J Nepal Health Res Counc 2025 April-June; 23 (67): 369-376

Assessment of Disaster Preparedness Planning in 25 Hub Hospitals of Nepal

Samir Kumar Adhikari,[1] Ashis Shrestha,[2] Naveen Phuyal,[3] Sumana Bajracharya,[2] Pavan Kuamar Shah,[1] Srijana Katwal,[3] Alisha Adhikari,[3] Rajesh Sambhajirao Pandav,[4] Alison Eugenio Gocotano,[4] Subash Neupane,[4] Bigyan Prajapati,[4] Irana Joshi,[4] Gaurav Devkota,[4] Dipesh Tikhatri[5]

[1]Health Coordination Division, Ministry of Health and Population, Kathmandu, Nepal, Ministry of Health and Population, Kathmandu, Bagmati, Nepal,

[2]Department of Emergency Medicine, Patan Academy of Health Sciences, Kathmandu, Bagmati, Nepal, [3]Department of Community Medicine, Nepalese Army Institute of Health Sciences, Kathmandu, Bagmati, Nepal, [4]World Health Organization, Kathmandu, Bagmati, Nepal, [5]National Society for Emergency and Disaster Risk Management, Kathmandu, Bagmati, Nepal.

ABSTRACT

Background: Hospitals play a crucial role in disaster response, but they often face resource challenges. Hospital disaster preparedness, involving plans and procedures, is vital to ensure they can handle emergencies effectively. Nepal has identified 25 Hub Hospitals to coordinate disaster response, highlighting the importance of organized disaster management planning in saving lives. This study assesses disaster preparedness in these designated hospitals.

Methods: This observational study conducted in December 2023 is a secondary analysis of data from a workshop held in 25 designated hub hospitals in Nepal. The workshop aimed to develop disaster preparedness plans. The study evaluates physical facilities, triage, planning, and available resources in these hospitals, categorizing variables related to beds, human resources, disaster plans, and more. Ethical approval was obtained.

Results: Average hospital bed occupancy in ward was 80% and that of emergency was 92%. The average bed per province was 1272, nurses were 833, doctors were 521, paramedics were 181. Disaster plan was available in 21(84%) of the hospital. Out of 21 hospitals that had disaster plan, surge capacity activation plan was included in 18(86%), infectious disease outbreak plan in 14(67%) and fire safety plan in 7(33%) of the disaster plan. Blood bank was available in 16(64%) of the hospitals. One stop crisis management Centre was available in in 24(96%) hub hospitals, birthing and facility for caesarean section was available in all hospitals.

Conclusions: The study findings reveal varying levels of hospital preparedness in Nepal, including bed occupancy, staff, disaster plans, structural assessments, and available services.

Keywords: Disaster; emergency; preparedness; response.

INTRODUCTION

Disaster is a result of hazard that can be natural or human-made.[1,2] Hospital is one of the important institution to be impacted after a disaster.[3] During a disaster, hospital resources are overwhelmed due to a sudden rush of patients in an emergency room.[2] Thus hospital must remain operational during and after a disaster.[4] Hospital disaster preparedness must be prioritized at the local, state, national, and international levels to achieve this.[3] Hospital preparation comprises the activities, procedures, and systems designed and executed prior to a significant catastrophe to increase the hospital's readiness and capacity to respond to disasters and emergencies.[1,5] Disaster preparedness has emerged as a global concern, [6] therefore, in order to response in an organized manner and have a coordinated response during disasters, Government of Nepal has identified 25 hospitals as Hub Hospitals. This study presents an assessment of disaster preparedness planning in 25 hub hospitals of Nepal.

METHODS

This study was carried out in December 2023 and is an observational descriptive study. The Health Emergency

Correspondence: Dr Ashis Shrestha, Department of Emergency Medicine, Patan Academy of Health Sciences, Kathmandu, Bagmati. Email: ashis_ktm@outlook.com.

and Disaster Management Unit (HEDMU), Ministry of Health and Population (MoHP), Nepal, in partnership with the World Health Organization (WHO), Nepal, and with assistance from the National Society of Emergency and Disaster Risk Management (NSEDRM), conducted a Hospital Preparedness and Response Planning Workshop. The data gathered during this workshop was used for secondary analysis.

The study was conducted in 25 hub hospitals across Nepal. The data collection period spanned from November to December 2023 as part of the Hospital Preparedness and Response Planning Workshop. Hospitals in Nepal operate under a Hub and Satellite model during disasters, where hub hospitals are government-run, while satellite hospitals can be either government or privately operated. This modality has been endorsed by the Ministry of Health and Population (MoHP), Nepal for disaster response coordination.

Ethical approval for this study was obtained from the Ethical Review Board (ERB) of the Nepal Health Research Council (NHRC) under reference number 1589. Since the study focused on hospital disaster preparedness rather than patient-specific data, individual patient consent was not required.

All 25 hub hospitals designated by the Government of Nepal for disaster response were included in this study. The study did not include satellite hospitals or other healthcare facilities. No specific exclusion criteria were applied, as the study aimed to assess the preparedness of all major hub hospitals in Nepal.

The study included a total of 25 hub hospitals, which formed the entire study population. The sampling method used was total population sampling, as all hub hospitals were included in the assessment without random selection. The data was collected through a structured evaluation conducted during the two-day Hospital Disaster Preparedness and Response Planning (HDPRP) Workshop. The assessment included on-site hospital visits by facilitators to evaluate available disaster management protocols, emergency services, and triage systems. The second data point was derived from the hospital disaster preparedness and response plans (HDPRP) developed by each hospital during the workshop. These plans included details on disaster committees, triage protocols, treatment areas, resource allocation, transportation, floor plans, communication strategies, surge capacity, reproductive health services, gender-based violence response, and disability inclusion.

The study categorized variables into key domains: hospital beds, human resources, disaster plans, structural integrity, crowd control, transport facilities, services, storage and supplies, reproductive health, disability inclusion, surveillance, and quality improvement (QI). Continuous variables, such as hospital bed capacity, were analyzed using measures of central tendency, including mean, median, and mode, depending on the skewness of the data. The hospital bed-to-healthcare worker ratio was also calculated. Categorical variables, such as disaster planning, triage systems, and resource availability, were represented as proportions. The study categorized all 25 hub hospitals based on the seven provinces of Nepal, and data was presented in aggregated form for each province. The data was tabulated using Microsoft Excel, and descriptive statistical methods were applied to summarize findings.

RESULTS

There are seven provinces in Nepal and division of hub hospital according to province is given in Table 1. Data of all 25 hospitals was tabulated in excel sheet and descriptive statistic was used for calculation

Table 1. Hub hospitals as per seven provinces of Nepal.

Province	Province Name	Hospitals
1	Koshi	BPKIHS, Koshi Hospital, Mechi Hospital
2	Madhesh	Gajendra Narayan Singh Hopital. MIHS, Narayani Hospital
3	Bagmati	Bhaktapur Hospital, Bharatpur Hospital, Bir Hospital, Civil Service Hospital, Dhulikhel Hospital, TUTH, Patan Academy of Health Sciences
4	Gandaki	Dhaulagiri Hospital, Pokhara Academy of Health Sciences
5	Lumbini	Bheri Hospital, Lumbini Hospital, Rapti Academy of Health Sciences, Rapti Provincial Hospital, Shree Birendra Sainik Hospital
6	Karnali	Karnali Academy of Health Science, Karnali Provincial Hospital
7	Sudurpacchim	Dadeldhura Hospital, Mahakali Provincial Hospital, Seti Provincial Hospital

Data from 25 hub hospitals over seven provinces of Nepal were collected.

The average hospital bed per province was 800, emergency bed 100, high dependency bed (HDU) 42 Intensive Care Unit (ICU) 66, bed for burn 5 and Mortuary 18. The detail breakdown per province is given in Table 2.

Table 2. Hospital bed distribution at hub hospitals of seven provinces in Nepal.

Total	Province 1	Province 2	Province 3	Province 4	Province 5	Province 6	Province 7
Hospital Bed	215	800	4282	521	966	325	371
Emergency Bed	159	100	290	41	116	43	74
High Dependency Bed	37	42	254	0	45	12	49
Intensive care bed	66	73	318	62	89	48	41
Burn Bed	0	6	70	7	5	0	1
Mortuary Capacity	22	9	75	20	18	9	1

Average hospital bed occupancy in ward was 80% and that of emergency was 92%. The bed occupancy according to the provinces is given in (Fig 1).

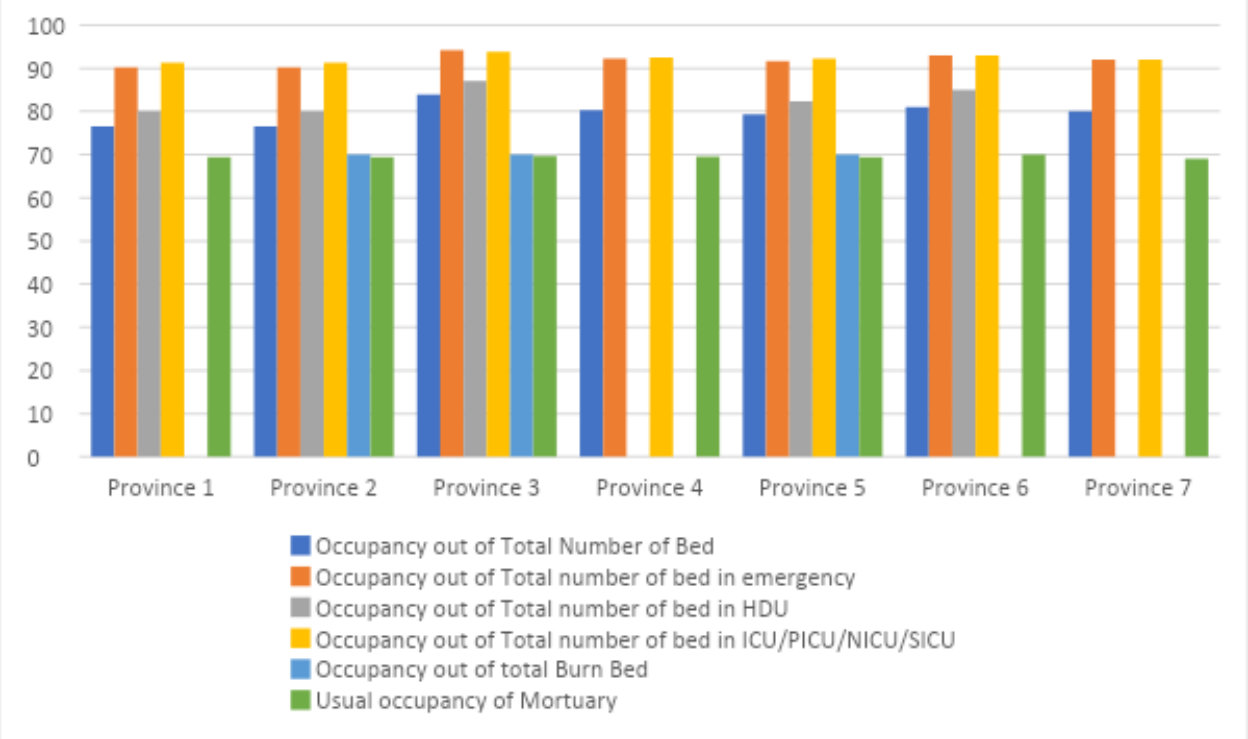

Figure 1. Hospital bed occupancy at hub hospitals of seven provinces in Nepal

Human Resources.

The average bed per province was 1272, nurses were 833, doctors were 521, paramedics were 181, daily wage staff were 177, housekeeping were 175, administrators were 98, maintenance staff were 41, pharmacy staff were 46 and store staff were 16. Average number per province is given in (Fig 2). In an average there were one doctor per 3.1 hospital bed, 2.1 bed per nurse; 14.8 bed per Administrator; 18.2 bed per housekeeping staff; 67.9 bed per Maintenance staff; 34.4 bed per pharmacy staff, 106.2 bed per store staff and 1.6 Nurse per Doctor and 42 total staff

per Administrator, in hub hospitals, province wise ratio is given in Table 3.

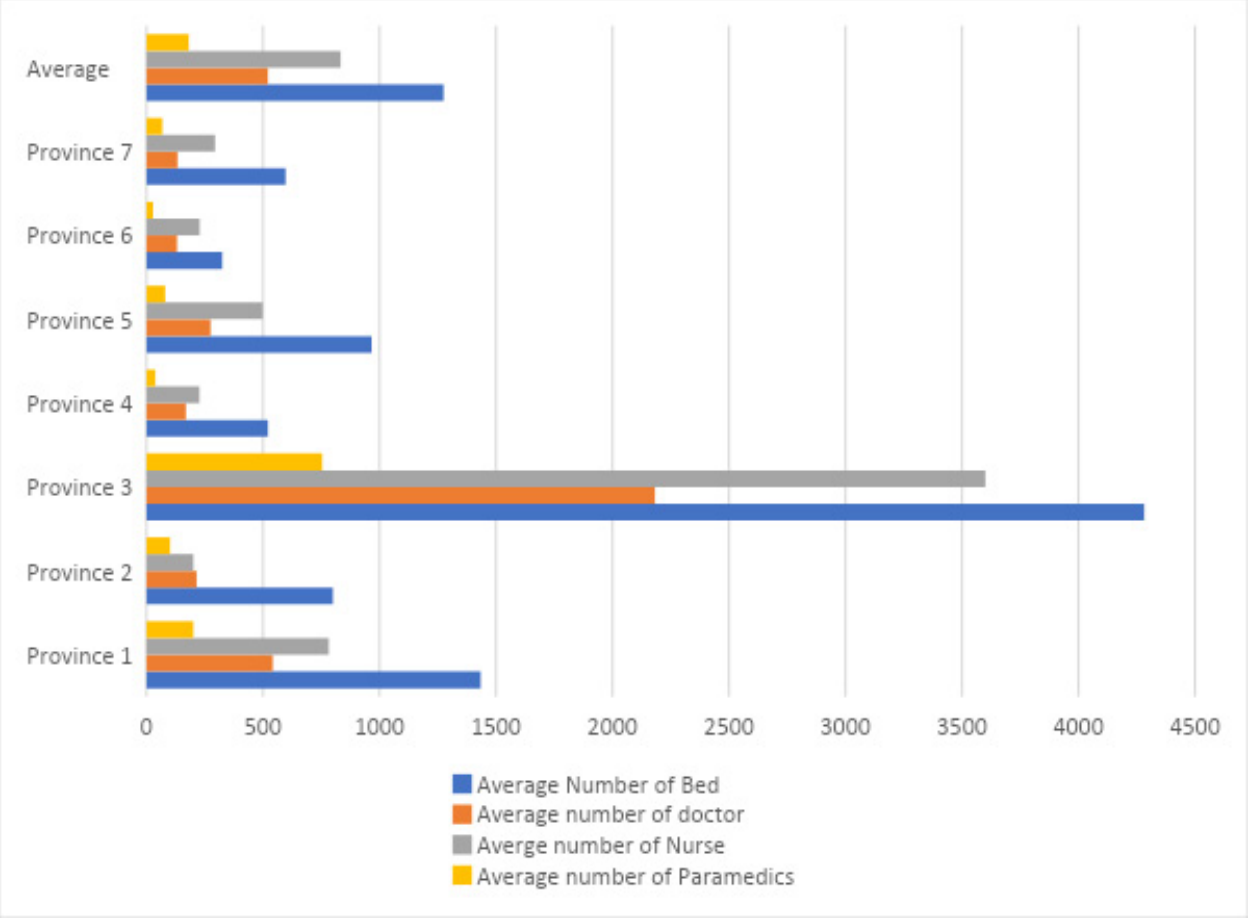

Figure 2. Average number of hospital beds and clinical staff in hub hospitals of seven provinces.

Table 3. Ratios of human resources in hub hospitals of seven provinces.

Ratios	Province 1	Province 2	Province 3	Province 4	Province 5	Province 6	Province 7
Hospital Bed per Doctor	2.6	3.7	2.0	3.1	3.5	2.5	4.5
Hospital Bed per Nurse	1.8	4.0	1.2	2.3	1.9	1.4	2.0
Hospital bed per Administrator	8.6	19.5	14.4	18.0	14.2	5.2	23.9
Hospital Bed per Housekeeping Staff	2.8	32.0	10.8	43.4	4.8	5.4	28.4
Hospital Bed per Maintenance Staff	159.33	114.29	20.99	43.42	26.83	36.11	74.63
Hospital Bed per Pharmacy Staff	71.70	53.33	23.27	20.84	33.31	17.11	21.32
Hospital Bed per Store Staff	95.60	200.00	70.20	173.67	64.40	54.17	85.29
Hospital Bed per Daily wage staff	7.24	12.12	9.45	20.84	38.64	16.25	18.66
Nurse to doctor	1.4	0.9	1.6	1.3	1.8	1.7	2.2
Total staff per Administrator	49.50	13.78	170.33	11.11	25.24	10.89	12.85

Disaster plan was available in 21(84%) of the hospital. Out of 21 hospitals that had disaster plan, surge capacity activation plan was included in 18(86%), infectious disease outbreak plan in 14(67%) and fire safety plan in 7(33%) of the disaster plan. Similarly, triage and treatment area were defined in all hospitals that had disaster management plan. Phone number of necessary committee were mentioned in 18(86%), phone numbers for external communication were mentioned in 16, human resources and capacity listed in 18(86%), and evacuation plan was available in 11(52%) of disaster management plan.

All hospitals had provision of one way route and information inside the hospital. Structural assessment was done in 12(52%) of the hospitals, structural retrofitting was done in 6(24%)of the hospital and non-structural assessment was done in 6(24%) of the hospital. Preventive maintenance was practiced in 7(28%) of the hospital. Adequate space for ambulance in front of emergency was available in 13(52%), hospital ambulance was available in 20(80%) of the hospitals, helipad was available in 7(28%) hospitals. Four (15%) of the hospitals had single access.

The services provided by hospitals were Emergency, Medicine, Surgery, Orthopedics, Neurosurgery, Obstetrics and Gynecology, Psychiatry, General Practice, Dermatology, Dental surgery, ENT, Maintenance, Housekeeping, Pharmacy, Microbiology, Pathology, Community medicine. All of these 15 services were available in 8(32%) of the hospital. Out of these, 9 services was the minimum provided by 2(8%) of the hospitals. Emergency service was provided by all hospitals, everyday triage was available in 4(16%), treatment areas were separated in 6(24%); emergency lab and radiology was available in all hub hospitals.

Provision of storage of medicine, equipment and laboratory reagents were available in all 25 hub hospitals. Blood bank was available in 16(64%) of the hospitals. All hospital had three phase electricity line, more than one electric supply line was available in 21(84%) of the hospital and all hospitals had generator for alternative power supply. Oxygen plant, system of waste segregation and disposal was available in all hospitals. Maximum days for the functional collapse are available in Table 4.

Table 4. Functional collapse of most of the hub hospitals of seven hub hospitals.

Maximum number of days the hospital would last for	Days
Without fuel	2
Without food	1
Without oxygen	3
Medicine supply	7
Lab supply	7

One stop crisis management Centre was available in 24(96%) hub hospitals, birthing and facility for cesarean section was available in all hospitals. Ramps were available in 20(80%), side bars were available in 15(60%) and disability friendly toilets were available in 13(52%) of the hospitals.

Early warning and reporting system (EWARS) was available in all hospitals, EWARS training was conducted in 21(84%) of hospitals. Upon suspicion by clinician, the system of infectious disease reporting from outpatient department was available in 15(60%), from emergency in 18(72%), and from ward in 19(78%) of the hospitals. Common outbreak disease testing facilities available in hub hospitals were as follows: stool for hanging drop 23(92%), stool culture 22(88%), COVID-19 PCR test 23(92%), COVID-19 antigen test 23(92%), dengue serology 25(100%). Minimal Service Standard (MSS) was conducted in 24(96%) of hospitals however, 10(40%) of the hospitals did not know the total score and record was not available in the hospital.

DISCUSSION

Sendai framework for disaster risk reduction 2015-2030, priority of action number four indicates that disaster preparedness needs to be strengthened for more effective response and capacities in place for effective recovery.[7] Hospital preparedness and planning is one of the crucial parts therefore it is imperative to evaluate the preparedness of hospital. One of the ways of evaluating resource is looking into 4s, space, staff, stuff and system.[8] Our finding of 25 hub hospital shows that almost all hospitals remain occupied with the average hospital bed occupancy in ward of 80% and that of emergency to be 92% during normal working days. This reflects that it will be very difficult to find beds in hospitals or emergency during event of disaster. Therefore this requires a good planning of 4s, a met-analysis suggests that infrastructure, logistics, capacity building, and communication were the priority themes under 4s.[8] These areas need to be addressed in hospital

disaster preparedness and management plan therefore the HDPRP workshop was conducted in 25 hub hospitals of seven provinces of Nepal. Prior to the workshop, disaster plan was available in 21(84%) hospitals, but it varied in terms of terminology, functionality and the system. This would make coordination not only difficult but also impossible. This again marks the need for the consistency of disaster management plan. Out of 21 hospitals that had disaster plan, surge capacity activation plan was included in 18(86%), infectious disease outbreak plan in 14(67%) and fire safety plan in 7(33%) and evacuation plan was available in 11(52%) of disaster management plan. These are the area that needs to be focused in the future update of disaster management plan. Despite outbreak of COVID-19, infectious disease management plan was not in place, COVID-19 was managed by ad-hoc committee. The system of multi-hazard committee needs to be in place.[9] Therefore, hospital incident command system is the system that needs to be in place, oriented and tested timely with simulation exercises.

Management of disaster requires proper allocation of human resources that represents staffs of 4s. In an average, there were one nurse per 2.1 bed; one doctor per 3.1 hospital bed; one administrator per 14.8 bed; one housekeeping staff per 18.2 bed; one pharmacy staff per 34.4 bed; one maintenance staff per 67.9 bed; one store staff per 106.2 bed. There was one doctor per 1.6 nurse and one administrator per 42 total staff. Support and administrative staffs are very important part of core function and often neglected. The number of administrative and support staff must match the requirements of patient influx. According to the Society for Acute Medicine (SAM) the nurse to bed ratio must be greater than 1:6.[10] This is three times more than our current scenario, similarly support staff like store, housekeeping and maintenance also needs to be in the number sufficient to provide uninterrupted services. In any hospital, the work load of administrative staff cannot be ignored, the critical function that are essentials to support the health care system are done by administrative staffs. Administrative staff are responsible for managing resources, including personnel, equipment, and supplies; maintaining records of response actions, resource usage, expenditures, and other critical information; organizing meetings, briefings, and conferences; and handling budgets, financial transactions, and financial reporting. Therefore, besides doctors and nurses, other planning staffs must be included in disaster management plan.

Highest number of hospital bed and human resources were in province 3 followed by 1, 5, 2, 7, 4, 6. This is consistent with the Human Development Index (HDI) which is highest for province 3 and lowest for province 6. The HDI of province 2 has been inconsistent and towards the lower side.[11] The province 3 has disproportionate resources in comparison to the population which is more in province 2.[1,2] Moreover, province 2 and 3 are in close proximity, suggesting the possibility of resource sharing through proper coordination.

Structural safety is important as one of the hazards for Nepal is earthquake. Safe hospital is necessary for the delivery of regular services. This requires timely assessment of buildings and maintenance, structural assessment was done in 12(52%) of the hub hospitals, structural retrofitting was done in 6(24%) of the hub hospital and non-structural assessment was done in 6(24%) of the hub hospital.

The Department of Urban Development and Building Construction has made revisions to the previous "National Building Code 105:1994," resulting in the new "National Building Code 105:2020." This updated code includes structural design requirements aimed at improving the safety and earthquake resilience of all building types.[13] Beside these nonstructural components also needs to be maintained regularly. However, Preventive maintenance was practiced in 7(28%) of the hospital. Preventive maintenance encompasses scheduled inspections, identification and correction of potential problems before they occur. This approach promotes efficient equipment operation, ensures employee safety, and prevents the financial burden of expensive repairs.[14] Some of the important structural component that is related with crowd control are space for ambulance in front of emergency. Only 13(52%) hospitals had adequate space for ambulance, and 4(15%) hospitals had single access. This emphasizes the importance of floor planning, route and gates to be planned in the new hospital buildings that are being made in various provinces.

Everyday triage was available in 4(16%) hub hospitals. Triage is a very important component of disaster management.[15] A hospital that does not perform triage on daily basis cannot perform triage suddenly during disaster therefore everyday triage is important. Triage plays a crucial role in recognizing, prioritizing, and appropriately assigning patients to receive emergency care at the most suitable time according to the severity of their condition. The Emergency Severity Index (ESI) and the Manchester Triage System (MTS) are some of the triage systems that have been developed worldwide.[16] This also holds true for treatment areas, which were

separated in 6(24%) hub hospitals only. A system of compartmentalizing as Red, Yellow and Green during regular emergency helps to escalate it during disaster. Creating areas during crisis is difficult.

Data of 25 hub hospitals showed that stock of fuel would not last more than 2 days, therefore it is necessary to look for alternative power source. Food was another important issue which would last for 1 day only in most of the hospitals. The provision of stocking food for disaster was not observed in most of the hospitals. The U.S. Administration for Strategic Preparedness and Response Technical Resources, Assistance Center, and Information Exchange (ASPR TRACIE) recommends stockpiling hospital supplies for 96 hours for normal use and an additional 20% for surge use during disasters. Hospitals should be aware of the quantity of supplies required on a daily basis so that they can stockpile goods according to their needs.[17]

Gender based violence and reproductive health are major concerns that needs to be addressed in disaster management plan. The facility of cesarean was available in all hospitals. There was also provision of one stop crisis management center (OCMC) however it is important that this is lined up with disaster to address the huge influx of patients in the hospital. Though there was OCMC, the plan for its functioning during crisis was not seen. Yet another area of concern is disability, the greatest barrier to disability inclusive planning was structure like ramps were available in 20(80%), side bars were available in 15(60%) and disability friendly toilets were available in 13(52%) of the hospitals. Disasters exacerbate pre-existing disability rates and present significant challenges for rehabilitation. Globally, disability inclusion in disaster preparedness is a pressing issue. Disaster preparedness plans should encompass disability and rehabilitation in all three phases of a disaster: before, during, and after. Disability-friendly hospitals with separate parking, accessible toilets, and ramps are necessary to address the needs of disabled individuals. These features also prepare hospitals for the transportation of injured people during disasters. Capacity of the rehabilitation center needs to be increased with an emphasis to provide training to rehabilitation staff and responders regarding emergency rehabilitation response, create a triage network to inform and deploy rehabilitation staff in the event of a disaster. Similarly, ambulatory aids and devices should be available in a stockpile for emergency use along with a strategy for their proper distribution during emergencies.[18]

Finally, a good surveillance system for disease was seen to be in place, however the reporting system within the hospital was observed as gap. Coordination mechanism for reporting patient presenting to outpatient or emergency was missing creating a chance of missing the patients. The service quality of all hospital was monitored by Minimal Service Standard (MSS) which was conducted in 24(96%) of hospitals however, 10(40%) of the hospital's staffs did not know the total score and record was not available in the hospital showing the lack of dissemination.

This was an assessment of 25 hub hospitals of Nepal and does not reflect the total capacity of all hospitals of Nepal, however we assume that the pattern of data will be similar in all hospitals of Nepal.

CONCLUSIONS

The hospital and ward bed occupancy rates were high, and there was a low healthcare worker-to-bed ratio, highlighting the need for an effective disaster management plan to handle crises. Many hospitals lacked fire safety and evacuation plans, which needed to be addressed in the future. There was a need to focus on structural and non-structural assessments and preventive maintenance to support disability-inclusive disaster management. Additionally, food and fuel storage were crucial for hospital functionality during prolonged crises, and very few hub hospitals regularly practiced triage.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

REFERENCES

1. Top M, Gider Ö, Tas Y. An investigation of hospital disaster preparedness in Turkey. Journal of Homeland Security and Emergency Management. 2010;7(1). doi: https://doi.org/10.2202/1547-7355.1781

2. Persoff J, Ornoff D, Little C. The role of hospital medicine in emergency preparedness: a framework for hospitalist leadership in disaster preparedness, response, and recovery. Journal of hospital medicine. 2018;13(10):713-8. doi: https://doi.org/10.12788/jhm.3073

3. Diab GM, Mabrouk SM. The effect of guidance booklet on knowledge and attitudes of nurses regarding

disaster preparedness at hospitals. Journal of Nursing Education and Practice. 2015;5(9):17–31. [Link]

4. Mulyasari F, Inoue S, Prashar S, Isayama K, Basu M, Srivastava N, et al. Disaster preparedness: looking through the lens of hospitals in Japan. International Journal of Disaster Risk Science. 2013;4:89–100. doi: https://doi.org/10.1007/s13753-013-0010-1

5. Djalali A, Della Corte F, Foletti M, Ragazzoni L, Gallardo AR, Lupescu O, et al. Art of disaster preparedness in European Union: A survey on the health systems. PLoS currents. 2014;6. https://doi.org/10.1371/currents.dis.56cf1c5c1b0deae1595a48e294685d2f

6. Fung OW, Loke AY, Lai CK. Disaster preparedness among Hong Kong nurses. Journal of advanced nursing. 2008;62(6):698–703. https://doi.org/10.1111/j.1365-2648.2008.04655.x

7. Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR [Internet]. 2015 [cited 2024 Apr 23]. [Article]

8. Munasinghe NL, O'Reilly G, Cameron P. Establishing the Domains of a Hospital Disaster Preparedness Evaluation Tool: A Systematic Review. Prehosp Disaster Med. 2022 Oct;37(5):674–86.doi: https://doi.org/10.1017/s1049023x22001212

9. Adhikari S, Rijal S, Acharya PK, Sharma BP, Ansari I, Rajbhandari P, et al. Hospital incident command system, the pillar of COVID-19 outbreak response: An experience from Patan Hospital, Nepal. Journal of Patan Academy of Health Sciences. 2020 May 8;7(1):80–4. doi: https://doi.org/10.3126/jpahs.v7i1.28872

10. Hegarty H, Knight T, Atkin C, Kelly T, Subbe C, Lasserson D, et al. Nurse staffing levels within acute care: results of a national day of care survey. BMC Health Serv Res. 2022 Dec;22(1):493.doi: https://doi.org/10.1186/s12913-022-07562-w

11. Provincial Comparison of Development Status in Nepal: An Analysis of Human Development Trend for 1996 to 2026 | Journal of Management and Development Studies [Internet]. [cited 2024 Apr 23]. [Article]

12. Nepal Census 2011 District Profiles (Demography) - Humanitarian Data Exchange [Internet]. [cited 2024 Apr 23]. Available from: https://data.humdata.org/dataset/nepal-census-2011-district-profiles-demography?

13. seismic-design-of-building-in-nepal.pdf [Internet]. [cited 2024 Apr 23].[Download PDF]

14. Mangla D. Importance of Preventive Maintenance [Internet]. Rochester, NY; 2023 [cited 2024 Apr 23]. [Article]

15. Shrestha A, Bajracharya S, House DR. Triage, Surge Capacity, and Epidemic Emergency Unit: An experience from the 2019 dengue outbreak at a Tertiary Care Centre. JNMA J Nepal Med Assoc. 2020 Apr 30;58(224):272–5.doi: https://doi.org/10.31729/jnma.4771

16. Tam HL, Chung SF, Lou CK. A review of triage accuracy and future direction. BMC Emerg Med. 2018 Dec 20;18(1):58.doi: https://doi.org/10.1186/s12873-018-0215-0

17. Tracie A. ASPR TRACIE Technical Assistance Request. [Web Link]

18. Landry MD, Sheppard PS, Leung K, Retis C, Salvador EC, Raman SR. The 2015 Nepal Earthquake(s): Lessons Learned From the Disability and Rehabilitation Sector's Preparation for, and Response to, Natural Disasters. Phys Ther. 2016 Nov;96(11):1714–23.doi: https://doi.org/10.2522/ptj.2015067