Isolation and Intensive Care (ICU) Service, Surge Capacity and Pandemic Training in Government Designated COVID-19 Clinics and Hospitals of Nepal

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ABSTRACT

Background

The coronavirus pandemic preparedness and response activities began in Nepal after the detection of the first case on 24 January 2020. Highest daily case record in June 2020 was 671, but it reached above 5,000 in October 2020.

Objective

This study assessed preparedness and response status of government designated COVID-19 clinics and various level hospitals.

Method

A web-based survey was conducted among government designated COVID-19 clinics and Level hospitals in June 2020. The Medical Operations Division of the COVID-19 Crisis Management Center (CCMC) retained contact list of focal person in each facility for regular updates. Forty-nine out of 125 clinics and all level hospitals (five Level-1, 12 Level-2, three Level-3) provided responses.

Result

There were 25 or less isolation beds in the majority of COVID-19 clinics (83.7%) and Level-1 hospitals (60%), whereas the majority of Level-2 (92%) and Level-3 hospitals (67%) had arranged >25 beds. Only five clinics, one Level-1 hospital, six Level-2 and two Level-3 hospitals had a surge capacity of additional 20 or more isolation beds. Only one-fourth of the designated health facilities had arranged separate isolation facility for vulnerable population. Majority of the designated clinics and Level-1 hospitals had five or less functional ICU beds and functional ventilators. Very few Level-2 hospitals had > 10 ICU beds and > 10 ventilators. Healthcare workers in the majority of facilities were trained on donning/doffing, hand washing, swab collection, and healthcare waste management, but, a very few received formal training on patient transport, dead body management, epidemic drill, and critical care.

Conclusion

This study revealed insufficient preparation in COVID-19 facilities during the initial phase of pandemic. The findings were utilized by the government stakeholders at central, provincial and local levels for scaling up surge capacity and improving health services at the time of case surge. As the pandemic itself is a dynamic process, periodic assessments are needed to gauze preparedness and response during different phases of disease outbreak.

KEY WORDS

COVID-19, Crisis Management Center (CCMC), Outbreak, Pandemic

INTRODUCTION

The World Health Organization (WHO) declared COVID-19 as Public Health Emergency of International Concern (PHEIC) on 30th January 2020 and on 11th March, it was declared a global pandemic.[1] Almost after a year, the total number of infected cases is nearly 150 million and deaths over three million. To reduce the burden on national health systems, global scientists have advised the governments to prevent possible outbreak among most vulnerable population that includes the elderly, patients with comorbid disease conditions, immunocompromised persons, pregnant women, children and the disabled population.[2]

The first case of COVID-19 disease in Nepal was confirmed on 24th January 2020.[3] The second case was detected on 23rd March, after two months of the first, and gradually the daily number of cases surpassed 500 in June, reaching up to 5,000 per day in October 2020.[4] At the time of this study, daily case surge was rapid and drastic, and the government response was gradually taking its pace. The Government of Nepal (GoN)'s COVID-19 response plans and strategies had not been fully materialized, especially in terms of its capacity to expand isolation beds, critical care, human resource and their training, and last but not the least; clinical management of hospitalised cases.[5-7] As a response activity, the GoN established the COVID-19 Crisis Management Center (CCMC) – an autonomous apex body for the management of pandemic, under the patronage of the Honourable Deputy Prime Minister of Nepal and the Defense Minister. The CCMC had the mandate to conduct rapid response activities with centralized control and decentralized execution, to draft response related national strategies and workplans, and to document and utilize the best practices and lessons learned from the past as well as contemporarily from the world.[8] However, the Ministry of Health and Population (MoHP) being the line ministry was given most of the preparedness and response related responsibilities.

The GoN initially designated 25 large (tertiary care) hospitals in the country as COVID-19 Hub hospitals, later expanding the list of designated secondary level hospitals to more than 130. Subsequently, the Ministry of Health and Population (MoHP) designated; 125 COVID-19 clinics (for fever screening), 23 Level-1 hospitals (for isolation of asymptomatic cases), 18 Level-2 hospitals (for management of mild/moderate cases), and three Level-3 hospitals (for management of severe/critical cases), with overlaps between categories in the case of some hospitals.[7]

In spite of the above it was difficult for the hospital and patients to understand where to go and take appropriate services in case of having symptoms, being serious or reporting for isolation even if asymptomatic. The aim of this study was to assess pandemic preparedness and response status of COVID-19 clinics and hospitals as designated by MoHP.[5]

METHODS

This study was a questionnaire based cross-sectional study in which all COVID-19 designated clinics and hospitals were included, however, only 49 clinics and all hospitals (five Level 1, twelve Level 2 and three Level 3) responded to the survey. The study was conducted in June 2020 and the study team was composed of independent clinical researchers at the Medical Operations of the COVID-19 Crisis Management Center (CCMC). The Medical Operations retained the contact list (email address, phone numbers) of COVID-19 focal persons at each of the designated COVID-19 clinics and hospitals for regular updates.

A semi-structured questionnaire was prepared on the basis of the WHO hospital readiness tool and the national guideline for infection prevention recommended by the GoN.[9,10] The questionnaire was uploaded into the Google form and a standard survey link was emailed to the focal person in each COVID-19 designated clinic and hospital. Responses were checked for completeness and quality before coding and analysis. Frequency tables were generated using SPSS 16.0. This study was approved by the Ethical Review Board (ERB) of Nepal Health Research Council (Ref: NHRC-ERB Reg. No. 267/2020P).

RESULTS

At the time of the study, all designated COVID-19 clinics and hospitals had arranged isolation beds for suspected or confirmed cases. The majority of clinics (83.7%) and Level-1 hospitals (60%) had arranged 25 or less beds, and the majority of Level-2 (92%) and Level-3 hospitals (67%) had arranged more than 25 isolation beds (table 1). Only five out of 49 COVID-19 clinics, one Level-1 hospital, six Level-2 and two Level-3 hospitals had a surge capacity of more than 20 isolation beds. Isolation unit in the majority of the designated clinics and hospitals (42-80%) was located inside the main hospital building.

On average, one-fourth of the designated clinics (20-29%) and the same proportion of Level (1-3) hospitals (8-42%) had arranged a separate isolation facility for vulnerable populations i.e. pregnant women, children, elderly, chronic disease, and disabled patients (table 2).

Isolation rooms in the majority of designated clinics and hospitals (60-100%) had cross-ventilation, however, only six clinics and one Level-2 hospital had a negative pressure room with high efficiency particulate air (HEPA) filter or a hybrid air filter system (table 3). Majority of isolation units had a separate toilet facility, separate handwashing station, and separate sample collection room for the patients. Free internet package was available to the patients in more than half of the clinics and hospitals, whereas television and recreational activities were available in fewer facilities. Although counselling support was available for patients in almost all clinics and hospitals, teleconsultation service was available in 40-67% of the facilities.

Table 1. Isolation service at government designated COVID-19 clinics and hospitals

		COVID clinics (n=49)	Level-1 hospitals (n=5)	Level-2 hospitals (n=12)	Level-3 hospitals (n=3)
Total bed capacity	51-100	13(26.5%)	4(80.0%)	-	-
	101-200	2(4.1%)	-	2(16.7%)	-
	201-500	5(10.2%)	-	7(58.3%)	-
	> 500	5(10.2%)	-	1(8.3%)	3(100.0%)
Isolation beds	≤ 10	21(42.9%)	2(40.0%)	1(8.3%)	-
	11-25	18(36.7%)	1(20.0%)	-	1(33.3%)
	26-50	7(14.3%)	2(40.0%)	7(58.3%)	1(33.3%)
	51-100	3(6.1%)	-	1(8.3%)	-
	> 100	-	-	3(25.0%)	1(33.3%)
Isolation beds for COVID-19 patients	≤ 10	26(53.1%)	2(40.0%)	1(8.3%)	1(33.3%)
	11-25	15(30.6%)	1(20.0%)	-	-
	26-50	6(12.2%)	2(40.0%)	7(58.3%)	1(33.3%)
	51-100	2(4.1%)	-	1(8.3%)	-
	> 100	-	-	3(25.0%)	1(33.3%)
Additional isolation beds capacity (surge capacity)	< 10	31(63.3%)	3(60.0%)	3(25.0%)	-
	10-20	12(24.5%)	1(20%)	3(25.0%)	1(33.3%)
	> 20	5(10.2%)	1(20.0%)	6(50.0%)	2(66.7%)
Location of isolation unit	inside main hospital building	26(53.1%)	4(80.0%)	5(41.7%)	2(66.7%)
	separate building within hospital premises	19(38.8%)	-	5(41.7%)	1(33.3%)
	outside hospital premises	4(8.2%)	1(20.0%)	2(16.7%)	-

Table 2. Isolation service for vulnerable population in government designated COVID-19 clinics and hospitals

	COVID clinics (n=49)	Level-1 hospitals (n=5)	Level-2 hospitals (n=12)	Level-3 hospitals (n=3
Separate isolation for pregnant women	14(28.6%)	1(20.0%)	4(33.3%)	1(33.3%)
Separate isolation for children	12(24.5%)	1(20.0%)	3(25.0%)	1(33.3%)
Separate isolation for elderly	13(26.5%)	1(20.0%)	3(25.0%)	0
Separate isolation for chronic disease patients	16(32.7%)	1(20.0%)	5(41.7%)	1(33.3%)
Separate isolation for disabled	10(20.4%)	1(20.0%)	1(8.3%)	0

Majority of the designated COVID-19 clinics and Level-1 hospitals had five or less functional ICU beds and functional ventilators for infected patients at the time of the study. Three Level-2 hospitals had more than 10 ICU beds and two Level-2 hospitals had more than 10 ventilators for COVID-19 patients. Two out of three Level-3 hospitals had more than 20 functional ventilators (table 4).

Table 3. Facilities for admitted patients in isolation units of government designated COVID-19 clinics and hospitals

	COVID clinics (n=49)	Level-1 hospitals (n=5)	Level-2 hospitals (n=12)	Level-3 hospitals (n=3)
Cross-ventilated room	35(71.4%)	3(60%)	12(100%)	3(100%)
Negative pressure room with HEPA filter	4 (8.2%)	0	1 (8.3%)	0
Hybrid negative pressure room	2 (4.1%)	0	1 (8.3%)	0
Separate toilet facility for patients	39(79.6%)	4(80%)	8 (66.7%)	2 (66.7%)
Separate handwashing station for patients	44(89.8%)	4(80%)	10(83.3%)	3 (100%)
Separate room for sample collection	30(61.2%)	4(80%)	9 (75%)	3 (100%)
Teleconsultations	27(55.1%)	2(40%)	8 (66.7%)	2 (66.7%)
Video monitoring / CCTV	22(44.9%)	4(80%)	12 (100%)	1 (33.3%)
Counselling support for patients	47(95.9%)	4(80%)	12 (100%)	3 (100%)
Gown supply for patients	29(59.2%)	2(40%)	6 (50%)	1 (33.3%)
Patient admission pack (toothpaste, sanitizer, mask, towel, etc.)	28(57.1%)	2(40%)	10(83.3%)	1 (33.3%)
Free internet package	33(67.3%)	3(60%)	7(58.3%)	1(33.3%)
Television	11(22.4%)	2(40%)	3(25%)	0
Recreational activities (indoor games, etc.)	9 (18.4%)	1(20%)	3(25%)	0

Table 4. Critical care service at government designated COVID-19 clinics and hospitals

		COVID clinics (n=49)	Level-1 hospitals (n=5)	Level-2 hospitals (n=12)	Level-3 hospitals (n=3)
Functional ICU beds	≤ 10	38(77.6%)	5(100%)	7(58.3%)	-
	11-25	6(12.2%)	-	3(25%)	1(33.3%)
	26-50	3(6.1%)	-	2(16.7%)	1(33.3%)
	51-100	1(2.0%)	-	-	1(33.3%)
	>100	1(2.0%)	-	-	-
Functional ICU beds for COVID-19 patients	≤ 5	42(85.7%)	5(100%)	3(25%)	2(66.7%)
	5-10	6(12.2%)	-	6(50%)	1(33.3%)
	11-20	1(2.0%)	-	2(16.7%)	-
	> 20	-	-	1(8.3%)	-
Functional ventilators	≤ 5	35(71.4%)	5 (100%)	6 (50%)	-
	6-10	7(14.3%)	-	4 (33.3%)	1 (33.3%)
	11-20	3(6.1%)	-	1 (8.3%)	-
	> 20	4(8.2%)	-	1 (8.3%)	2 (66.7%)

Healthcare workers in the majority of designated health facilities were trained on donning/doffing, hand wash, and swab collection (table 5). Twenty eight clinics, one Level-1 hospital, ten Level-2 and two Level-3 hospitals received training on healthcare waste management. Very few facilities received formal training on patient transport for referral, dead body management, and epidemic drill. Critical care training was provided to the healthcare workers in one Level-1, seven Level-2 and two Level-3 hospitals.

Table 5. Pandemic response related training for frontline health workers in government designated COVID-19 clinics and hospitals

	COVID clinics (n=49)	Level-1 hospitals (n=5)	Level-2 hospitals (n=12)	Level-3 hospitals (n=3)
Donning/doffing	35(71.4%)	3(60%)	11(91.7%)	3(100%)
Hand wash	40(81.6%)	3(60%)	12(100%)	3(100%)
Swab Collection	39(79.6%)	3(60%)	12(100%)	3(100%)
Healthcare waste management	28(57.1%)	1(20%)	10(83.3%)	2(66.7%)
Dead body management	13(26.5%)	0	5 (41.7%)	1(33.3%)
Epidemic drill	11(22.4%)	0	3 (25%)	1(33.3%)
Physical distancing	36(73.5%)	2(40%)	10(83.3%)	1(33.3%)
Respiratory hygiene	27(55.1%)	2(40%)	8(66.7%)	2(66.7%)
Patient transport for referral	20(40.8%)	2(40%)	6(50%)	1(33.3%)
ICU training	21(42.9%)	1(20%)	7(58.3%)	2(66.7%)

DISCUSSION

At the time of the study, daily records of COVID-19 cases in Nepal were relatively low (approximately 500), and the Government of Nepal had formulated a preparedness and response strategy to prevent and control the possible case surge.[4,11] The government had drafted necessary guidelines and identified clinics and various level hospitals across all seven provinces for the effective management of probable and confirmed cases.[4] Globally accepted public and social health measures (travel restrictions, face mask, sanitizer, hand washing), quarantine management, dead body management, and hospital-based interventions were in place across the country.[4] However, our findings suggest that the government's preparedness for outbreak response and case management was suboptimal due to inadequacy in resources, isolation services and pandemic response related training in government designated COVID-19 clinics and hospitals.

Quarantine and isolation services are the first control measures for any outbreak management.[12] As informed by our study findings, isolation beds should have been uniformly established across health facilities throughout the country. Only 10.2% of COVID-19 clinics had a total bed capacity to accommodate more than 500 patients at a time, whereas none of the level hospitals had such capacity. Only three Level-2 and one Level-3 hospitals had above 100 isolation beds for COVID-19 patients. The majority of hospitals had a capacity to add ten or less isolation beds in response to case surge. Our study also found that four out of five hospitals had established isolation units inside the main hospital building. Ideally, isolation units should have been arranged outside the main hospital building, if not outside hospital premises, to reduce infection transmission risk.

At the time of our study, there was lack of isolation facilities for vulnerable groups. According to WHO, separate isolation room should be available for pregnant women and all IPC guidelines should be followed. However, this study found that only 29% of COVID-19 clinics and one-third of Level hospitals had a separate isolation facility for pregnant women, which is inadequate. According to the Center for Disease Control (CDC, USA), the risk of COVID-19 illness is higher in elderly population and persons with comorbid chronic diseases, so proper health facilities should have been available for them (CDC).[2] Most of the hospitals in our study did not have adequate isolation facilities for elderly as well other vulnerable group of patients. No separate isolation rooms were available for elderly patients in Level-3 hospitals. Only 32.7% COVID-19 clinics had separate isolation rooms for chronic patients. Similar was the case with services for patients with disability/ differently abled patients.

Hospitals should provide minimum facilities for COVID-19 patients such as well-ventilated room, 24 hours availability of hand washing station, sanitizer, separate sample collection room, separate toilets and other day to day equipment (utensil, towel, tooth brush and toothpaste, soap) are basic requirements of an isolation unit. According to the IPC guidelines, there should be an availability of handwashing station at the entrance gate of each isolation unit, which was found in most of the hospitals in our study. Although there was a lack of negative pressure system, television, and other recreational facilities in isolation rooms, other facilities were relatively better. Such facilities should be made available in all designated clinics and hospitals around at all times.

Intensive Care Unit (ICU) bed availability for moderate to severe COVID-19 patients was not sufficient at the time of study. Majority of COVID-19 clinics (77.6%) had less than ten functional ICU beds. All Level-2 hospitals had less than 10 functional ICU beds, whereas all Level-3 hospitals had more than ten functional ICU beds. Almost half of Level-1 hospitals did not have a single ICU bed allocated for COVID-19 patients. The number of mechanical ventilators was also very less in the designated clinics and all Level hospitals. Therefore, overall critical care service in the country was not sufficient for outbreak response of this magnitude.

Human resource to fight the pandemic was not found adequate either. According to the UNDP report, our health systems is weak with the availability of just three hospital beds, six physicians and 27 nurses per 100,000 population.[13] Training opportunities for health workers were not uniform in all hospitals. Compared to donning/doffing, hand washing and swab collection training, which was adequate in the majority of clinics and hospitals, training on dead body management and epidemic drill was poor in the facilities, and the finding is supported by the studies done by Bhattarai et al. and Nepal Health Research Council (NHRC) during March-June 2020.[5,6,14] None of the Level-1 hospitals had received training related to dead body management and epidemic drill. Training related to ICU care of COVID-19 patients was received by approximately half of the designated clinics and Level hospitals.

Our study has few limitations. First, it was conducted in the transition phase of COVID-19 case surge in Nepal to gauze the capacities of designated clinics and hospitals which were also in the transition phase of preparation for response. Second, the web-based survey may not have captured the accurate scenario of preparation and response in health facilities. On-site assessment of health facilities would have informed the actual level of preparedness, however it was not possible taking into consideration the travel and social restrictions imposed by the government.

CONCLUSION

This study revealed that during the initial phase of the pandemic, there was insufficient preparation in government designated COVID-19 clinics and hospitals of Nepal, measured in terms of isolation and critical services, priority services for vulnerable population, and pandemic related training for frontline health workers. The study findings were useful for the governmental stakeholders at central, provincial and local levels while streamlining pandemic preparedness activities, scaling up response, and improving health services in the designated health facilities at the time of outbreak and case surge. As the pandemic itself is a dynamic process, periodic assessments are needed to gauze the actual preparedness and response level during different phases of disease outbreak in a country, so that the evolving evidence can inform the policymaking and programme planning.

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