

# Challenges Faced by Hilly Hospitals During Covid-19 Second Wave Disaster: Quantitative Study in Garhwal Region, Uttarakhand

Vidushi Bhandari<sup>1</sup>, Arti Rauthan<sup>1\*</sup>, Khatib Sayeed Ismail<sup>2</sup>, Asaduddin Mohammed<sup>2</sup>, Abhishek Chauhan<sup>3</sup>

<sup>1</sup>Department of Public Health, Himgiri Zee University, P.O. Sherpur, Chakarata Road, Dehradun- 248197, India

<sup>2</sup>Department of Biology, College of Science, Jazan University, Jazan, Saudi Arabia

<sup>3</sup>Amity Institute of Environmental Toxicology, Safety, and Management, Amity University, Noida, U.P., India

Email: aartirauthan@gmail.com

DOI: 10.47750/pnr.2022.13.S10.119

## Abstract

Covid -19 second wave was considered a disaster in India as it was more havoc than the first one. Shortness of breath in patients leads to more demand for oxygen and hospitalization. So, there was a challenge for the hospitals to combat this disease. In the covid second wave, moderate to severe cases were treated at three hospital levels (CHC, Sub-district, and District hospital). This disease was not limited to bigger cities but spread to rural and hilly areas. We conducted quantitative research among government hospitals in five hilly districts of Uttarakhand at three levels of hospitals. Data were collected from a close-ended questionnaire using a judgmental sampling technique and analysed with the help of tables and bar charts. Questions were set based on the pilot study. The challenges explored through this study were divided into five main headings and eleven sub-headings. The main headings were Manpower, Surge capacity, logistics, coordination, and management of non-covid patients. Sub-headings were a shortage of medical staff, shortage of paramedical staff, shortage of sweepers, shortage of ambulance drivers, shortage of ICU beds, shortage of oxygen beds, shortage of covid drugs (Remdesivir and Steroids), oxygen cylinders, PPE kits, difficulty in coordination with staff and difficulty in managing non- covid patients.

**Keywords:** Covid-19 second wave; Hilly hospitals; disaster; challenges; levels of the hospital.

## 1. INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), the cause of the coronavirus disease 2019 pandemic, is the worst challenge for a century for international health and financial systems.[13] India has experienced three waves of Covid-19. The second one was the deadliest. It proved to be a disaster as it came for a short duration but was lethal. It started in the March end and declined in May end. Covid19 second wave emerged more lethal as more moderate and severe cases required urgent hospital admission. This unexpected increase in patients demanded medical attention. On 30 January 2020 WHO announced that Covid-19 was the sixth global health emergency. Till December 2020, 64 million people worldwide have been affected by this disease and the global economy has experienced the loss of more than \$1trillion [12]. "Some of the hospital Challenges during the covid-19 pandemic were the difficulties in maintaining adequate staff (specialized providers and support staff), maintaining and expanding hospital capacity, ventilator shortage, shortages of the items that support patients' rooms, thermometers, disinfectants, and cleaning supplies. Higher costs and decreased revenue had affected the hospitals" [2].

There were more severe cases in the second wave than the first one, so the demand for an ICU setup increased. During the second wave, an increase in ICU admissions led to many challenges: insufficiency of ICU bed capacity, equipment, staffing in ICU, and staff training [5].

Patients with diabetes are at higher risk for severe illness from Covid-19 [11]. Globally, India ranks second after China in diabetes.

Delta variant, a double mutant virus, drove the second covid wave and was first identified in India in December 2020. It was highly contagious and deadly. A Chinese study reported that viral loads in Delta infections were 10000 times higher than other

variant infections. A severe symptom in this variant was Shortness of breath which had increased the demand for oxygen and hospitalization in the country. Due to its highly contagious nature, it spreads very fast to urban cities and hilly states like Uttarakhand, which lies on the Himalayas. Eighty-six percent of Uttarakhand is mountainous.

Uttarakhand State has two regions, Garhwal and Kumaon. It has thirteen districts. Garhwal region has seven districts, two are plain, and the rest five come under the hilly area. According to the Niti Aayog health index report for 2019-20, Uttarakhand ranked 15th among 21 large states. The health facilities in Uttarakhand were not adequate compared to other large states. So, it was a massive challenge for the state health system to manage covid patients. The state health system includes sub-centres, Primary health centres (PHC), Community Health centres (CHC), sub-districts, District and Base hospitals.

National Health Mission had allocated funds to support the preparedness and prevention related function in states for management of covid-19 under the entitled “India Covid-19 Emergency Response and Health Systems Preparedness Package”. Their objective was to support the states to establish pediatric units in all 736 districts of the country for pediatric Covid-19 management, support in increasing bed capacities in CHC’s and PHC’s, increase the availability of Intensive care units for better management of Covid-19, enhance the availability of medical oxygen in in public health care system, increase access to ambulance services, enhance testing capacity, support the states in implementation of hospital management information system and strengthen tele - consultation platform [9].

Uttarakhand's population is 0.8 of India's population. Based on Uttarakhand health departmental data, Uttarakhand ranked highest in death numbers in the first 20 days of May 2021 since the second wave of COV-19 began. Between March 1, 2021, and May 2021, the state estimated that 5600 deaths occurred.

WHO released the checklist which has twelve components to manage COVID-19 in a hospital setting. They are leadership and incident management system, coordination and communication, surveillance and information management, risk communication and community engagement, administration finance and business continuity, human resources, surge capacity, continuity of essential support services, patient management system, occupational health, mental health and psychosocial support, rapid identification and diagnosis, infection prevention and control.

Indian Ministry of Health and Family Welfare provided the six checklists the covid-19 facility, SOP to manage emerging infectious diseases, availability of Rapid Response Team(RRT), roles and responsibilities of RRT, contingency plan, monitoring & managing health care personnel and training of healthcare personnel[8].

Kumar et al. (2020) described the status of rural hospitals. His study states that rural hospitals in the hilly states usually struggled with a shortage of doctors, hospital beds and equipment, and poor infrastructure. So, this pandemic has created a massive challenge and opportunity to strengthen and improve the health system of rural India [5].

Malik (2021) exposed the weakness of the Indian health system through WHO's six building blocks. The unexpected rise of cases lead a shortage of medical supplies such as essential drugs, medical oxygen, and ICU beds. Due to their poor logistics and low-level equipment, many states have failed to obtain the oxygen supply and transfer it from one place to another. A massive challenge in this pandemic was mobilizing the resources and delivering the services in a short time. Lack of financial resources became the barrier to accessing health services [10].

S.Ghosh et al. (2021) state a disproportion between health facilities and patients during the second wave. This wave has disclosed the ignored issues[1].

K M Griffin et al.(2020) explained in his study that challenges like ICU surge capacity, Staffing, operational challenges, staff wellness faced by New York City hospitals during Covid-19 was overcome through interdisciplinary collaboration and iterative surge planning.

Krishnan et al. (2022) observed in his study that proper planning based on various government guidelines and modifiable initial layout is effective in the prevention and management of the pandemic.

M Gul et al. (2021) had proposed an integrated approach to evaluate the hospital preparedness against Covid-19 pandemic.

M Zhang et al. (2020) has analyzed in his study that 89% of healthcare workers had sufficient knowledge of Covid-19, more than 85% feared self-infection with virus and 89.7% had followed the correct practices regarding Covid-19.

The scope of this paper is to highlight significant issues faced at three hospital levels during the covid second wave, understand their importance, and discuss the reasons behind their shortage.

## 2. Methodology

### 2.1 Study Approach

We conducted quantitative research in the Garhwal region of Uttarakhand from October 2021 to December 2021. We did a pilot survey of five hospitals to understand the hospital issues faced during the covid second wave. A close-ended questionnaire was constructed based on a pilot study.

### 2.2 Population Size and Sample Size

There are seven districts in the Garhwal region, out of which two are plain, the rest five are hilly. CHC, Subdistrict and District hospitals of Pauri, Chamoli, Tehri, Rudraprayag, and Uttarkashi form the population for this study (see table1). We have excluded PHC and sub-center from this study.

**Table 1.** Health Infrastructure in Garhwal Region

Garhwal Hilly District	CHC (Community Health Center)	Sub-District Hospital (SDH)	District Hospital (DH)
Chamoli	CHC Gairsain	SDH Karanprayag	DH Gopeshwar
	CHC Ghat		
	CHC Pokhari		
	CHC Joshimath		
	CHC Tharali		
Tehri	CHC Chamba	Sridev Suman SDH Narendra Nagar	DH Baurari
	CHC Khari		
	CHC Pratapnagar		
	CHC Thathyur		
	CHC Kirtinagar		
	CHC Devprayag		
	CHC Beleshwar		
	CHC Hindolakhil		
Pauri	CHC Ghandiyal	SDH Kotdwar	DH Pauri
	CHC Thalishain		

	CHC Rikhnikal		
	CHC Bironkhal		
	CHC Nainidanda		
	CHC Pabau		
Uttarkashi	CHC Purola		DH Uttarkashi
	CHC Naugaon		
	CHC Barkot		
	CHC Chinyalisain		
Rudraprayag	CHC Jakholi		DH Rudraprayag
	CHC Augustmuni		
	CHC Okhimath		
Total	26	4	5

Population size of this study was 35. We used the Cochran's formula to find sample size.  $n_0 = Z^2pq/e^2$

$n_0 = (1.96)^2 \times 0.5 \times 0.5 / (.005)^2 = 385$ . Then put 385 in target population using formula

$$n = n_0 / 1 + (n_0 - 1) / N$$

$$385 / 1 + 384 - 1 / 35 = 32.$$

So, the sample size calculated for this study was 32.

### 2.3 Data Collection

We used the Judgmental Sampling technique to collect the data collection from 32 hospitals (see Table2).

CHC	23	71.9%
Sub-district hospital	4	12.5%
(District Hospital	5	15.6%

We divided the collected data into five main and eleven subheadings. The main headings were Manpower, Surge capacity, Logistics, coordination, and management of non-covid patients. Medical staff, paramedical staff, trained ICU staff, support staff (sweepers, ward boys), ambulance drivers, oxygen beds, ICU beds, PPE kits, covid drugs (Remdesivir, Steroids, etc.) oxygen cylinders were sub-headings.

### 3. Result and Discussion

We entered collected data from 32 hospitals (23 CHCs, 4Sub-district, and 5district hospitals) into an excel sheet to analyze the challenges in three levels of hospitals. (refer table3, table4, table5)

<b>Table 3. Challenges at CHC during Covid-2</b>			
Challenges	Total CHCs	Responded yes	Responded No
Medical staff	23	15	7
Paramedical staff	23	16	6
Sweepers/ward boys	23	23	0
Ambulance driver	23	7	15
Provision of ICU	23	1	22
ICU staff	23	1	22
ICU beds	23	1	22
Oxygen beds	23		
Oxygen cylinder	23	17	5
Remdesivir and Steroids	23	15	7
PPE kits	23	0	23
Coordination with staff	23	4	19
Non- covid patient suffered	23	21	2

Significant challenges faced by CHCs were Sweepers/ ward boys and medical and paramedical staff shortages. Difficulty in managing non-covid patients and deficiency of oxygen cylinders were the critical issues faced by CHCs.

<b>Table4. Challenges at Sub-District Hospitals during Covid-2</b>			
Challenges	Total Sub-District	Responded yes	Responded No
Medical staff	4	4	0
Paramedical staff	4	4	0
Sweepers/ward boys	4	4	0
Ambulance driver	4	1	3
Provision of ICU	4	4	0
ICU staff	4	4	0
ICU beds	4	4	0

Oxygen beds	4	2	2
Oxygen cylinder	4	3	1
Remdesivir and Steroids	4	1	3
PPE kits	4	0	4
Coordination with staff	4	3	1
The non- covid patient suffered	4	3	1

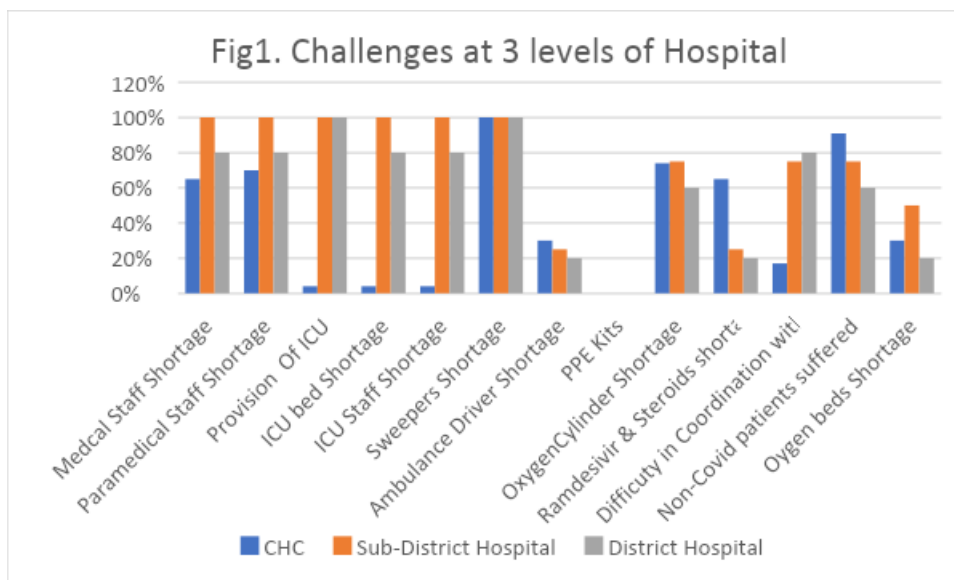
Significant challenges faced by Sub-district hospitals were lack of medical, paramedical staff, sweepers/ward boys, ICU staff, and oxygen cylinders. Poor coordination with staff and managing non-covid patients were the big challenge for Sub-district hospitals.

**Table5.** Challenges at District Hospitals during Covid-2

Challenges	Total Sub-District	Responded yes	Responded No
Medical staff	5	4	1
Paramedical staff	5	4	1
Sweepers/ward boys	5	5	0
Ambulance driver	5	1	4
Provision of ICU	5	5	0
ICU staff	5	4	1
ICU beds	5	4	1
Oxygen beds	5	1	4
Oxygen cylinder	5	3	2
Remdesivir and Steroids	5	1	4
PPE kits	5	0	5
Coordination with staff	5	4	1
Non- covid patient suffered	5	3	2

Significant challenges faced by district hospital were sweepers/ ward boys, medical, paramedical staff, ICU bed shortages, and lack of coordination with staff and managing non -covid patients.

Analysis of Challenges faced by CHC, Sub-district, and District hospitals was depicted in the bar diagram. (refer to fig1)



### 3.1 Manpower

Health workers are the backbone of the health system. Doctors and paramedics are always an integral part of the hospital. In this pandemic, doctors, paramedical, and support staff like ward boys and sweepers played a significant role. Sweeper's work starts from cleaning the hospital and patient's waste to wrapping the dead bodies. A coronavirus affected many health workers, which led to a shortage in their numbers. In any emergency, an ambulance is the need of the hour. In covid times, an ambulance helps move patients from one hospital to another. In the covid situation, the hospital was overburdened with patients, leading to a shortage of ambulance drivers. Their need affected the ambulance services.

Hospitals increased their bed capacity to overcome the advanced cases, but sweepers/ ward boys numbers remained the same. This disturbance in bed and sweepers ratio led to a need for sweepers and increased their workload. There was a need for specialist doctors and trained ICU staff. During covid times, ICUs ran without specialist doctors and insufficient nursing staff.

The workforce shortage was due to an unexpected rise in cases, disproportion of bed numbers and workforce, and vacant specialist doctors and ICU nursing staff posts.

Shortage of workforce was analysed in thirty-two hospitals and found that lack of sweepers/ward boys/Ayas was the significant issue faced. There were ten ICU hospitals, out of which nine ICU hospitals need ICU staff. ( see table 5, table 6, table 7, table 8 )

**Table 5.** Shortage of paramedical staff during Covid-2

Participants	Yes	No	Percent
32	24	8	75.0

**Table 6.** Shortage of sweepers/ ward boys/ward ayas

Participants	Yes	No	Percent
32	32	0	100.0

Table 7. Shortage of ambulance drivers during Covid-2

Participants	Yes	No	Percent
32	9	23	71.9

Table 8. Shortage of ICU staff during Covid-2

Participant	Yes	No	Not Applicable	Percent
32	9	1	22	90.0

### 3.2 Surge Capacity

Surge capacity means increasing the available size. An increase in bed numbers led to increased work pressures on the workforce. There was a steep increase in cases during this pandemic, so hospitals had increased their bed number but failed to increase other resources. This disproportion of bed numbers and other resources led to a deficiency.

Due to fewer ICUs, patient loads were more in these setups. Limited ICU couldn't bear the overburden of severe patients, which led to the shortage. Running the ICU with limited resources was a challenge for the hospital.

Analysis of surge capacity of ICU beds and Oxygen beds of all thirty-two hospitals found that ten hospitals had the provision of ICUs. Out of which nine hospitals had faced a shortage of ICU beds. Ten hospitals had faced a lack of oxygen beds. (see table 9, table 10)

Table 9. Shortage of ICU beds during Covid- 2

Participant	Yes	No	Not Applicable	Percent
32	9	1	22	90.0

Table 10. Shortage of oxygen beds during Covid-2

Participants	Yes	No	Percent
32	10	22	31.3

### 3.3 Logistics

The second wave was driven by moderate to severe covid cases. These cases led to a massive demand for oxygen. There were supplies of half-filled oxygen cylinders to the hospital to meet their need and make a profit. Due to the huge chaos of oxygen,



cylinders were not adequately checked. So, the arrival of half-filled cylinders and the overburden of patients led to a shortage of oxygen.

During covid second wave, drugs like Remdesivir and steroids were in need. Their lack led to high pricing and blackmarking, which led to shortages. Unlike 1st wave, there was no shortage of PPE kits in Covid-2. There was an abundant supply of PPE kits, gloves, sanitizers, and masks in the hospital. This study showed the shortage of Remdesivir and Steroids mostly in CHCs. During Covid-2, Remdesivir and steroids were first supplied in districts and Sub-district hospitals than CHCs. So, less supply of these drugs to CHCs led to a shortage of these drugs. In the case of oxygen cylinders, its demand was almost the same at all three levels of the hospital.

The shortage of logistics in 32 hospitals was analysed, and it found that 17 hospitals had faced a shortage of Remdesivir and steroids, and 23 hospitals had an insufficiency of oxygen cylinders. (see table 11, table12)

Table 11. Shortage of Remdesivir and steroids during Covid2

Participants	Yes	No	Percent
32	17	15	53.1

Table 12. Shortage of oxygen cylinders during Covid-2

Participants	Yes	No	Percent
32	23	9	71.9

### 3.4 Management

Management has a significant impact on the functioning of the hospital. Proper planning helps in smooth functioning and avoids any hassles during emergencies. It had observed that government hospitals didn't have well-established management systems like private hospitals. Govt. hospitals had documented HIRS (hospital Incident Response System) but failed to implement it during emergencies. During covid, poor coordination of staff was observed. A staff shortage and new appointments during covid led to chaos and poor coordination with the team. So, it was a big challenge for the hospital to maintain coordination among staff.

Management issues were analysed in thirty-two hospitals and found that eleven hospitals had poor coordination with staff. (see table13)

Table 13. Coordination issues with staff during Covid-2

Participants	Yes	No	Percent
32	11	21	34.4

### 3.5 Management of Non-Covid patients

In Garhwal hilly region, there are no private hospitals. People are dependent on government hospitals. During the covid second wave, facilities for non-covid patients were made limited. Cesarean and other surgeries were being closed. Only OPDs were opened. Non-Covid had suffered a lot during this pandemic. Mostly Resources were made for Covid patients. A separate facility was created for non-covid. A particular area for pathological testing for non-covid and covid in limited space was a challenge

for the hospital. Staffing and managing with limited resources in covid and non-covid departments was a big challenge for Hospital Administration.

Management of non -covid patients was analysed in thirty-two hospitals and found that non -covid had suffered in twenty-seven hospitals during Covid-2. (see table14)

Table 14. Non -Covid patients suffered during Covid-2

Participants	Yes	No	Percent	
32	27	5	84.4	84.4

#### 4. Conclusion

Human resources, surge capacity, logistics, and management form the four pillars for the smooth functioning of the hospital. If one of the pillars gets shaken, it will disturb its functioning. If all four pillars get shaken, it will bring a disaster. Covid -19 second wave was an example of this disaster.

Shortage of workforce was always the issue of hilly hospitals. Earlier shortage of Manpower was considered only to be medical and paramedical staff. All three levels of the hospital faced a shortage of support staff like sweepers, ward boys, etc. Role of sweepers and ward boys were always ignored. This paper highlighted that the shortage of sweepers was the biggest challenge for all hospitals. More support staff vacancies (sweepers/ward boys) should be recruited. Vacant posts of specialist doctors should be filled. This paper also highlights the sufferings of non-covid patients during covid times and the challenge for hospitals to continue services for noncovid patients in limited space during covid times. ICUs were not fully functional. They were running with insufficient ICU staff. Medical and paramedical staff should provide ICU training to minimize their shortages. ICU Training should be sufficient, including practical and theoretical. Shortage of oxygen cylinders was a big challenge in logistics. This pandemic wave showed attention to healthcare needs and allowed the health system to strengthen it. So strong measures should be taken to improve the healthcare system and make it more resilient. There is a need to enhance the Hospital Administration system so that proper planning and assessment can be done and the next pandemic wave wouldn't be a disaster.

#### REFERENCES

1. Ghosh, S., Moledina, N., & Ghosh, A. (2021, June 2). Colossal challenges to healthcare workers combating the second wave of coronavirus disease 2019 in India. *Infection Control and Hospital Epidemiology*, 1-2. doi:10.1017/ice.2021.257
2. Griffin KM, Karas MG, Ivascu NS, Lief L. (2020). Hospital Preparedness for Covid- 19: A Practical Guide from a Critical Care Perspective . *Am J Respir CritCare Med*. 1337-1344. doi: 10.1164/rccm.202004-1037CP.
3. Grimm, C. A. (2020). Hospital Experiences Responding to the Covid-19 Pandemic: Results of a National Pulse Survey March 23-27, 2020. <https://oig.hhs.gov/oei-06-20-00300.asp>.
4. Gul M, Yucesan M. (2021). Hospital Preparedness Assessment against Covid-19 Pandemic : A case study in Turkish Tertiary Healthcare Services. *Mathematical Problems in Engineering*. doi:10.1155/2021/2931219.
5. Kumar, A., Koya, S. F., & Nayar, k. R. (2020, November 1). Covid-19: Challenges and its consequences for rural health care in India. *Public Health in Practice*, 1. doi:10.1016/j.puhip.2020.100009.
6. Krishan PK, Topno N, Kumar S S. ((2022). Covid-19 pandemic : Hospital preparedness in a Tertiary care hospital in North East India. *Journal of Family Medicine and Primary Care*. 11 (6):p 2877-2883.
7. Malik, M. A. (2022, March). Fragility and Challenges of health systems in pandemic: lessons from India's second wave wave of coronavirus disease 2019. *Global Health Journal*, 6(1), 44-49. doi:10.1016/j.glohj.2022.01.006.
8. National Centre for Disease Control. (2021). Hospital preparedness and IPC assessment tool for Covid-19. <https://ncdc.mohfw.gov.in>.
9. National Health Mission. (2021). Guidance Note on Preparation of Proposals for “ India Covid 19 Emergency Response and Health Systems Preparedness Package : Phase 11”. <https://www.mohfw.gov.in/pdf/standardOperatingProcedureSOPfortransportingasuspectorconfirmedcaseofcovid-19.pdf>
10. Vijayaraghavan, B. K., Myatra, S. N., Mathew, M., Lodh, N., Divatia, J. V., Hammond, N., Venkatesh, B. (2020, August 28). Challenges in the delivery of critical care in India during the COVID -19 pandemic. *Journal of the delivery of critical care in India during the COVID-19 pandemic*. doi:10.1177/1751143720952590
11. Targher G, Mantovani A, Wang X-B, Yan H-D, Sun Q-F, Pan K-H, Zheng K L, Chen Y-P, MEslam, George J, Zheng M-H. (2020). Patient with Diabetes are at higher Risk for severe illness from Covid-19. *Diabetes Metab*. 46(4), 335-337. doi:10.1016/j.diabet.2020.05.001. Epub 2020 May 13.
12. Siddique F, AbbasR Z Mansoor Khalid M K, Alghamdi E S, Saeed M, Ayaz M M, Rahman Moazur, Mahmood M S, Manzoor M, Hussain I, Javaid A. (2021). An Insight Into Covid-19: A 21st Century Disaster and Its Relation to Immunocompetence and Food Antioxidants. *Frontiers Veterinary*

Science.(7). doi :10.3389/fvets2020.586637.

- 13.Singer D RJ.(2020). Health Policy and Technology Challenges in Responding to the Covid-19 Pandemic. *Health Policy Technology*. 9(2): 123-125.
- 14.WHO. (2020).Rapid hospital readiness Checklist: Interim Guidance.WHO/ 2019-n CoV/ hospital \_readiness\_checklist/2020.2.
15. Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, You.(2020). Knowledge Attitude and Practice regarding Covid-19 among healthcare workers in Henan , China. *J Hosp Infect*.105(2):183-187.