A Multi City Study of Logistics Management & Medical Facilities Provided to Combat COVID-19 Pandemic

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Abstract

The effects of COVID-19 are having a significant impact on the Healthcare sector. The disease is transmitted by direct touch, through contaminated surface or object. Even though no fool proof or most effective medicine or vaccine has been invented to cure COVID-19. Thus, people are infected very fast and it becomes a threat to the health employees who are directly involved. Logistics provided by the government of health play an important role in the lives of the healthcare providers as they can treat the patients without being infected.

The recovery rate of the patient depends on the primary facilities and aid provided by the healthcare sector. During this situation, the health infrastructure, equipment, and heavy amount of logistics were needed to combat the pandemic. The area of study has been done on a state of India that is West Bengal. The study is mainly focus on West Bengal Healthcare Sector. The data on COVID-19 was drawn up from the Government websites provided by West Bengal Health Department. Total positive case, recovery rate, mortality rate, test per confirm case, and percentage distribution of active cases were calculated. Availability of hospital, ICU beds, and ventilators with respect to total active COVID-19 patient was also computed by government sector.

The result revealed that, Kolkata constitutes more than 30% active case in the West Bengal. Highest active cases in West Bengal belong to South 24 Parganas and highest mortality rate was found in Kolkata. About 6246 people are being tested per every million population. Here, the question arises that, the healthcare facilities provided by the West Bengal Health Department is enough or not.

The priority should be the laid-on expansion of more laboratories and hospitals, logistics like PPE, Gloves, Sanitizer, Mask, and indigenously developed vaccines.

1. Introduction

Coronavirus disease 2019 (COVID-19) is defined as illness caused by a novel coronavirus now called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV), It was initially reported to the WHO on 31 December 2019. On 30 January 2020, the WHO declared the COVID-19 outbreak a global health emergency. On 11 March 2020, the WHO declared COVID-19 a global pandemic, its first such designation since declaring H1N1 influenza a pandemic in 2009. (Source: https://www.who.int/emergencies/diseases/novel-coronavirus-2019). Illness caused by SARS-CoV-2 was recently termed COVID-19 by the WHO, the new acronym derived from "coronavirus disease 2019". The name was chosen to avoid stigmatizing the virus's origins in terms of populations, geography, or animal associations.

COVID-19, a highly infectious disease, was first detected in Wuhan, China, in December 2019. The disease has spread to 212 countries and territories around the world and infected (confirmed) more than three million people. The COVID-19 is spreading rapidly, and scientists are endeavouring to discover drugs for its efficacious treatment in the world. COVID-19 is an infectious disease; mostly, infected people will experience mild to moderate respiratory illness, high fever, sore throat, nasal congestion, malaise, headache, muscle pain. Older people, suffering some medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer, are more likely to develop severe illness. Currently, there are no specific vaccines or drugs for COVID-19. Studies suggest that the use of isolation is the best way to contain this epidemic. Thus, countries are racing to reduce the spread of the virus by treating and testing patients, limiting travel, carrying out contact tracing, quarantining citizens, and cancelling large gatherings such as sporting events, concerts, and schools.

The COVID-19 disease surfaced first in December 2019, which is linked to direct exposure to the Huanan seafood wholesale market of Wuhan, China. On January 30, the World Health Organisation (WHO) declared this COVID-19 situation as a Public Health Emergency of International Concern (Kannan et al. 2020). India has reported 95,676 confirmed COVID-19 cases on 17 May 2020. India closed its international borders and enforced an immediate lockdown on 24 March 2020, for 21 days and it further extended until 31 May 2020, which WHO praised as "tough and timely". The government demarcated 130 districts as red zones (Hotspot area), 284 districts as orange zones, and 319 districts as green zones, on 1 May 2020. As the number of COVID-19 positive case is increasing day by day, the study on test rate is important. If a country has fewer cases than expected,

it could be either because the country did a good job to combat against the virus or the country is not testing for the virus well enough. West Bengal experienced the highest death rate from COVID-19, along with the lower testing than major states in India. The reported cases (confirmed, active, recovery, and death) differ across the states because of the wide variation in the testing centres. The number of testing (on people conducted) indicates, some states are farther behind in getting a sense of the outbreak than others. India's testing regime is far from the global standards. The state governments began taking more swab samples, without realizing the limited capacity of laboratories in the states. Many states have sent samples to laboratories outside the state to get faster test result. That is why there is a need to study the current trend of West Bengal in the testing, recovery rates, and fatality rates. Study on active case is important, as they really need health care. Because of geographical and socio-economic diversity in West Bengal, there is a wide variation in health infrastructure. Preparedness and response to COVID-19 is not same at the District level. The implementation of the public health measures to handle the epidemic is difficult in places within adequate hygiene and sanitation and overcrowded living conditions. (https://www. medrxiv.org/content)

2. Review of Literature

A brief review of literature has been done of the latest research work done in the area of COVID-19 and is given as below. Singla, Singla, and Singla (2020) discusses about how that the coronavirus pandemic that has originated in Wuhan province of China has brought the whole world on its knees. Despite many scientific advancements since 1900s in the field of Medicine, the world remains clueless of controlling this pandemic. USA remains on top with the highest number of cases and counting while the rest of the world is also not far behind. To understand about corona virus disease, we did an extensive research of literature and have summed up our findings in our article. SARS-CoV-2 also known as COVID-19 gains entry via nasopharyngeal route where it attaches itself with the help of ACE 2 receptor thus causing infection. It most commonly affects lungs followed by heart, kidney, and liver. Most of the cases present with fever, dry cough, shortness of breath, and loss of taste and smell among other manifestations. RT-PCR remains the investigation of choice. Social distancing, practising hand hygiene, and use of facemask have been advocated. Many of the drug trials are under way with recent FDA approval of Remdesivir. Use of HydroxyChloroquine has been debated. However, trials are underway for a more definite conclusion. The world is fast tracking the approval of vaccine with many of the vaccines in various stages of trials. Key words- Corona Virus, COVID-19, ACE 2, Lung, Heart, RT-PCR, Social distancing, Vaccine.

Mediawati, Susanto, & Nurahmah (2020) reported in Wuhan, Hubei Province. The source of transmission of this case is still unknown, but the first case was linked to the fish market in Wuhan. At the end of December 2019 there were five patients treated with Acute Respiratory Distress Syndrome (ARDS). By early January 2020, ARDS cases were accelerating with the discovery of 44 new cases and had spread in China and outside China such as Japan and South Korea, until the end of 2 April 2020, there were 896,450 positive cases of

COVID-19 and 45,526 deaths in all over the world. Meanwhile, in Indonesia 1,790 cases have been established with positive COVID-19 and 170 deaths. The COVID-19 mortality rate in Indonesia is 9.5%, this figure is the highest in the world. The first COVID-19 was reported in Indonesia on 2 March 2020 in a number of two cases. The paper focuses on the characteristic and pattern of transmission of Corona virus that has been obtained and studied from several reputable journals and other reliable sources.

Sahoo, Mandal, Mishra, and Banerjee (2020) have reported that COVID-19 is spreading rapidly across the country but India's testing regime is far from the global standards. It is important to identify the states where testing needs expansion and the magnitudes of active COVID cases are higher focusing on current health infrastructure to meet the pandemic. The data on COVID-19 was extracted from the Application Programming Interface. Test positive rate, test per confirmed case, recovery rate, case fatality rate, and percent distribution of active cases were computed. Availability of hospitals, hospital beds, intensive care unit, and ventilators per lakh population was also computed by public and private sector. The result revealed that, Maharashtra constitutes more than one-third positive cases in the country. More than a quarter of the active cases in India belonged to the Mumbai district of Maharashtra, followed by the Chennai district (9.4%) and Ahmedabad district (9.1%). Further, about 40% of the active cases in India belonged to the 11 districts of Maharashtra. The increased test positive rate in Maharashtra and Gujarat to almost double in last one month is a concern. In order to bring the states and the country in right track, the test positive rate need to be

brought down to below 2%. The procurement of higher number of high throughput machine, the Cobas 6800 testing machine, is need of the hour. Only few states have adequate health infrastructure. The priority should be the laid-on expansion of more laboratories and hospitals, storage of PPE kit, testing kit, and indigenously developed vaccines.

Patwardhan (2020) informed that SARS-COV-2 has stopped the world in its footsteps and a third of the population has been forced to stay at home. A comparative study of the performance of states of India, in curbing the spread of the disease, that are most affected by the pandemic is presented here. This has been done, based on the data collected between 14 March 2020 and 17 April 2020. This has been done by comparing the smoothened time series and percentage changes along with change point detection of the daily-confirmed cases. The core people have developed ARIMA (p,d,q) models where (p,d,q) are obtained by minimising the AIK (Akaike Information Criterion). These models are used to make the forecasts for the country that report, by 7 May 2020, India would have around 50,237 confirmed cases and a doubling rate of 11 days. Based on the performance, of each state, the argument that a local level strategy that is based on the demographics of that particular region be developed instead of a central and uniform one is in the offing.

In India, the disease was first detected on 30 January 2020 in Kerala in a student who returned from Wuhan. The total (cumulative) number of confirmed infected people is more than 769,052 until now across India (8 July 2020). Most of the research and newspaper articles focus on the number of infected people in the entire country. However, given the size and diversity

of India, it may be a good idea to look at the spread of the disease in each state separately, along with the entire country. For example, currently, Maharashtra has more than 223,724 confirmed cumulative infected cases, whereas West Bengal has more than 24,757 confirmed infected cases (8 July 2020). The approaches to address the pandemic in the two states must be different due to limited resources. In this paper, there is an attempt to focus on the infected people in various cities of West Bengal.

3. Methodology

3.1. Objectives of the Study

- To analyse the total number patients of infected with COVID-19, Recovery rate, Active patient, mortality rate in West Bengal.
- To understand the Logistics provided by the West Bengal health and welfare department.
- To analyse the logistic and medical supply to the Hospitals, to treat patients with COVID-19 in West Bengal.
- To study the relationship between logistic and medical supply to the Hospitals by the Government of West Bengal and the recovery rate of COVID-19 patients.
- To study the recovery rate of COVID-19 patients in comparison to total number of such patients.
- To study the mortality rate of COVID-19 patients in comparison to total number of such patients.
- To analyse the number of people tested per million, Quarantine Centre, Test Lab Centre in West Bengal.

3.2. Sampling Size

The plan adopted for the analysis is based on survey and secondary data source, which has been sourced from State Ministry of Health & Family welfare, Government of West Bengal.

3.3. Data Collection

The data collected from secondary source. The sources are Government health portal/ website, e-newspapers, journals, along with brochures, and discussions with personnel of West Bengal Health & family Welfare.

3.4. Tool used for Analysis and Hypothesis Testing

To conduct the statistical analysis of the data collection, SPSS software is used. The tool for hypothesis testing is the cross tabulation and co-relation. The results of the analysis have been tabulated in the chapter of analysis and interpretation of data.

3.5. Analysis of Results

The analysis of results has been split into the following broad areas. Each of the areas has been briefly discussed in relation to the tables (provided at the end of this paper), along with their graphs. The broad areas are

A. Discharged, Active Cases and Death of Patients by COVID-19 in West Bengal.
B. Discharge, Active Cases, Death of Patients in COVID-19 (District wise) up to 7th July.
C. Discharge, Active Cases, Death of Patients in COVID-19 (District wise) on 7th July
D. Occupancy, vacant, number of ICU and Ventilator bed availability status

of Government declared Hospitals for COVID-19 until 7th July.

E. Bed occupancy, vacant, availability status of Govt. Declared Hospitals for COVID-19 until 7th July (District Wise).

F. Total bed, number of ICU and Ventilator bed availability status of Govt. Declared Hospitals for COVID-19 until 7th July (District Wise).

G. Overall COVID-19 Test, Total Sample Tested, Cumulative Sample Tested by Govt. of West Bengal Health for COVID-19.

H. Overall Institutional Quarantine, Home Quarantine, and Quarantine status for Migrant returnees in West Bengal up to 7th July.

I. Relationship between Recovery Rate and logistics provided by Govt. of West Bengal Health to combat COVID-19.

A. Discharged, Active Cases and Death of Patients by COVID-19 in West Bengal.

First part of the Table 1 (i.e., Number of Patients until 7th July) represents that out of the total number of patients affected by COVID-19, the discharges of the recovered patients are at 66%, the active number of COVID-19 is at 31% and 3% of these patients have died. In the same line, from the second part of the table (i.e., Number of

Patients on 7th July) out of the total number of patients affected by COVID-19, the discharges of the recovered patients are at 51%, the active number of COVID-19 is at 47% and 2% of these patients have died.

We can interpret that majority/more than half of the COVID-19 patients have recovered till 7th July and also on 7th July also recovery rate is high (i.e., 51%) compared to the number of active patients and those who have died.

B. Discharge, Active Cases, Death of Patients in COVID-19 (District wise) up to 7th July.

Table 2 represents that out of total number of patients in Alipurduar, Coochbehar, and Darjeeling district affected by COVID-19, the discharge of the recovered patients are at 96%, 98%, and 68% respectively, active numbers of COVID-19 are at 4%, 2%, and 31% respectively and only 1% have died in Darjeeling, no patients died in the other two districts.

In the district of Kalimpong, Jalpaiguri, and Uttar Dinajpur out of total number of patient affected by COVID-19, the discharge of the recovered patient are at 93%, 81%, and 85% respectively, active number of COVID-19 are at 5%, 18%, and 15% respectively and 2% have died in Kalimpong

TABLE 1. Status of patients till 7th July and on 7th July.

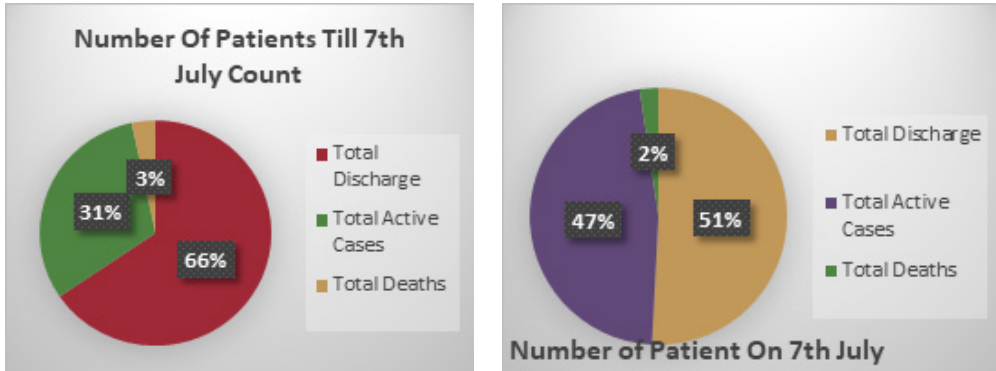| Overall COVID-19 status	Number of patients till 7th July		Number of patient on 7th July	
	Count	% Of total	Count	% Of total
Total discharge (after being cured)	16,228	66%	501	51%
Total active cases	7705	31%	462	47%
Total deaths	824	3%	23	2%
Total COVID-19 cases	24,757	100%	986	100%

FIGURE 1. Status of number of patients until 7th July.

and 1% died in Jalpaiguri, no patient died in Uttar Dinajpur.

In the district of Dakshin Dinajpur, Malda, Murshidabad, and Nadia out of total patient affected by COVID-19, the recovery rate is 85%, 69%, 74%, and 77% respectively. The rate of active number of cases is 15%, 30%, 25%, and 21% respectively. 1%, 1%, and 2% have died in Malda, Murshidabad, and Nadia, no patient died in Dakshin Dinajpur.

In the district of Birbhum, Purulia, Bankura, and Jhargram out of total number of patients affected by COVID-19, the recovery rate is 92%, 77%, 83%, and 76% respectively. The rate of active number of cases are 7%, 23%, 17%, and 24% respectively and only 1% have died in Birbhum, no patients died in the other three districts.

In the district of Paschim Medinipur, Purba Medinipur, Purba Bardhaman, and Paschim Bardhaman out of total number of patients affected by COVID-19, the discharge of the recovered patients is at 83%, 67%, 82%, and 78% respectively. The rate of active number of cases are 15%, 31%, 17%, and 19% respectively and 2%, 2%, 1%, and 3% of these patients have died respectively.

In the district of Howrah, Hooghly, North 24 Pargana, South 24 Pargana, and Kolkata out of total number of patients affected by COVID-19, the discharge of recovery patients is at 71%, 71%, 58%, 55%, and 59% respectively. The rate of active number of patients 26%, 27%, 39%, 43%, and 35% respectively and 3%, 2%, 3%, 2%, and 6% of these patients have died respectively.

We can interpret that majority of the patients of Coochbehar district have recovered (i.e., 98%) compared to the number of active patients and those who have died. We can also conclude that most of patients are active in South 24 Parganas (i.e., 43%) compared to total patient and highest mortality rate is in Kolkata (i.e., 6%) compared to total patient.

C. Discharge, Active Cases, Death of Patients in COVID-19 (District wise) on 7th July

Table 3 represents that out of total number of patients on 7th July in Alipurduar, Coochbehar, and Darjeeling district, the admission of new patients affected by COVID-19 are 1,1 and 32 respectively, and the discharge of recovered patient in Alipurduar and Darjeeling is 5 and 32

TABLE 2. Status of recovered, death, and active cases.

District	Total cases	Recovered cases		Death cases		Active cases	
		Count	% Of recovery over total case	Count	% Of death over total case	Count	% Of active case over total case
Alipurduar	191	184	96%	0	0%	7	4%
Coochbehar	312	305	98%	0	0%	7	2%
Darjeeling	716	482	68%	10	1%	224	31%
Kalimpong	56	52	93%	1	2%	3	5%
Jalpaiguri	424	345	81%	3	1%	76	18%
Uttar Dinajpur	350	296	85%	1	0%	53	15%
Dakshin Dinajpur	253	214	85%	0	0%	39	15%
Malda	954	661	69%	6	1%	287	30%
Murshidabad	300	222	74%	4	1%	74	25%
Nadia	385	298	77%	8	2%	79	21%
Birbhum (Rampurhat HD)	316	291	92%	3	1%	22	7%
Purulia	114	88	77%	0	0%	26	23%
Bankura (Bishnupur HD)	286	238	83%	0	0%	48	17%
Jhargram	25	19	76%	0	0%	6	24%
Paschim Medinipur	427	356	83%	7	2%	64	15%
Purba Medinipur (Nandigram HD)	458	309	67%	7	2%	142	31%
Purba Bardhaman	202	165	82%	3	1%	34	17%
Paschim Bardhaman	171	134	78%	5	3%	32	19%
Howrah	3398	2415	71%	114	3%	869	26%
Hooghly	1294	922	71%	28	2%	344	27%
North 24 Parganas (Basirhat HD)	4353	2501	58%	144	3%	1708	39%
South 24 Parganas (Diamond Harbour HD)	1726	943	55%	36	2%	747	43%
Kolkata	8046	4788	59%	444	6%	2814	35%
Total	24,757	16,228	66%	824	3%	7705	31%

respectively, while no patient was discharge in Coochbehar.

In Kalimpong, Jalpaiguri, and Uttar Dinajpur and Dakshin Dinajpur district, out of total number of patients the discharge of recovered patients is 1, 16, 13, and 13 respectively. No new patient was admitted in Kalimpong and Dakshin Dinajpur, while in Jalpaiguri and Uttar Dinajpur district 10 and 3 patients has been admitted on 7th July. In Malda, Murshidabad, Nadia, and Birbhum district, the admission of new patients affected by COVID-19 are 45, 6, 10, and 2 respectively. The discharge of recovered patient in Malda, Murshidabad, Nadia is 69, 4, 5 respectively, while no patient was discharged in Birbhum, 2 patients have died in Malda on 7th July.
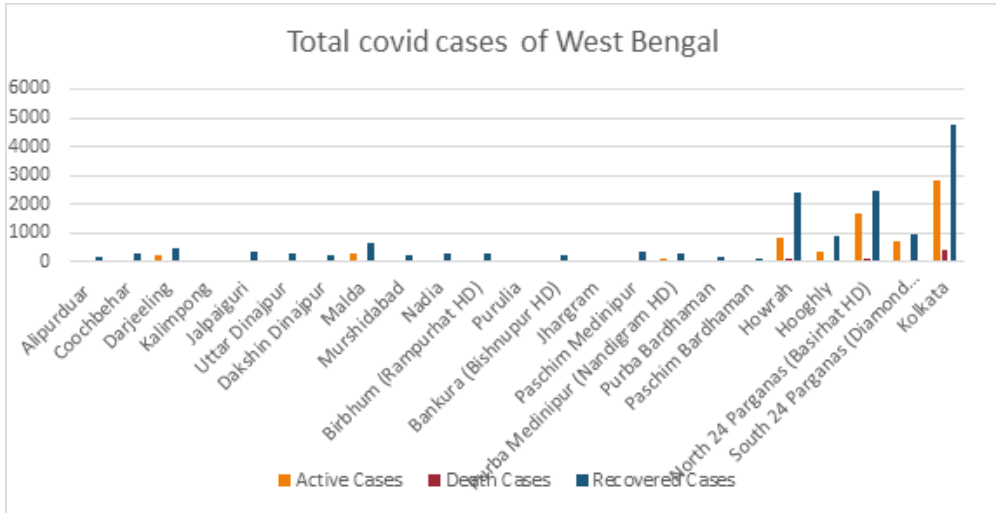
FIGURE 2. Showing the total number of COVID-19 cases across the state of West Bengal until 7th July.

TABLE 3. Status of total number of newly affected, discharged, and death cases.

| District	New cases	Total discharged	Total death
Alipurduar	1	5	0
Coochbehar	1	0	0
Darjeeling	32	42	0
Kalimpong	0	1	0
Jalpaiguri	10	16	1
Uttar Dinajpur	3	13	0
Dakshin Dinajpur	0	13	0
Malda	45	69	2
Murshidabad	6	4	0
Nadia	10	5	0
Birbhum (Rampurhat HD)	2	0	0
Purulia	10	0	0
Bankura (Bishnupur HD)	10	0	0
Jhargram	0	0	0
Paschim Medinipur	2	4	1
Purba Medinipur (Nandigram HD)	10	5	0
Purba Bardhaman	4	2	0
Paschim Bardhaman	6	0	0
Howrah	106	74	5
Hooghly	36	28	1
North 24 Parganas (Basirhat HD)	223	90	6
South 24 Parganas (Diamond Harbour HD)	103	32	1
Kolkata	366	98	6
Total	986	501	23
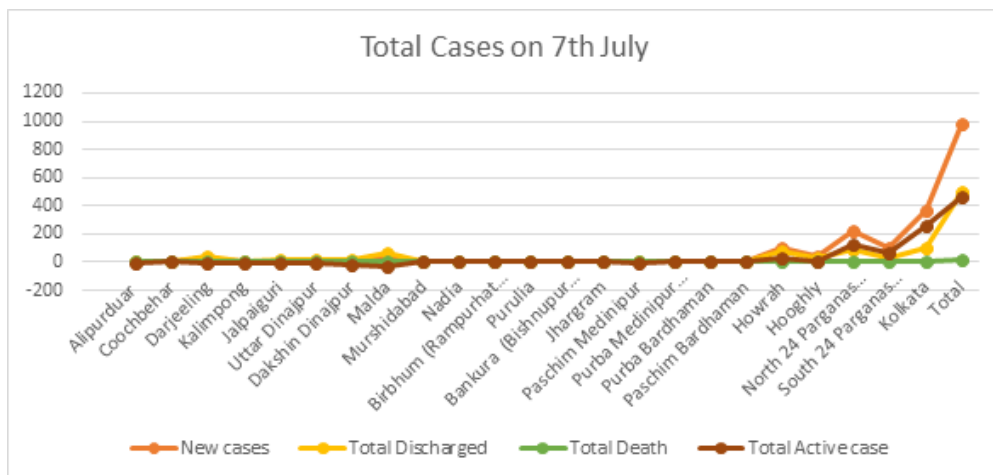
FIGURE 3. Total number of cases on 7th July across the state of West Bengal.

In Purilia and Bankura, 10 new patients were admitted in each district on that day so total active cases increased in each district by 10. In Jhargram, no case was reported on that day. In Paschim Medinipur, Purba Medinipur, and Purba Bardhaman district, the admission of new patients affected by COVID-19 is 2, 10, and 4 respectively and the discharge of recovered patient is 4, 5, 2 respectively. In Paschim Medinipur one patient has died on that day (i.e., 7th July). In Paschim Bardhaman district 6 new cases were reported on that day. In Howrah, Hooghly, and in North 24 Parganas districts the admission of number of new patients affected by COVID-19 is 106, 36, and 223 respectively and the discharge of recovered patient is 74, 28, 90 and 5, 1, 6 patients was died respectively. In South 24 Parganas, Kolkata district 103 and 366 new patients has been admitted whereas 1 and 98 patients were discharged respectively, and 6 patients died in each district.

We can interpret that majority of the new cases on 7th July reported highest in Kolkata and also the number discharged cases were also higher compare to other district. There was no new case reported in Kalimpong, Dakshin Dinajpur, and Jhargram. In Malda total number of active cases on that day decreased the most compare to other district. In North 24 Parganas and Kolkata district highest number of death case were reported on 7th July compared to other district.

D. Occupancy, vacant, number of ICU and Ventilator bed availability status of Government declared Hospitals for COVID-19 till 7th July.

First part of the Table 4 (i.e., earmarked COVID-19 beds) we can interpret that the number of earmarked and occupied beds in Government declared Hospitals dedicated for treating COVID-19 are at 27% and vacant earmarked beds are at 73% out of total number of earmarked beds. In the same line, from the second part of the table (i.e., Infrastructure details) that out of total number of earmarked beds, 9% belongs to

TABLE 4. Status of bed occupancy, vacant, number of ICU & ventilator bed availability.

Status of occupancy and vacant bed in hospitals dedicated for treating COVID-19	Number of bed		Status of ICU & ventilators bed in hospitals dedicated for treating COVID-19	Number of bed	
	Count	% Of total		Count	% Of total
Occupancy in COVID Beds	2908	27%	ICU Beds in the COVID Hospitals	948	9%
Vacant earmarked COVID-19 Beds	7749	73%	Ventilators in the COVID Hospitals	395	4%
Total Bed	10,657	100%	Normal Bed	9314	87%

FIGURE 4. Status of occupied and vacant bed, ICU, and ventilator bed till 7th July.

ICU bed, 4% belongs to Ventilator bed and rest of 87% are normal bed.

We can interpret that the number of serious patients admitted in hospital is less, because the number of occupied beds is less that is 27% of total available bed.

E. Bed occupancy, vacant, availability status of Govt. Declared Hospitals for COVID-19 till 7th July (District Wise).

Table 5 represents that in the Alipurduar, Coochbehar, and Darjeeling district, the number Government declared hospital is 1, 1, and 5 respectively and number of available beds 100, 120, 484 respectively. Out of total number of bed occupied bed 33%, 4%, and 21% respectively. In Kalimpong district, the number of Government declared hospital is 1 and total number of available beds is 150, whereas the number of vacant beds is 100%, there is no patient admitted in the hospital.

In Jalpaiguri and Uttar Dinajpur district, the number of Government declared hospital is 2 and 3 respectively and total number of available beds is 241 and 195 whereas the number of occupied beds is 6% and 25% respectively out of total available bed. In Dakshin Dinajpur district, the number of Government declared hospital is 1 and total number of available beds is 20, whereas the number of vacant beds is 100% so, no patient is admitted in hospital. In Malda, Murshidabad, Nadia, Birbhum district, the number of Government declared hospital is 3, 6, 3, 3 and total number of available beds is 241, 500, 570, 250 whereas the number of occupied beds is 18%, 11%, 10%, 3% respectively out of total available bed. In Purulia, Paschim Medinipur, Purba Medinipur district the number of Government declared hospital is 2, 4, 3, and total number of available beds is 120, 350, 330, and out of total available 4%, 9%, 35% bed is occupied respectively.

In Bankura district the number of Government declared hospital is 2 and total number of available beds is 304, out of total available bed 13% bed is occupied. In Jhargram district, the number of Government declared hospital is 1 and total number of available beds is 75, whereas the number of vacant beds is 100%, there is no patient admitted in the hospital. In Purba Bardhaman, Paschim Bardhaman, Howrah district the number of Government declared hospital is 2, 2, 7 and total number

TABLE 5. Bed occupancy, vacant, and availability status at Govt declared hospitals.

District	Govt. COVID-19 hospital	Number of beds available	Number of vacant beds		Number of occupied bed	
			Count	% Of vacant over available	Count	% Of occupied over available
Alipurduar	1	100	67	67%	33	33%
Coochbehar	1	120	115	96%	5	4%
Darjeeling	5	484	381	79%	103	21%
Kalimpong	1	150	150	100%	0	0%
Jalpaiguri	2	241	226	94%	15	6%
Uttar Dinajpur	3	195	146	75%	49	25%
Dakshin Dinajpur	1	20	20	100%	0	0%
Malda	3	180	147	82%	33	18%
Murshidabad	6	500	447	89%	53	11%
Nadia	3	570	515	90%	55	10%
Birbhum (Rampurhat HD)	3	250	242	97%	8	3%
Purulia	2	120	115	96%	5	4%
Bankura (Bishnupur HD)	2	304	264	87%	40	13%
Jhargram	1	75	75	100%	0	0%
Paschim Medinipur	4	350	319	91%	31	9%
Purba Medinipur (Nandigram HD)	3	330	216	65%	114	35%
Purba Bardhaman	2	220	201	91%	19	9%
Paschim Bardhaman	2	500	482	96%	18	4%
Howrah	7	1239	783	63%	456	37%
Hooghly	7	766	692	90%	74	10%
North 24 Parganas (Basirhat HD)	7	864	690	80%	174	20%
South 24 Parganas (Diamond Harbour HD)	7	1020	917	90%	103	10%
Kolkata	7	2059	539	26%	1520	74%
Total	80	10,657	7749	73%	2908	27%

of available beds is 220, 500, 1239 and out of total available bed 9%, 4%, and 37% bed are occupied respectively. In Hooghly, North 24 Parganas, South 24 Parganas, Kolkata district the number of Government declared hospital is 7, 7, 7, 7 and total number of available beds is 766, 864, 1020, 2059 out of total available bed 10%, 20%,10%, 74% bed is occupied.

We can interpret that the number of occupied beds is high (i.e., 74%) in Kolkata district comparison to other districts. In Kalimpong, Dakshin Dinajpur, and Jhargram district, no patient is admitted in the hospital. In overall scenario a smaller number of patients (i.e., 27%) has been admitted out of 80 Govt. Declared Hospitals for COVID-19.
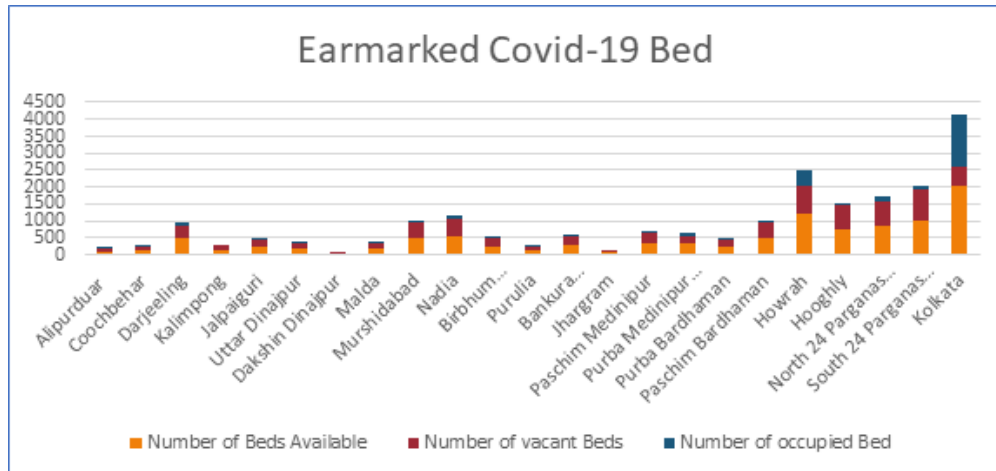
FIGURE 5. Status of earmarked COVID-19 beds in hospitals until 7th July.

F. Total bed, number of ICU and Ventilator bed availability status of Govt. Declared Hospitals for COVID-19 till 7th July (District Wise).

Table 6 represents that in the Alipurduar, Coochbehar, and Darjeeling district, the number of beds in Government declared hospital is 100, 120, 484 respectively. Out of total number of beds 6%, 22%, and 15% beds are available for ICU and 6%, 5%, 8% beds are available with ventilator facility respectively. In the Kalimpong, Jalpaiguri, Uttar Dinajpur district, the number of beds in Government declared hospital is 150, 241, 195 respectively. Out of total number of beds 3%, 2%, and 8% beds are available for ICU and 3%, 1%, 4% beds are available with ventilator facility respectively.

In the Dakshin Dinajpur, Malda, Murshidabad, Nadia district, the number

TABLE 6. Status of Govt hospitals, number of beds & ICU beds, along with ventilators.

District	Govt. COVID hospital	Number of beds available	Number of ICU bed		Number of ventilator & transport ventilator	
			Count	% Of ICU over available	Count	% Of ventilator over available
Alipurduar	1	100	6	6%	6	6%
Coochbehar	1	120	26	22%	6	5%
Darjeeling	5	484	73	15%	40	8%
Kalimpong	1	150	4	3%	4	3%
Jalpaiguri	2	241	4	2%	3	1%
Uttar Dinajpur	3	195	16	8%	7	4%
Dakshin Dinajpur	1	20	4	20%	4	20%
Malda	3	180	14	8%	13	7%
Murshidabad	6	500	76	15%	21	4%

Nadia	3	570	26	5%	10	2%
Birbhum (Rampurhat HD)	3	250	16	6%	4	2%
Purulia	2	120	19	16%	10	8%
Bankura (Bishnupur HD)	2	304	14	5%	12	4%
Jhargram	1	75	8	11%	4	5%
Paschim Medinipur	4	350	14	4%	6	2%
Purba Medinipur (Nandigram HD)	3	330	32	10%	23	7%
Purba Bardhaman	2	220	34	15%	10	5%
Paschim Bardhaman	2	500	94	19%	11	2%
Howrah	7	1239	108	9%	29	2%
Hooghly	7	766	61	8%	21	3%
North 24 Parganas (Basirhat HD)	7	864	57	7%	35	4%
South 24 Parganas (Diamond Harbour HD)	7	1020	98	10%	33	3%
Kolkata	7	2059	144	7%	83	4%
Total	80	10,657	948	9%	395	4%

of beds in Government declared hospital is 20, 180, 500, 570 respectively. Out of total number of beds 4%, 8%, 15%, 5% beds are available for ICU and 4%, 7%, 4%, 2% beds are available with ventilator facility respectively. In the Birbhum, Purulia, Bankura, Jhargram district, the number of beds in Government declared hospital is 250, 120, 304, 75 respectively. Out of total number of beds 6%, 16%, 5%, 11% beds are available for ICU and 2%, 8%, 4%, 5% beds are available with ventilator facility respectively.

In Paschim Medinipur, Purba Medinipur, Purba Bardhaman, Paschim Bardhaman district, the number of beds in Government declared hospital is 350, 330, 220, 500 respectively, out of total number of beds 4%, 10%, 15%, 19% beds are available for ICU and 2%, 7%, 5%, 2% beds are available with ventilator facility respectively. In Howrah, Hooghly, North 24 Parganas, South 24 Parganas district, the number of beds in Government declared hospital is 1239, 766, 864, 1020 respectively, out of total number of beds 9%, 8%, 7%, 10% beds are available for ICU and 2%, 3%, 4%, 3% beds are available with ventilator facility respectively. In Kolkata district, the number of Government declared hospital is 7 and total number of available beds is 2059, whereas the number of ICU bed beds is 7% and the number of Ventilator available bed is 4% out of total available bed.

We can interpret that in Dakshin Dinajpur district the number of ICU beds and ventilator available bed is high (i.e., both 20%) in comparison to other districts. In Jalpaiguri district, number of ICU beds and Ventilator available bed is the lowest (i.e., 2% and 1% respectively) in comparison to other district. In overall scenario, number of ICU beds and Ventilator available bed is 9% and 4% out of 80 Govt. Declared Hospitals for COVID-19.
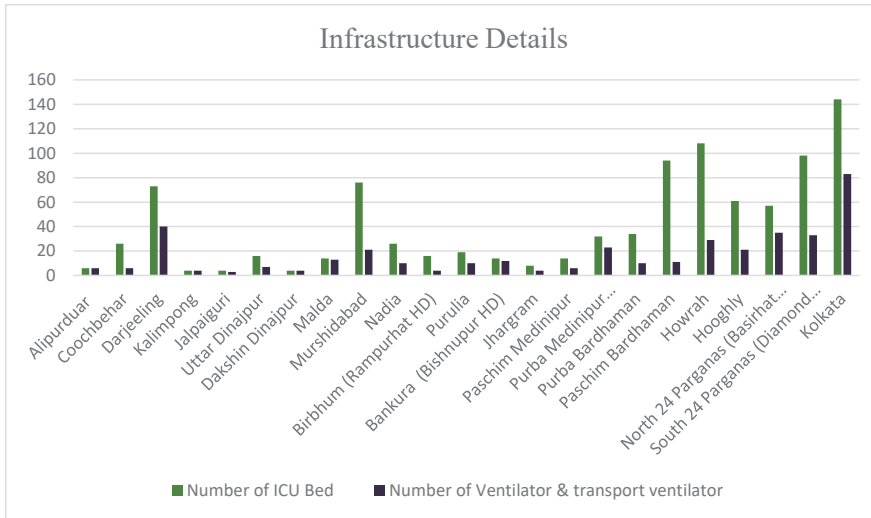
FIGURE 6. Status of bed availability in Govt. Hospitals.

G. Overall COVID-19 Test, Total Sample Tested, Cumulative Sample Tested by Govt. of West Bengal Health for COVID-19.

First part of the Table 7 (i.e., status of tested sample till 7th July) represents that out of the total number of samples tested for COVID-19, the negative report of the tested sample is at 95.56%, positive number of cases is at 4.44%. In the same line, from the second part of the table (i.e., status of tested sample on 7th July) out of the total number of samples tested for COVID-19, the negative report of the tested sample is at 90.50%, positive number of cases is at 9.50%.

We can interpret that in the total sample tested for COVID-19, most of the patient's reports (i.e., 95.56%) were found to be negative till 7th July and on 7th July also negative cases rate is high (i.e., 90.50%) compared to total positive cases (refer to the table given below).

H. Overall Institutional Quarantine, Home Quarantine, and Quarantine status for Migrant returnees in West Bengal up to 7th July.

First part of the Table 8 (i.e., institutional quarantine), we can infer that out of the total number of patients affected by COVID-19,

TABLE 7 Overall COVID-19 test status of West Bengal

Overall COVID-19 test status	Number of patients tested till 7th July (cumulative)		Number of patient tested on 7th July	
	Count	% Of total sample tested	Count	% Of total sample tasted
Total positive cases	24,823	4.44%	986	9.50%
Total negative case	534,231	95.56%	9400	90.50%
Total sample tested	559,054	100%	10,386	100%

Status of cumulative Tested Sample Till 7th July
- 4.44% — Total Positive cases
- 95.56% — Total Negative Case

Status of cumulative Tested Sample on 7th July
- 9.50% — Total Positive cases
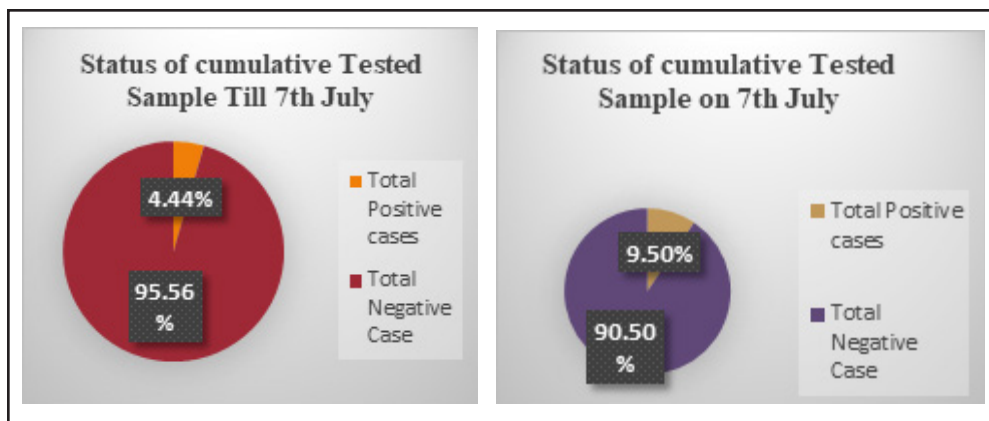- 90.50% — Total Negative Case

TABLE 8   Overall Quarantine Status for Migrant Returnees in West Bengal

Institutional quarantine	Total number of people		Home quarantine	Total number of people		Quarantine for migrant returnees	Total number	
	Count	% Of total		Count	% Of Total		Count	% Of total
Active from Govt. Quarantine Centres	5152	5%	Currently in-Home Quarantine	36,824	11%	Returnees in Quarantine Centres	10,618	4%
Released from Govt. Quarantine Centres	99,634	95%	Released from Home Quarantine Centres	304,719	89%	Total number of workers released from Quarantine Centres	261,678	96%

the discharges of the recovered patients are at 95%, the active number of COVID-19 is at 5%. In the same line, from the second part of the above table (i.e., home quarantine) out of the total number of patients affected by COVID-19, the discharges of the recovered patients are at 89%, the active number of COVID-19 is at 11%.

In the same line, from the second part of the above table (i.e., Quarantine for Migrant Returnee) out of the total number of patients affected by COVID-19, the

discharges of the recovered patients are at 96%, the active number of COVID-19 is at 4%.

We can interpret that the recovery rate of the people infected with COVID-19 is very high in the Institutional Quarantine centre (i.e., 95%). The recovery rate of COVID-19 infected people at Home Quarantine centre is very high (i.e., 89%). Also, the recovery rate of COVID-19 infected people at Quarantine centre for Migrant Returnees is very high (i.e., 96%).
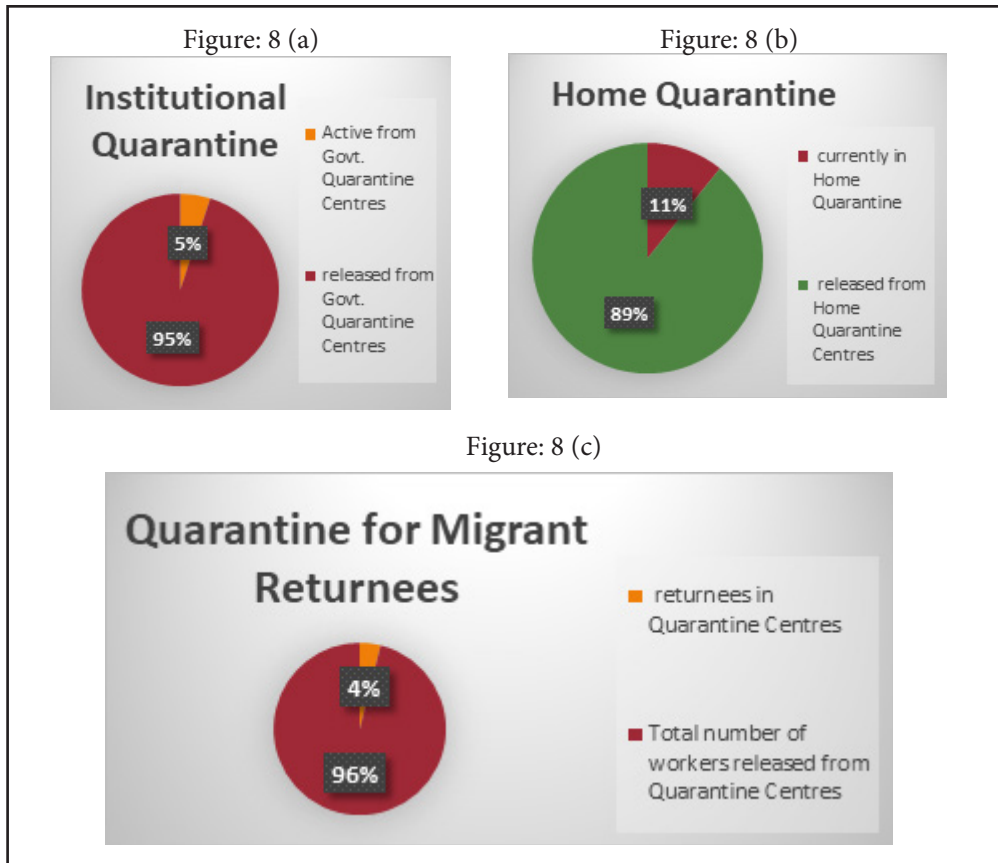
FIGURE 8. Status of active and recovery rate of patients in Institutional, Home, and Migrant returnees Quarantine centres.

I. Relationship between Recovery Rate and logistics provided by Govt. of West Bengal Health to combat COVID-19.

We can infer from Table 9 that the significant value for all cases is 0.000 that is lesser than 0.05 therefore, the null hypothesis (i.e., H0: There is no correlation between recovery rate of patient infected with COVID-19 and the logistics provided by the Government of West Bengal) will be rejected. We accept the alternative hypothesis (i.e., H1: The recovery rate of patient infected with COVID-19 can be correlated

with logistics provided by the Government of West Bengal). This shows the exists a significant relationship between recovery rate of the people infected with COVID-19 and logistics (PPE, N-95 mask, Reusable Mask, Disposable Mask, Gloves, Sanitizer) provided by Govt. of West Bengal Health to combat COVID-19.

The correlation value is equal to 0.862, 0.823, 0.676, which indicates that there exists a strong positive relationship between recovery rate of the people infected with COVID-19 and PPE, The N-95 mask and Reusable mask, respectively.

The correlation value is equal to 0.796, 0.817, and 0.669, which indicates that there

FIGURE 9. Relation between Recovery Rate and logistics provided by Govt. of West Bengal Health.

Correlation

		Recovery from COVID-19	PPE	N95 mask	Reusable mask	Disposable mask	Gloves	Sanitizer
Recovery from COVID-19	Pearson Correlation	1	0.862**	0.823**	0.676**	0.796**	0.817**	0.669**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000
	N	23	23	23	23	23	23	23
PPE logistic	Pearson Correlation	0.862**	1	0.980**	0.883**	0.967**	0.961**	0.891**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000
	N	23	23	23	23	23	23	23
N95 Logistic	Pearson Correlation	0.823**	0.980**	1	0.877**	0.987**	0.980**	0.916**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000
	N	23	23	23	23	23	23	23
Reusable Mask	Pearson Correlation	0.676**	0.883**	0.877**	1	0.899**	0.868**	0.904**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000
	N	23	23	23	23	23	23	23
Disposable Mask	Pearson Correlation	0.796**	0.967**	0.987**	0.899**	1	0.990**	0.905**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000
	N	23	23	23	23	23	23	23
Gloves	Pearson Correlation	0.817**	0.961**	0.980**	0.868**	0.990**	1	0.875**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000
	N	23	23	23	23	23	23	23
Sanitizer	Pearson Correlation	0.669**	0.891**	0.916**	0.904**	0.905**	0.875**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	
	N	23	23	23	23	23	23	23

**Correlation is significant at the 0.01 level (2-tailed).

exists a strong positive relationship between recovery rate of the people infected with COVID-19 and Disposable Mask, Gloves, and the Sanitizer respectively.

From the above we can interpret that there exists a strong relation between recovery rate of the people infected with COVID-19 and logistics, which indicates increase in logistic supply increase the recovery rate of the people infected with COVID-19.

Main Findings of the study

- Most of the people have recovered out of the total population affected by COVID-19.
- In overall scenario mortality rate is very low in West Bengal.
- In comparison to other district Coochbehar district has the highest recovery rate up to 7th July.
- In comparison to other district Kolkata has the highest mortality rate up to 7th July.
- New cases reported as on 7th July is the highest in Kolkata compared to other district.
- Total number of Government Hospitals in West Bengal dedicated for treating COVID-19 are 80 and number of total beds 10,657.
- From the total affected people only 27% are admitted in Government Hospitals dedicated for treating COVID-19.
- Out of the total beds in hospital 9% beds are ICU and 4% beds have ventilator facility.
- In Kolkata the bed occupancy rate is high in comparison to other district.
- In Jalpaiguri district, number of ICU beds and Ventilator available bed is the lowest in comparison to other district.

- 6246 people are tested per million population.
- Total positive cases are very low out of total sample tested for COVID-19.
- The recovery rate of the people infected with COVID-19 is very high in the Institutional Quarantine centre.
- The recovery rate of COVID-19 infected people at Home Quarantine centre is very high.
- The recovery rate of COVID-19 infected people at Quarantine centre for Migrant Returnees is very high.
- There is a strong relation between recovery rate of the people infected with COVID-19 and logistics provided by West Bengal Health & family welfare department.

4. Conclusion

Testing to detect the cases is one of the important strategies to deal with COVID-19 epidemic. To minimize the spread of the infection, it is vital to find out the detected cases, trace their contacts and quarantine infected persons.

The number of tests per million populations may not provide accurate information about the adequacy of the tests rather the test positive rate provides a better measure. If we will say that the state is in right direction, then the test positive rate should be low and it should decrease.

During the lockdown, the epidemic curve of COVID-19 was flattered at somewhat desired level but the critical component of this post-lockdown strategy is adequate testing. The immediate challenge is to keep infections at manageable levels and to test, trace contacts, isolate patients, and implement COVID-19 care plans.

From the information collected through secondary data, it can be concluded, logistic and facilities provided by the West Bengal government is satisfactory and has a strong positive correlation with recovery rate. As per the finding of the study, recovery rate of COVID-19 infected people is very high, mortality rate is low. The study witness that facilities and availability of logistic provided by the Government is satisfactory. From the finding of the study, rate of new positive cases is low out of total testing. In the future while developing policies, regarding epidemic management, we must do so in a manner that focuses on local containment rather than central containment. The methodology applied here can be used to investigate the situation in other countries or regions as well.

Suggestions:

- The Government of West Bengal must ensure enough medical infrastructure to control this situation.
- The number of tests done per million must be increased.
- In respect to the increase in number of COVID-19 cases, the number of quarantine centres should be increased.
- The Government of West Bengal should initiate more awareness campaign regarding COVID-19.
- The availability of ventilator and ICU beds must be increased.
- Logistic & medical facilities are to be improved.

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