employees Affected



**Inference:** By analyzing above data it is evident that there was clearly staff mixing as the health care workers were not aware of using proper personal protective equipments while providing care for the COVID positive patients.

In our sample we found that, in the month of September 2020, the % of employee affected is 20% , in the month of October 2020 it is 15% and in month of November 2020 it has come down to 5% with awareness, proper training of hand hygiene and hospital zoning system.

Two main factors like maintaining proper hand hygiene and wearing of PPE while providing direct patient care like performing aerosol generating procedures, interacting with the patients are important.

We found 23.33% of HCW did not perform hand hygiene after providing direct patient care and 56.67% HCW did not perform hand hygiene after removing (doffing) of their PPE.

It was found that those who did not follow the standard guidelines of infection control practice were affected more.

Also after performing a root cause analysis, it was recommended that the organization should put emphasis on

- a) Proper bio medical waste segregation
- b) Review of Hospital infection control protocol
- c) Improved air engineering
- d) Separate donning and doffing areas
- e) Mandatory testing of exposed individual
- f) Provision of staff treatment in hospital or home isolation with full pay
- g) Zoning of the hospital
- h) Robust leave and joining policy of the affected employees

## **Discussion & Conclusion:**

In this prospective observational study carried out in Ruby general Hospital which is a tertiary care teaching hospital in Kolkata, it is evident that safety of health care workers are very important and it is possible to minimize the risk by taking proper safety measures, adhering to infection control measures and putting emphasis on good practice. The top management involvement and initiatives are extremely important because any good initiative which involve cost requires motivation at the management level. It is possible in this hospital to instill an environment which provides a safe place to work for the employees amid the Covid situation and which is evident by seeing the decreasing trend of infection rate after implementing several approaches shown in this study which indicates that number of affected employee has gone down in the month of August, September, October and November which has gradually decreased from 5.4 % to 2.5%.<sup>4</sup> It is evident from this study that implementation and adherence of safe infection control practice may help to reduce the rate of infection among the staff of health care system. The potential for tall introduction to COVID-19 is by and large higher for healthcare specialists due to expanded hospitalization, long-time introduction, disappointment to actualize successful individual protection, shortage of individual defensive hardware (PPE), need of preparing, supervision and observing of infection avoidance and control instruments. All inclusive, the misfortune of a few wellbeing care laborers to COVID19 has encourage compounded the issue of deficiency of workforce within the wellbeing sector. Preventing exposure to COVID-19 within the healthcare settings depends on the healthcare specialists understanding of the irresistible nature of the infection, the courses by which the infection is obtained, the procedures that are the most perilous and the secure working hones required. This audit is subsequently pointed at providing relevant data on the chance of presentation, the impacts of the infection on healthcare specialists and the required biosafety measures needed to keep the wellbeing care laborers secure within the battle against the pandemic.<sup>5</sup>

With the worldwide spread of COVID-19, there is a compelling open wellbeing intrigued in evaluating who is at expanded chance of contracting infection. Word related characteristics, such as meddle with the open and being in near quarters with other laborers, not as it were put specialists at tall chance for malady, but moreover make them a nexus of infection transmission to the community. This could assist be exacerbated through presenteeism, the term utilized to portray the act of coming to work in spite of being symptomatic for infection. Measuring the number of workers who are regularly uncovered to disease and illness within the work environment, and understanding which word related bunches they represent, can offer assistance to provoke open wellbeing chance reaction and administration for COVID-19 within the working environment, and consequent irresistible infection flare-ups.<sup>6</sup>

## Reference:

1. Long H. Nguyen, David A. Drew, at all Risk of COVID-19 among frontline healthcare workers and the general community: a prospective cohort study. 2020 May 25.10.1101/2020.04.29.20084111 Available from: <https://www.medrxiv.org/content/10.1101/2020.04.29.20084111v2.full-text>
2. Michal Pruc,<sup>a</sup> Dawid Golik, COVID-19 in healthcare workers 2020 May 8, 10.1016/j.ajem.2020.05.017 DOI: <https://doi.org/10.1016/j.ajem.2020.05.017>
3. Diane M. Gibson and Jessica Greene Risk for Severe COVID-19 Illness among Health Care Workers Who Work Directly with Patients, 2020 Jun 24. doi: 10.1007/s11606-020-05992-y. Available from: <https://link.springer.com/article/10.1007/s11606-020-05992-y>
4. <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html>, National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases, Last Updated Oct. 16, 2020
5. Itodo GE, Enitan SS, Oyekale AO, Agunsoye CJ, Asukwo UF, Enitan CB. COVID-19 among Healthcare Workers: Risk of Exposure, Impacts and Biosafety Measures—A Review. Available from: [https://www.academiascholarlyjournal.org/ijhse/publications/may20/Itodo\\_et\\_al.pdf](https://www.academiascholarlyjournal.org/ijhse/publications/may20/Itodo_et_al.pdf)
6. Baker MG, Peckham TK, Seixas NS. Estimating the burden of United States workers exposed to infection or disease: a key factor in containing risk of COVID-19 infection. PLoS One. 2020 Apr 28;15(4):e0232452. <https://doi.org/10.1371/journal.pone.0232452>