

## IMPLEMENTATION OF INFECTION CONTROL STRATEGIES IN COVID-19 PREVENTION IN A TERTIARY HEALTH CARE FACILITY IN NORTH KERALA

\*Dr. Mini P. N., Dr. Shabina M. B., Dr. Hesna, Dr. Fairoz C. P., Dr. Kalpana George, Dr. Beena Philomina J.

Department of Microbiology, Govt Medical College Kozhikode, Kerala.

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\*Corresponding author: Dr. Mini P. N.

Department of Microbiology, Govt Medical College Kozhikode, Kerala.

### ABSTRACT

**Background:** Since December 2019 the COVID-19 outbreak in China has led to emotional challenges to the entire community in the world. With the evolving pandemic and, the rapid spread every health care personnel are working tirelessly to combat the infection to prevent its further spread. The Hospital infection control team has to strive hard to protect the front-line health care workers (HCW) by promoting the implementation of infection control strategies and its strict adherence.

### INTRODUCTION

The COVID-19 epidemic caused by the novel Corona virus SARS CoV2 has spread rapidly worldwide since it was first reported in Wuhan, China, on the 31st of December, 2019. It was declared as a pandemic by the World Health Organization (WHO) on the 11th of March, 2020. It became a global public health threat being highly infectious with human to human transfer which has been confirmed<sup>[1]</sup> and caused a remarkable effect on national economy.

Hospital transmission of the virus can be a major contribution to the spread of the disease among health care workers. Therefore, healthcare work force is under huge pressure to prevent and control nosocomial transmission. Thus, to strengthen the ability of the Health care system, a robust health care team constituting the Hospital infection control committee is required. The non-medical staff and care givers who do not have sufficient awareness and knowledge of coping with infectious diseases are well trained into this, in order to support the team.

Our Institution is one of the biggest teaching institutions catering to the patients from different districts in North Kerala. During the COVID-19 outbreak, this tertiary care hospital was converted into COVID-19 exclusive hospital without admitting non covid cases.

The present article aims to throw light on the implementation of infection control practices in preventing COVID-19 infection in a tertiary health care center in North Kerala. The guidelines detailed in the Advisory of State Ministry of Health and Family welfare

(dated 12/3/2020), World Health Organization and ICMR for COVID 19 were adopted for the implementation of Hospital Infection Control activities against COVID- 19. Eventually changes in IPC practices were made based on updated guidelines.

The faculty and majority of health care workers in the hospital had already been sensitized about the standard precautions and transmission based precautions during Nipah outbreak which occurred in 2017 -2018. All health care personnel worked in unison to control the outbreak. HICC played a vital role to curb NIPAH infection and inspired others by its true dedication and determination in infection control and prevention activities. So this experience had made HICC stronger enough to tackle any threat. To curtail COVID 19 spread proper infection prevention and control measures and good hygiene practices are crucial to protect both patients and the health-care workers.

### The Institution implemented the following measures in accordance with actual situation and need.

Hospital Infection Control Committee (HICC) initially formulated the COVID committee with members entrusted to discharge the various Infection Control and Prevention (ICP) activities in different areas. The institutional infection control policy was prepared by the HICC based on National Guidelines for IPC in health care facilities,<sup>[2]</sup> for the guidance on infection prevention and control practices to be adopted by all Health care personnel during the current COVID pandemic. This was extended to Government Dental college and Govt Nursing college Kozhikode.

In order to execute proper Infection Control Practices, triaging of patients after arrival in the hospital is done. Screening of patients is done at the entry level for symptoms, any history of exposure to positive case or history of travel.

A three-tier triage system was introduced to categorize the patients coming to the casualty with symptoms suggestive of COVID-19.

Triage 1-Casualty for non-fever related cases without international /interstate travel since last 14 days.

Triage 2 -Patients with fever, cough and respiratory related diseases were brought. Red area an isolation facility was identified in the casualty for SARI/ARDS and COVID suspects.

Triage 3-Received COVID-19 suspects referred from other hospitals/airport.

ICP were implemented in these areas and 2-meter distance maintained between patient and doctor. Doctors and other HCW worked in full PPE in Triage 2 and 3

#### **Modification of layout of clinical departments**

The building layout and ward environment were modified to meet the requirements of hospital infection prevention and control. The potential contamination area and patient care area in the ward were separated, to prevent the risks of cross infection. To achieve adequate ventilation and to implement proper infection control measures, the space between beds of patients were increased to 3 feet. Isolation rooms, casualty and wards were instituted exclusively for COVID patients. Signages for direction to different areas were present.

COVID ICU was set up with a separate exit and restricted entry with security personnel at the entry. Another well-equipped COVID-19 ICU with sensor doors were built for following non touch technique. The core team for ICU consisted of experts who were well trained in airway and ICU procedures. Small teams were formed as backup. To meet the surge additional staff were recruited from non-clinical departments. A separate laboratory for basic investigations, X ray and, USG facility and dialysis machine were also set up for COVID-19 ICU. Separate donning and doffing areas were designed at the entrance of each area. An area for washing and bathing before leaving was provided to prevent transmission of infection.

Different areas were chosen in the hospital, respectively, for suspected and confirmed and mild cases of COVID-19. New patients who did not have fever or those who returned from a pre-arranged leave of absence were kept in the transitional quarantine and transferred to the regular ward after 14 days of observation. Patients with fever that was not related to COVID-19 were kept individually in a quarantine room and transferred to the

regular ward when they maintained normal body temperature for at least 3 days and were evaluated as admissible. The pay wards of the institution were converted to isolation rooms for admitting covid positive patients. In case of increased number of COVID-19 positive cases, they were shifted to isolation wards. Terminal cleaning and disinfection of Single rooms of covid positive patients is done when the patient is shifted out. Cleaning and disinfection of environmental surfaces is done with 1% sodium hypochlorite solution with a contact time of 30 minutes.

In all the above areas the infection control team (ICT) identified and designed Donning and Doffing areas with proper hand washing facility and shower. Steps of donning and doffing charts were hung up in order to follow it sequentially. This can prevent cross infection and spread. An audio visual communication facility was employed in the hospital for the display of the infection control measures like hand hygiene performance, wearing and removal of surgical and N95 masks and PPE for patients and bystanders

#### **Other facilities set up for COVID patients**

Negative pressure COVID OT and ICU for covid positive patients were installed with the help of Biomedical engineer, satisfying the conditions to prevent transmission of infections during surgery. Negative Pressure COVID-19 OT was designed at one end of the Hospital building in collaboration with the department of Medicine, Anaesthesia, Surgery and Biomedical Engineer and another at the Institute of maternal and child health adjacent to the main hospital complex. A Mock drill was performed by the surgical team to assess the feasibility of performing surgery for long hours in the Covid OT with full PPE.

#### **Sample collection for COVID-19 in KIOSK**

The kiosk was started for sample collection in the designated area for outpatients and inpatients to prevent overcrowding in wards. The nasopharyngeal/throat swabs were collected by medical officers with full PPE. The patients queued up maintaining a distance of 1 m between them.

#### **COVID testing laboratory**

The swabs collected in Viral Transport Medium (VTM) were sent to the covid testing lab attached to the regional Virus Research and Diagnostic Laboratory. The lab functioned under the supervision of the medical officers from Department of Microbiology with the Head of the department as its nodal officer.

The following are the diagnostic tests done for COVID in the laboratory based on Advisory on strategy for COVID 19 testing in India.<sup>[3]</sup>

RTPCR, True NAT, cartridge based nucleic acid amplification and testing (CBNAAT) and Rapid antigen testing(RAT)

The COVID testing laboratory was set up in a separate building in the institution. Samples for testing were brought by staff in full PPE from various centers in appropriate triple layered boxes with icepacks. The technicians and other staff processed the samples in full PPE. Cleaning and disinfection was carried out regularly in the lab and waste was disposed in labelled (COVID 19 waste) double layered yellow bags. Standard precautions were strictly followed in all areas like sample reception, sorting, extraction and PCR run area. The Medical Officers and Data entry operators maintained social distancing with wearing of proper masks during the work.

A dedicated **Infection Control Team** for every department comprising of its faculty was constituted to implement all the control measures and to work as a team under HICC. The team is led by the Link Medical officers, Link nurses, infection control nurse and Heads of all Departments. The Link MO and ICN identifies and reports individual problems like, breach in the usage of PPE, improper waste disposal etc. The HICC coordinator observes and monitors infection prevention and control (IPC) activities, ensures adequate supplies and provide real time aid when needed. Finally, the report is submitted to the COVID-19 control cell of the institution every month.

#### Other activities of HICC

**Risk assessment committee**,<sup>[4]</sup> consisting of the epidemiologist, the HICC coordinator, Head of the department of infectious diseases was devised. The committee develops or modifies the institutional specific guidelines according to the advisory of the Ministry of Health and family welfare and WHO interim guidance March 2020<sup>[4]</sup> for the management of health care workers exposed to covid positive cases, there by to decide upon the quarantine measures to be adopted.

The HCW who have been exposed are enquired telephonically about the type of breach in PPE while caring for the patients. They are further categorized into High risk and Low risk exposure group.

**High risk exposure:** HCW or other person providing care to a covid -19 case or lab worker handling respiratory specimens from COVID 19 without recommended PPE or with possible breach of PPE. Performed aerosol generating procedures without appropriate PPE.

HCW without mask /face-shield/goggles, having face to face contact with covid-19 case within 1 metre for more than 15 minutes, Having accidental exposure to body fluids.

**Low risk exposure:** contacts who do not meet criteria of high risk exposure.

The High risks are advised to be placed in quarantine for

14 days, Tested for covid the 8<sup>th</sup> day by RTPCR as per ICMR day as per ICMR testing protocol, and are actively monitored for development of symptoms. Those in low risk group are advised to continue duty and self monitor for symptoms and to report to nodal officer when symptomatic.

**Surveillance committee for surgical management**,<sup>[5]</sup> constituted by the epidemiologist, HICC coordinator, Professor of medicine and Surgery, and surgeons from surgical specialties. This committee is mainly for the pre-operative screening for COVID 19 risk assessment in patients posted for surgical procedures. This is also to decide upon whether the case is to be taken in COVID-19 OT or general OT.

Admission of non COVID-19 patients was necessary as there were surge in the number of patients. So the importance of provision of COVID-19 and non covid ward was put forward to avoid cross infection. Non covid patients were admitted, in a separate ward after screening. The ward would be declared a containment zone if ever a positive case was detected in the non covid ward and the hospital superintendent informed. No further admissions were made in the ward Instructions were given by HICC to be followed on detection of COVID- 19 positive in a general ward in the Hospital. Covid positive patient with N95 mask is shifted to COVID-19 isolation ward by a dedicated HCW in full PPE. The ward is closed after shifting the remaining patients to other wards or discharged if permitted (asymptomatic).

**Terminal cleaning and disinfection procedure** -The ward is closed for 1 hr, the windows are opened to let in fresh air. The cleaning staff are allowed to enter with full PPE, dirty linen removed without shaking and discarded into double layered yellow bag with COVID label. The floor is first cleaned with soap and water and allowed to dry. Mopping with freshly prepared 1 % sodium hypochlorite solution is done from clean to dirty areas for disinfection. Floor cleaning is followed by cleaning of environmental surface and high touch areas.

**Training in infection control measures:** In order to manage the infection and prevention transmission of Covid 19 in the hospital, the health care personnel were effectively trained based on a well-tailored IPC protocol by the HICC The educational activities was an ongoing programme for the new HCW. Buddy system was formed to ensure good compliance of IPC practices, It is useful for The critical measures like donning and doffing of PPE, HH observation and reporting of any breach in PPE.

On declaring lock down following covid 19 pandemic from the month of March zoom classes on standard precautions and transmission based precautions were conducted for students nurses and Medical Officers. International Webinars were conducted regarding

infection control for Nurses.

### **Sensitisation were on the following infection control practices for the health care workers**

#### **Hand hygiene (HH)**

For effective HH, alcohol based hand rubs were provided at all the entrances and exit sites, wards, ICU -each beds, all patient -care areas

#### **Appropriate use of PPE**

Eventually training was given to each and every HCW about the sequences of donning and doffing through video demonstration to reduce the incidence of adverse events. An extra face shield outside the respirator was suggested for all HCW working in COVID positive areas.

Guidelines were prepared for the use of individual components of PPE based on the risk of exposure as they vary according to the different care areas, personnel and activity in Covid and non Covid areas. Full PPE is advised in covid ward, covid ICU, sample collection areas, during transport of covid patients and in dealing with SARI and in COVID-19 triage. Other than in areas which housed COVID POSITIVE patients the others were advised to wear triple layered surgical masks and to maintain proper hand hygiene.

#### **Other personnel outside hospital who received training on infection control practices**

The cabin crew of Vande Bharat Programme which became operational for bringing passengers from abroad, and police personnel who played a key role in the community during the outbreak.

**Management of Logistics**-The reserves of protective materials and disinfectants were limited. The supplies of surgical masks, N95 masks, personal protective clothing, were in great demand during the COVID-19 pandemic. They were made available in time to all HCW by timely intervention of HICC.

**Quality check committee** was formed to assess the quality of different components of PPE procured from different manufacturers and to decide on the factors like the correct fit of the masks, water repellent character of the masks and gown- material. Quality of the zip and collar were also checked The N95 masks with exhalation valve does not meet the respiratory protection so was discouraged in the COVID-19 positive areas. Overall that of plastics were not advocated, since it produced profuse sweating and feeling of tiredness. Gloves were checked for holes and appropriate size.

#### **Handling and packing of dead bodies<sup>[6]</sup>**

The forensic faculty were trained in infection prevention control practices during handling and packing of dead bodies by HICC. Autopsies were not advised, but only for special reasons. Embalming of bodies were not done as it requires excessive handling of the body.

Transmission of infection from a dead body to health care workers can happen while handling body and packing during an autopsy. Hence standard precautions (HH, appropriate use of PPE, proper handling of sharps) are strictly followed to minimize the chance of transmission family members were instructed not to touch or kiss the body, when viewing and to maintain at least 1 meter distance from one another with PPE and to perform hand hygiene after viewing.

#### **ICP during removal of the body from the isolation room**

##### **The following instructions were given by HICC**

The health care worker attending to the dead body of covid positive patients should follow standard precautions. All tubes, drains and catheters on the dead body is removed. Open wounds are to be disinfected with 1% hypochlorite and dressed. Oral, and nasal orifices of the dead body is be plugged to prevent leakage of body fluids. The Team should be dressed in full PPE and dead body is packed in a leak-proof plastic double bag. The external surface of body bag is decontaminated with 1% hypochlorite after packing. The body bag is wrapped with a sheet and handed over to the relatives. All waste generated during packing of bodies are disposed according to Biomedical waste management rules. The vehicle, after the transfer of the body for burial is decontaminated with 1% Sodium Hypochlorite.

#### **HICC role in organizing Corona first line treatment center (CFLTC)<sup>[7]</sup>**

Many covid positive patients who were asymptomatic or with mild symptoms who needed minimal care, if not isolated, may lead to faster spread of the pandemic. The novel concept of First line treatment centers was to treat the mild cases of covid 19 organized at Kozhikode. COVID -19 positive patients with mild symptoms Category A were admitted to CFLTC or were home quarantined.

First CFLTC functioned under Government Medical College at Mega boys Hostel with the help of the panchayat, National Health Mission and District Administration which was inspected by HICC .It was initially started with 200 bed capacity, later on increased to 400beds.At each CFLTC specific areas were defined by HICC like separate patient entry and exit for Triage, patient receiving areas, two Donning and one doffing, a room to keep the COVID-19 waste, food receiving area, nursing station, data entry room, duty doctors room in the green area, pharmacy and store in the green area, office room for nodal officers and patient care area.

The same facilities were arranged in CSLTC (Corona second line treatment center Training was given to all HCW in the CFLTC and CSLTC. Food waste was managed by LSGD and Covid related BMW is by IMAGE (Indian Medical Association goes eco-friendly).

### **Treatment of Biomedical waste generated during covid management**

The used PPE and other wastes from each covid ward was collected and discarded into the yellow bin (labelled as COVID 19) double bag kept in a separate designated area meant only for covid waste and was sent to IMAGE in a special vehicle for disposal. The food waste was regularly trucked to land fill (10 feet deep) far away in an open ground.

Evaluation of the outcome of Infection Prevention and Control Measures were done by HH audit, PPE adherence study, Perioperative infection control study decided by guidelines set up by the surgical screening committee.

Overall, the current preventive measures provides a novel insight into how to combat COVID-19 thereby preventing its transmission and effective hospital infection control during a major epidemic. The dedicated and sincere efforts of all the determined medical faculty and other entrusted frontline workers of all categories played a great role in curtailing the pandemic to a great extent.

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