



Hospital preparedness for COVID-19 at a base level hospital in Galle District, Sri Lanka

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Abstract

COVID-19 is a contagious respiratory illness caused by SARS-CoV-2. As such, it is challenging to maintain the safety of healthcare workers while delivering care to patients during the COVID-19 pandemic. The health sector has thus implemented various strategies to enhance hospital preparedness and ensure safety. The aim of this study is then to assess the hospital's preparedness for COVID-19 at a base hospital in Galle District, to ensure safety. A descriptive cross-sectional study was conducted among medical officers and nursing officers in Galle district. A self-administered questionnaire and an observational checklist were used to collect data. Response rate was 90.52%. Majority were female 88.8% (n=221). Majority of the participants were between 30-39 years of age (n=144 %). Study sample consisted of 62 (24%) medical officers and 196 (76%) nursing officers and the majority (n=152, 58.9%) had more than 10 years of work experience. Furthermore, the majority 81.4% (n=210) were aware of updates about guidelines and circulars regarding COVID-19 issued by the Ministry of Health. Frequent hand washing was practiced by 96.9% (n=250) while social distancing was not practiced by a considerable number of participants (n=77, 29.8%). 90.7% (n=234) participants were not exposed to training on outbreak management. A considerable proportion was not confident about the correct practice of donning and doffing (n=60, 23.2%). The absence of a dedicated respiratory ward and a separate venue at emergency treatment unit to manage patients with respiratory symptoms were noted. There were deficiencies of adherence to social distancing, training, self-confidence and physical arrangement of hospital. Ergo, it is noted that implementing training programs on outbreak response and building trust between the institution and staff on safety will improve the preparedness in future outbreaks.

Keywords: Covid-19, Hospital preparedness, Safety, preventive measures, SARS-CoV-2, Sri Lanka

1. Introduction

An outbreak of pneumonia of unknown etiology was found in late December 2019 in Wuhan, Hubei Province in China. Later this “Coronavirus disease 19” was declared as a Public Health Emergency of International Concern (Henceforth referred to as PHEIC) by World Health Organization (Henceforth referred to as WHO) and on 11 March 2020, it was characterized as a pandemic (WHO, 2020).

The causative agent of COVID-19 is Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (Henceforth referred to as COVID-19), which belongs to the RNA virus. The clinical presentation of COVID-19 can range from asymptomatic or mild infection to severe pneumonia leading to acute respiratory distress syndrome (ARDS) and death. The highest morbidity and mortality were found in elderly population and the individuals with comorbidities. Viruses are transmitted through respiratory droplets from infected individuals. Incubation period varies from 2-14 days (Nicholas J. Beeching, Tom E. Fletcher, 2020).

A “Disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (UNISDR, 2009). As such, the COVID-19 pandemic may be considered as a biological disaster we are facing in the contemporary.

Preparedness is the main component in the disaster cycle. “Disaster preparedness is the knowledge and capacities developed by governments, professional response and recovery organizations, communities, and individuals to effectively anticipate respond to, and recover from, the impacts of likely, imminent, or current hazard events or conditions” (UNISDR, 2009). The aim is to predict the disaster, if possible, prevent them, mitigate their impact, and respond effectively.

Most viral infections have no definitive treatment other than supportive care. With the vaccines, the infection rate is expected to decline with the epidemiological curve. However, herd immunity by vaccination is still a challenge due to mutating strains of the virus and the inability to cater to the huge

demand for vaccination globally. Therefore, preventive measures and preparedness still play a huge role in controlling COVID-19. According to WHO recommendations, many countries adopted WHO guidelines to their systems and developed their own preparedness plans, toolkits, and monitoring indices

All hospitals need to be prepared to handle emergencies of quarantined/ suspected patients, infection prevention from asymptomatic individuals seeking health care for other illnesses while maintaining hospital safety and cross infections. The main goal is to reduce overall morbidity and mortality.

Hospital preparedness is of two main domains

- 1) Preparedness among Health Care Workers (HCW).
- 2) Preparedness of hospital physical structure and layout.

The main aim of this study is to assess the hospital preparedness from the Preparedness among Health Care Workers (HCW) domain in base level hospital in Galle district Sri Lanka.

The Ministry of Health Sri Lanka notes 15 different types of hospitals. Hospitals which able to provide health care in the main four specialties (Medicine, Surgery, Pediatrics, Obstetrics, and Gynecology) are considered as Base Hospitals.

In Sri Lanka, the National preparedness and response plan was introduced by the Ministry of health at the beginning of the outbreak. More attention was paid to the preparedness of hospitals and HCWs. Some hospitals were nominated as COVID treatment centers. All hospitals are instructed to triage respiratory patients and provide isolation facilities as required. Hospital staff is advised on infection preventive measures, transferring and handling COVID suspected patients. The Staff was trained on PCR sampling. Non-urgent hospital visits were limited, and routine healthcare services were provided using new technology. Mechanisms were developed to maintain good internal and external coordination, and collaboration among stakeholders.

The HCWs serve as the frontline in COVID management. Their preparedness is very important

in providing care for COVID suspected patients and preventing the spread of the infection among health staff, their families, and other patients. Doctors and nurses are two health care worker-categories who are in direct contact with patients. They should be well trained and be competent in applying their knowledge according to the situation.

The checklists were prepared by WHO, Centers for Disease Control and (CDC), and European Centre for Disease Prevention (ECDC) to assess the overall preparedness of hospitals. According to ECDC, they evaluate Hospital Preparedness under following areas; establishment of a technical team and main internal and external contact areas, human, facility and material capacity, communication and protection of data, hand hygiene, PPE and management of waste material, triage, patient placement, transport of the patients within the facility, visitor access, and environmental cleaning (ECDC, 2020). Many sub-components are assessed under each area to increase the sensitivity and specificity of the checklist. This literature was used in the preparation of the checklist in this study.

2. Methodology

A descriptive cross-sectional study was conducted. The Government funded Base Hospital in Balapitiya, the largest type-A base hospital in Galle District has been selected for study. According to hospital data, there are 15 consultants, 65 grade medical officers, 24 house officers, 42 residential house officers, and 220 nurses are working in the hospital. All grade medical officers and nurses have been selected for the study (n=285). Data has been collected from first of January 2021 to the fifteenth of February in 2021.

A pretested self-administered questionnaire and an observational checklist to assess hospital preparedness were used as the study instruments. The questionnaire was consisting of 2 sections: 1 - Socio-demographic data and 2 - Preparedness of grade medical officers and nurses. The checklist was designed based on the checklists issued by ECDC (ECDC, 2020), Sri Lanka Preparedness & Response Plan COVID-19 (Ministry of Health Sri Lanka, 2020b), and the Hospital Preparedness for COVID-19 (Ministry of Health Sri Lanka, 2020a). Items were categorized into 12 main areas. The Check list was filled by the principal investigator after careful observation of the hospital. Written consent for administrative clearance has been taken from the participants and the administrative authority. The data was entered and analyzed using SPSS. All variables of demographic data, preparedness of grade medical officers, and nursing officers were described using frequency and percentages. In questionnaire section 02 which indicating preparedness, both answers “no” and “not sure” were considered as not prepared.

Results of Hospital preparedness check list were described based on availability and unavailability of items indicated in the checklist.

3. Results

The study was carried out among 285 grade medical officers and nurses at Base Hospital Balapitiya. Out of them, 258 answered the questionnaire. Response rate was 90.52%.

Table 1 - Distribution of grade medical officers and nursing officers at Base Hospital Balapitiya by demographic characteristics

	Frequency (n)	Percentage %
Age (in completed years) less than 30 years	8	3.1
30 to 39	144	55.8
40 to 49	64	24.8
50 or more than 50 years	42	16.3

Gender	male	37	11.2
	female	221	88.8
Marital status	married	228	88.4
	single	30	11.6
Total		258	100

Majority of the population comprised of women, 88.8% (n=221). Majority of the participants (n=144, 55.8%) were between 30 to 39 years of age. The

average age of grade medical officers was 36.9 years and for nursing officers was 40.2 years.

Table 2 - Distribution of grade medical officers and nursing officers at Base Hospital Balapitiya by job-related characteristics

Variables		Number (n)	Percentage %
Job category	medical officer	62	24.0
	nursing officer	196	76.0
Department	ETU	19	7.4
	OPD	16	6.2
	Medical unit	47	18.2
	Surgical unit	23	8.9
	Pediatrics	24	9.3
	gynecology and obs	38	14.7
	ICU	19	7.4
	PBU	15	5.8
	Blood bank	8	3.1
	Hematology unit	1	.4
	Pathology unit	1	.4
	Eye	7	2.7
	Infection control unit	3	1.2
	Radiology	1	.4
Operation theater	16	6.2	
Others	20	7.8	
Work experience (in completed years)	5 or less than 5 years	20	7.8
	6 to 10 years	86	33.3
	more than 10 years	152	58.9
Total		258	100

The study sample consisted of 62 (24%) grade medical officers and 196 (76%) nursing officers. Majority of the population (n=152, 58.9%) had more than 10 years of work experience.

measures for COVID19, exposure to training programs for COVID-19, adherence to safe practices related to PPE usage.

The Preparedness of grade medical officers and nursing officers for COVID19 were assessed under four main themes: the awareness on guidelines and circulars, adherence to essential general preventive

Table 3 - Distribution of medical officers and nursing officers by awareness on guidelines /circulars and reporting a probable COVID patient

Awareness (n=258)	yes	no	Not sure
	No. %	No. %	No. %
Awareness on updates about guidelines and circulars regarding COVID-19 issued by MOH	210 (81.4%)	15 (5.8%)	33 (12.8%)
Aware on how to report a probable COVID-19 case	184 (71.3%)	38 (14.7%)	36 (14%)

From total population, 48 participants (18.6%) were not aware on updates about guidelines and circulars regarding COVID-19 issued by MOH. Seventy-four participants (28.7%) were not aware on how to report a probable Covid-19 case.

Details on distribution of medical officers and nursing officers by adherence to essential general preventive measures for COVID19 are shown in table 4.

Table 4 - Distribution of medical officers and nursing officers by adherence to essential general preventive measures for COVID19

Essential general preventive measures (n=258)	yes	no	Not sure
	No. %	No. %	No. %
Remain at home and notify to hospital authorities if sick	198 (76.7%)	44 (17.1%)	16 (6.2%)
Practice frequent hand washing	250 (96.9%)	0	8 (3.1%)
Maintain social distance with colleagues	181 (70.2%)	38 (14.7%)	39 (15.1%)

Considerable amount of population (n=77, 29.8%) were not adhered to social distancing. However, adherence to frequent hand washing was seen

among the majority (n=250, 96.9%) of the population.

Table 5 - Distribution of medical officers and nursing officers by exposure to training programs for COVID19

Exposure to training programs (n=258)	yes	no	Not sure
	No. %	No. %	No. %
Training on donning and doffing PPE	86 (33.3%)	163 (63.2%)	9 (3.5%)
Training on outbreak management	24 (9.3%)	226 (87.6%)	8 (3.1%)

Majority were lack of training on donning and doffing (n=172, 66.7%). Exposure to training on

outbreak management was extremely low among the participants (n=234, 90.7%).

Table 6 - Distribution medical officers and nursing officers by adherence to safe practices related to PPE usage

Safe practices related to PPE usage (n=258)	yes	no	Not sure
	No. %	No. %	No. %
Confidence in donning and doffing PPE correctly	198 (76.8%)	23 (8.9%)	37 (14.3%)

Practice of safe disposal* of PPE 225 (87.2%) 17 (6.6%) 16 (6.2%)

*Safe disposal- Dispose PPE in a waste bin with lid and wash hands thoroughly (Ministry of Health Sri Lanka, 2020a)

A considerable proportion of participants (n=60, 23.2%) were not confident on the correct practice of donning and doffing. Safe disposal of PPE was not seen among 33 (12.8%) individuals.

Patients were initially received by OPD and ETU staff. Table 7 describes the distribution of exposure to training programs and adherence to safe practices related to PPE usage together by ETU and OPD staff.

Table 7 - Distribution of exposure to training programs and adherence to safe practices related to PPE usage by ETU and OPD staff

Exposure to training and safe practices related to PPE (n=34)	Yes	No	Not sure
	No. %	No %	No %
Training on donning and doffing PPE	8 (23.5%)	26 (76.5%)	0
Training on outbreak management	5 (14.7%)	29 (85.3%)	0
Confident in donning and doffing PPE	23 (67.6%)	1 (2.9%)	10(29.5%)
Practice of safe disposal* of PPE	23 (67.6%)	2 (5.9%)	9 (26.5%)

Proportion of those who have not received training on outbreak management (n=29, 85.3%) was very high among both OPD and ETU staff. A considerable number of participants (11, 32.4%) were not confident in donning and doffing as well as safe disposal practice of PPE

Hospital preparedness for reception and care for COVID-19 patients assessed using an observational checklist categorized into 12 themes and each divided into sub-components.

According to the findings, available items and unavailable items are mentioned below.

Available Items:

Hospital preparedness plan, COVID operational cell, signposts (at the hospital entrance, at triage area), triage area, trained triage nurse, designated area to manage suspected unstable COVID patients, Isolation facility for suspected COVID patients, designated area for donning and doffing at the entrance to the isolation units, documentation of Healthcare personnel entering to the isolation units, dedicated equipment for COVID suspected patients, limitation of visitors, visitor records, designated nurse for IPC activities, hand washing

facilities (at hospital entrance, OPD, ETU, Wards), Auditing adherence to hand washing before entering to the hospital, cleaning of frequently touched surfaces and rooms on a regular basis, records of buffer stocks of PPE, color-coded waste disposal bins, separate waste management plan for isolation units, dedicated ambulance, dead body management plan.

Unavailable items:

Separate area to manage unstable respiratory patients at ETU, dedicated respiratory ward, body temperature screening at hospital entrance, hand washing facilities at triage area, maintenance of social distancing at OPD, dedicated ambulance to transport COVID suspected patients

4. Discussion

This study aimed to assess the preparedness for COVID 19 at a base level hospital in Galle District. Therein, the study has identified the level of preparedness among grade medical officers and nursing officers, and the overall preparedness of the hospital. The study further explored the deficiencies of hospital preparedness. The findings of this

research can be used to further strengthen COVID-19 response in relation to hospital preparedness and planning outbreak preparedness at a hospital setting.

4.1 Socio-demographic factors

It may be noted that the majority of population assessed consisted of women (n=221, 88.8%). According to demographics profile of Sri Lanka in 2012, the sex ratio for the age group of 25-54 years was 0.97 and 55- 64 years was 0.86 which shows a nearly 1:1 male/female ratio (Department of Census and Statistics, 2012). In this study, 1:8 male female ratio was noted. However, this could be due to the majority of nursing officers in Sri Lanka being nurses and a greater proportion of study participants represented nursing officers (n=196, 76%).

The majority of the participants (n= 144, 55.8%) were between 30 to 39 years of age. In current study average age of grade medical officers was 36.9 years and nursing officers 40.2 years. Among the economically active population of Sri Lanka, the highest participation rate for male is found in the age group 35-39 years (97.1%), and that for female (48.3%) is from 45-49 age group (Department of Census and Statistics, 2020). From the assessment sample, 88.4% of the sampled were married. Study sample consisted of 62 (24%) grade medical officers and 196 (76%) nursing officers which 3.1 nurses per doctor. According to nurses to doctor ratio in 2015, nurses per doctor ratio in southern province is 2.7, which matches with the study (Ministry of Health & World Health Organization, 2018). Furthermore, the majority of participants (58.9%) have more than 10 years of work experience. Ergo, the sample can be considered as a representative sample of grade medical officers and nursing officers in Sri Lanka.

4.2 Preparedness of grade medical officers and nursing officers for COVID-19 response.

Preparedness among selected health staff categories was assessed under main factors of preparedness, based on national guidelines and other international recommendations; awareness on guidelines and circulars, adherence to essential general preventive measures for COVID-19, exposure to training programs related to COVID-19 response, adherence to safe practices related to PPE usage and distribution of exposure to training programs and

adherence to safe practices related to PPE usage by ETU and OPD staff for study purpose. Most of the participants (n =210, 81.4%) were aware of updates about guidelines and circulars regarding COVID-19 issued by Ministry of Health, but considerable proportion was unaware of guidelines (18.6%). Awareness refers to information acquired from experience or education. A study among nurses' awareness towards COVID done in Saudi Arabia revealed 96.8% were fully aware of signs and symptoms, transmission, a management protocol, complications, and preventive methods of COVID-19. Moreover, healthcare workers, especially nurses and doctors are considered to be highly aware and updated (Al-Dossary et al., 2020). A study on knowledge, attitude, and practices among healthcare workers conducted in Greece at the early stage of outbreak found 76% awareness on recommendations of WHO for COVID-19 while 12.7% were not aware and 10.6% were uncertain (Papagiannis et al., 2020). While these studies are not directly comparable with the present study, the levels of awareness on guidelines/circulars and reporting a probable COVID patient of the present study is much lower compared to overall awareness including awareness on protocols in the Saudi Arabic study and is closer to the results of awareness on recommendations of WHO for COVID-19 in the study conducted in Greece. The awareness of grade medical officers and nursing officers on guidelines and circulars are expected to be closer to 100% as frontline health care workers to need to ensure the optimum care to patients.

According to latest guidelines issued by Ministry of Health Sri Lanka, hospitals are expected to carry out surveillance of all the patients presenting to the OPDs and wards with COVID-19 like symptoms, irrespective of the contact or travel history (Ministry of Health Sri Lanka, 2021). Weekly report should be sent to the Epidemiology unit with the signature of ICNO and Head of the institution. In this study, 71.3% (n=184) of participants were aware of how to report probable COVID-19 cases, which is better vis a vis a study carried out among doctors and nurses in Libya which showed the knowledge of reporting a potential COVID-19 case to be as lower as 26.3% (Elhadi et al., 2020).

A case-control study was conducted in China to check risk of influenza transmission associated with hand-washing and unhealthy hygienic habits among

residents in Fujian Province. The study observed around 80% reduction of risk of influenza by frequent hand washing (Liu et al., 2016). As such, frequent hand washing in majority of participants (n=250, 96.9%) in our study, can be considered as a good preparedness.

As a general preventive measure, many studies were carried out to detect the effectiveness of social distancing in controlling COVID-19. A study conducted at non-healthcare workplaces in the United States of America estimated a median reduction of 23% in the total influenza attack rate only by social distancing measures in the general population (Ahmed et al., 2018). Current research observed a considerable proportion of constituents (n=77, 29.8%) lacked adherence to social distancing with colleagues. Furthermore, 23.3% did not agree to remain at home and notify hospital authorities if they are ill. Immediate action needs to be taken to convince hospital staff to ensure adherence to these measures to prevent disease spread within hospitals. One of the most important findings of this study was the lack of exposure to training programs among the study participants. Majority (n=234, 90.7%) didn't receive any training on outbreak management and more than half of the population (66.7%) was not received training on donning and doffing. A similar study conducted in Libya showed that 93.7% didn't receive any training in outbreak management (Elhadi et al., 2020). Research done in Bangladesh revealed that 58.3% haven't received any training on the use of PPE, while 40.2% did not follow correct donning/doffing methods and 62.6% did not follow safe disposal protocol of the PPE (Hossain et al., 2021). Findings of both studies indicate that outbreak management, donning and doffing protocols are untouched areas during training. Moreover, the causes for a presence of much lower values for training exposure (23.5%), confidence in donning and doffing (67.6%) and knowledge of safe practices in PPE disposal (67.6%) among OPD and ETU staff compared to total population must be identified and addressed. As they serve as first responders, their lack of preparedness can lead to an increased COVID-19 inflow into the hospital.

4.3 Hospital preparedness for reception and care for COVID-19 patients

Resilient health systems are essential to provide better response in outbreaks and natural hazards.

The Base Hospital Balapitiya has started preparedness schematically and has established a COVID operational cell and an institutional COVID preparedness plan. This is a requirement of local and international guidelines to ensure smooth functioning of response activity (Ministry of Health Sri Lanka, 2020a) (ECDC, 2020).

According to the national guidelines, there should be two separate triage areas to triage patients with respiratory symptoms and COVID suspects. Separate areas to manage emergencies of patients with respiratory symptoms at ETU (Ministry of Health Sri Lanka, 2020a) is further required. In the current study setting, the absence of separate triage areas and a separate area at ETU to manage emergencies of patients with respiratory symptoms shows weak preparedness. But the presence of a separate isolated area to manage COVID suspects was a positive finding.

National guidelines prescribes that a patient triaged under respiratory illness is to be sent to a respiratory ward. Moreover, patients' entry to and exit from the isolation units is to be from a separate area. The unavailability of adequate space and already established ward setup has made such exercises practically difficult within this hospital.

Though it's somewhat unusual, body temperature screening at the entrance was not observed. South Korea conducted a study for safe hospital preparedness based on Swiss cheese model. Sequential strategies were implemented to prevent the spread of COVID-19 into the hospitals. They were the education and training of staff, wearing appropriate PPE, monitoring for new onset of fever and respiratory symptoms for inward patients, separate clinic for COVID suspected patients, separate clinic for patients with respiratory symptoms, hospital gate screening, and use of telemedicine (Noh et al., 2020).

Local guidelines paid much attention to infection prevention activities. Hand hygiene, social distancing, equipment, and environmental cleaning were clearly mentioned. However, this study finds that social distancing at the OPD unit was poor. European guidelines highlighted the necessity of buffer stocks of PPE, identification of alternative suppliers of PPE, availability of an inventory, and its' regular updating (ECDC, 2020).

As such, this study finds the availability of a centrally coordinated mechanism to record and update buffer stocks as a positive finding.

Each healthcare facility is responsible for the proper management of waste that it generates until its final disposal. It is noted that separate collection and incineration of infectious waste produced from isolation units were very important to prevent disease spread. According to Sri Lanka COVID-19 Emergency Response and Health Systems Preparedness Project, color codes for health care waste segregation is recommended, and are yellow-infectious, yellow with red stripes- sharps, black-general waste, green- biodegradable, red- glass, blue-

5. Conclusions

Considerable proportion of study population were showed poor knowledge on updates about guidelines and circulars regarding COVID-19, inadequate training and confident on outbreak management, donning/doffing (specially, OPD and ETU staff). Adherence to social distancing (30.7%) is considerably low among the grade medical officers and nursing officers who participated in the study. The unavailability of separate triage areas

7. Declarations Ethical approval and consent to participate

The research proposal was approved by Ethics Review Committee of the Post Graduate Institute of Medicine, University of Colombo, Sri Lanka. Written informed consent of participants was received before the interview.

paper, and orange- plastic (Ministry of Health and indigenous medical service, 2020). The Base Hospital in Balapitiya has placed color-coded waste disposal bins, which indicate good preparedness.

4.4 Limitations of the study

This study was conducted in Base Hospital Balapitiya, among medical officers and nurses. As such, the findings of this study might be insufficient to predict the whole image of the district. The checklist was filled by principal investigator, which may lead to some observational bias during data collection.

COVID suspected patients is a defect in preparedness.

6. Recommendations

Health education, awareness activities, and training should be conducted regularly and make updated guidelines on outbreak management and donning and doffing. A need for improvement of hospital infrastructure such as hand washing facilities, dedicated respiratory ward, and well-organized isolation facilities for COVID suspected patients is noted

8. Consent to publish

Administrative authorities consented the collection and publication of data. All authors read the manuscript and agreed to publish.

9. Conflicts of interest

The authors have none to declare.

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