DRUG UTILIZATION EVALUATION IN COVID- 19 HOSPITALIZED PATIENTS: A RETROSPECTIVE STUDY

Abstract

Introduction: Coronavirus disease 2019 (COVID-19) is an airborne viral infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) mutant. Transmission can occur if splashed or sprayed with contaminated fluids in the eyes, nose, or mouth, and, rarely, via contaminated surfaces. Symptoms of this are variable & include fever, cough, headache, fatigue, breathing difficulties, and loss of smell and taste. The co-morbid diseases like cancer, cardiovascular disease, diabetes, hypertension, and chronic respiratory disease & the elderly are more likely to develop severe illnesses. The standard diagnostic method and treatment pattern varies from hospital to hospital, which provokes to carry out this project.

Objectives: To understand the drug treatment pattern, assess the antibiotic usage pattern & its cost, to determine the antiviral usage pattern & its price. To evaluate anti–interleukin-6 receptor monoclonal antibody (Tocilizumab) usage & cost.

Methodology: A retrospective observational study was conducted in Sagar Hospitals, Kumaraswamy Layout, Bangalore, for six months after obtaining the ethical clearance.

Results and Discussion: 155 Cases were collected from the medical records department. The most widely used antibiotic was Ceftriaxone (94, 60.6%), a cell wall synthesis inhibitor, followed by Azithromycin (92, 59.4%), a protein synthesis inhibitor. Oseltamivir was the most widely used antiviral, which was administered to 80 (51.6%) patients, followed by Remdesivir, distributed to 64(41.3%) patients, and Favipiravir administered to 19(12.3%) patients. Other drugs used to treat various co-morbidities are corticosteroids, immunomodulators, mucolytics, antihistamines, blood thinners, anti-helminths, and medications.

Conclusion: It was found that the treatment protocol followed in the hospital was according to the ICMR Guidelines. The cost of the drugs also played a significant role in selecting treatment regimens, especially antibiotics, antiviral, and immunomodulators.

Keywords: Covid 19, DUE: Drug utilization evaluation, Antibiotics

,

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) mutant. Coronaviruses are a group of viruses that affect mammals, i.e., humans and animals. First identified this case in Wuhan, China, in December 2019. Coronaviruses are zoonotic (is an infectious disease transmitted between species from animals to humans or vice versa). (1)

COVID-19 is an airborne viral disease. The risk of breathing airborne particles is highest when people are nearby, but they can be inhaled over longer distances, particularly indoors. Transmission can also occur if splashed or sprayed with contaminated fluids in the eyes, nose, or mouth, rarely via contaminated surfaces. People remain contagious for up to 20 days and can spread the virus even if they do not develop symptoms. (2)

Symptoms of COVID-19 are variable but often include fever, cough, headache, fatigue, breathing difficulties, and loss of smell and taste. Found the incubation period to be 1-14 days. One-third of people who are infected are asymptomatic. (2)

81% of the patients develop mild to moderate symptoms (up to mild pneumonia). 14% develop severe symptoms (dyspnea, hypoxia, or more than 50% lung involvement on imaging), and 5% suffer acute/critical symptoms (respiratory failure, shock, or multiorgan dysfunction). However, some will become seriously ill and require intensive care. The geriatric/senior population and those with other comorbidities like cancer, cardiovascular disease, diabetes, hypertension, and chronic respiratory disease are more likely to develop profound/severe illnesses. There are various challenges associated with treating geriatric COVID-19 patients experiencing interstitial pneumonia, of which some are delirium, acute respiratory distress syndrome (ARDS), bacterial superinfections, sepsis, and septic shock. Chronic symptoms and organ damage were observed in patients after recovery. The standard diagnostic method detects the virus nucleic acid by real-time reverse transcription-polymerase chain reaction (RRT-PCR) and high-resolution computed tomography (HR-CT). (1) (2)

SARS-CoV-2 is a newly discovered virus closely related to bat coronaviruses, pangolincoronaviruses, and SARS-CoV. The origin controversy heightened geopolitical divisions, notably between the United States and China.

The earliest known infected person fell ill on 1 December 2019. However, an earlier case may have occurred on 17 November. Molecular clock analysis suggests that the index case is likely to have been infected between mid-October and mid-November 2019. (3)

Official "case" counts refer to the number of people tested for COVID-19 and whose test has been confirmed positive according to official protocols whether or not they experienced the symptomatic disease. (4)

Many countries, early on, had official policies not to test those with only mild symptoms. Multiple studies claimed that total infections are considerably greater than reported cases. On 9 April 2020, preliminary results found that in Gangelt, the center of a significant infection cluster in Germany, 15 percent of a population sample tested positive for antibodies. Screening for COVID-19 in pregnant women in New York City, and blood donors in the Netherlands, found rates of positive antibody tests that indicated more infections than reported. Early 2020 cases in China by age showed a relatively low proportion of patients in individuals under 20. It was unclear whether young people were less likely to be infected or less likely to develop symptoms and be tested. (1)

In December 2021, the number of cases continued to climb due to several factors, including new COVID-19 variants. 28 December, 282,790,822 individuals worldwide had been confirmed as infected. (4)

Complications of Covid 19: Acute Respiratory Failure, Pneumonia, Acute Respiratory Distress Syndrome (ARDS), Acute Liver Injury, Acute Cardiac Injury, Secondary Infection (A secondary infection means that you get an illness unrelated to the first problem you had. In this case, it means someone with COVID-19 gets infected with something else). AKI, septic shock, Disseminated Intravascular Coagulation (When you have disseminated intravascular coagulation, or DIC, the body's blood-clotting response doesn't work right. Abnormal clots form, which can lead to internal bleeding or organ failure. DIC is not uncommon among those who have died of COVID, Rhabdomyolysis.)

Management of Covid-19 according to WHO: Mild disease clinical presentation: Symptomatic patients without viral pneumonia or hypoxia. Control of the infection: Isolation, Symptomatic treatment such as antipyretics, adequate nutrition and rehydration. Counsel the patients on alarming symptoms. No antibiotic therapy is recommended. *Moderate disease(pneumonia):* Clinical presentation: Clinical signs and symptoms of pneumonia (fever, cough, dyspnoea, fast breathing), SPO2>90%. Pneumonia's clinical signs and symptoms (fever, cough, dyspnoea, fast breathing), SPO2>90%.Management of the infection: Isolation, no antibiotics prescribed until a clinical suspicion of bacterial infection. Geriatric patients are prescribed antibiotics for prophylaxis—close monitoring of patients for signs or symptoms of disease progression.

Severe disease (severe pneumonia): Clinical presentation: Clinical signs and symptoms of pneumonia (fever, cough, dyspnoea, fast breathing), respiratory rate>30bpm, SP02 <90%. Diagnosis: radiograph, CT scan, ultrasound. Management of the infection: The patients should be equipped with pulse oximetry, and disposable oxygen delivering interfaces—immediate administration of supplemental oxygen therapy. Closely monitor patients for signs of clinical deterioration like respiratory failure and shock. Use conservative fluid management.

Acute respiratory distress syndrome /Critical disease (ARDS): Clinical presentation:Onset: within one week.Mild ARDS: 200mmHg<PaO2. Moderate ARDS: 100mmHg<PaO2.Severe ARDS: 100mmHg>PaO2. Management of the infection: Treated with high flow nasal oxygen (HFNO) systems or endotracheal intubation to be performed by a trained and experienced provider.Ventilation for 12-16 hours.ECMO can be given.

Critical/Acute disease (Septic shock): Clinical presentation: Acute life-threatening organ dysfunction with persistent hypotension despite volume resuscitation.Serum lactate > 2mmol/L. Management of the infection: Vasopressors to maintain mean arterial pressure. Give 250-500ml crystalloid fluid as a rapid bolus in the first 15-30 mins.

DUE: The ultimate goal of a DUE or MUE is to provide better patient care through the best treatment and make sure the medicines are according to the current standards of care. Different purposes of DUE are: 1. To create rules for suitable drug utilization. 2. To evaluate the efficacy of treatment with drugs. 3. To enhance management in the drug use techniques. 4. To control the cost of drugs. 5. To prevent drug-associated problems like ADR, lack of success in the treatment, too much use and less use of drugs, inaccurate doses, and use of medicines not in the formulary.
6. To sort out areas requiring more knowledge and studies for individuals who practice medicine.
The DUE is classified as:

Prospective DUE: A review has to be done prospectively by evaluating the patient's pre-planned drug theory before the medication is described. This type of DUR paves the way for a pharmacist to assess the dosage of prescription drugs and the interaction of drugs and to clear the problems associated with drug use.
Concurrent DUE: It is performed during therapy and continuous monitoring of treatment with medicines to attain positive outcomes from the patient.
Retrospective DUE: It is a treatment review after medication administration by a patient. This review aims to find the trends in prescribing, dispensing, and advertising medication, thereby helping to prevent duplication. Retrospective drug utilization programs are structured ongoing initiatives that interpret drug use patterns concerning predetermined criteria and attempt to minimize inappropriate prescribing. (4)
NEED FOR THE STUDY: The treatment regimen is diverse in different parts of the world, and it also differs from patient to patient. This study will aid in developing a standardized treatment regimen. This study is carried out to know the various treatment protocols and their outcome in the hospital setup. This study will aid in assessing treatment protocol, its outcome, and its cost.

***OBJECTIVES*:**
Primary Objective: To understand the drug treatment pattern in the Covid 19 Disease management.
Secondary Objective:
To assess the antibiotic & antiviral usage pattern & its cost.
To evaluate the cost of anti–interleukin-6 receptor monoclonal antibody *(Tocilizumab)*

METHODOLOGY
The study was a retrospective observational study conducted in Sagar Hospitals, Kumaraswamy Layout, Bangalore. for six months (November 2021 to April 2022). One hundred fifty-five cases were collected from the medical records from March 2020 to June 2021 in the Sagar Hospitals, Kumaraswamy Layout after obtaining the ethical clearance from the hospital by considering the criteria's are
Inclusion criteria: Patients with RT-PCR, Rapid RT-PCR, and Rapid Antigen test positive for COVID-19 virus.
Exclusion criteria: Non-COVID-19 patients

A patient profile form was designed to collect the data from the medical records in the hospital. The document contains the demographics of the patient like age, gender, date of admission (DOA), Date of discharge (DOD), In-patient identification number (IPID), etc., past medical and medication history, and collected the reason for admittance, collected Required laboratory data from medical records by using this form. Copied the treatment chart containing various details of the medicines like brand name, generic name, frequency, dose, and the duration of the therapy, from the medical records

Results:

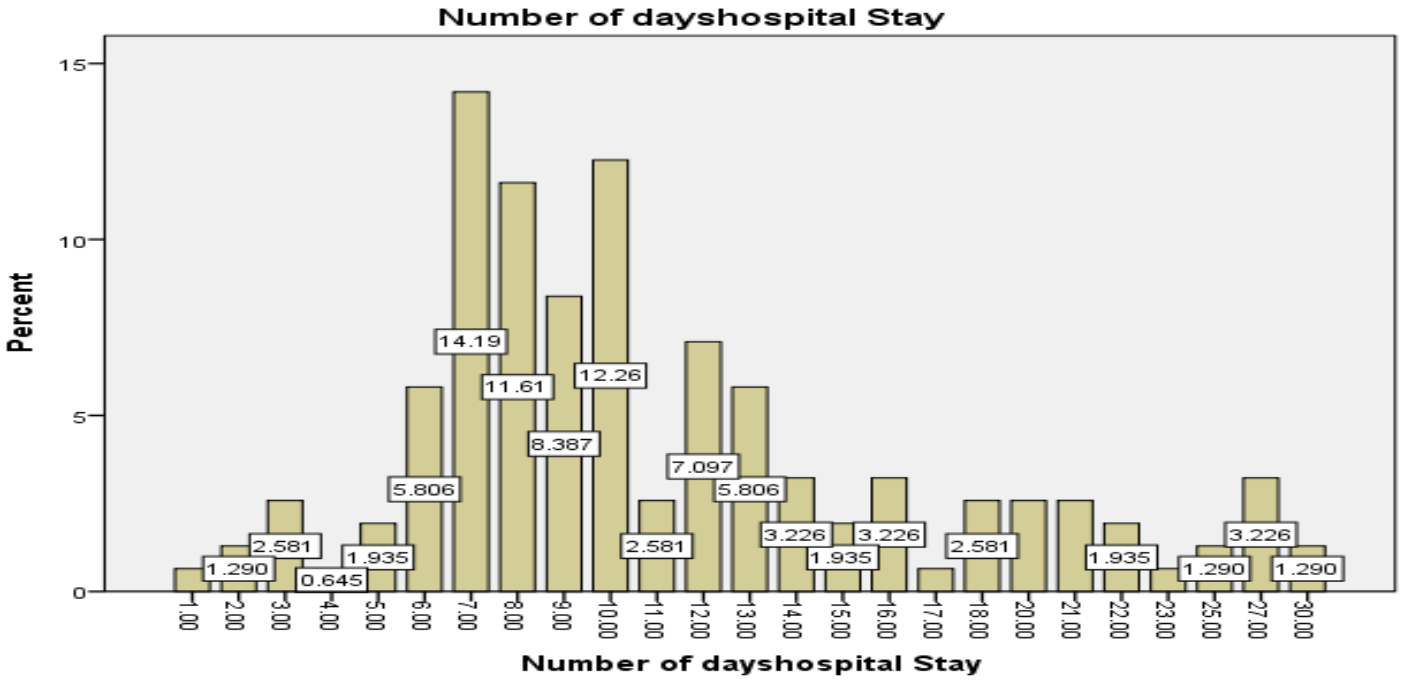
Out of 155 subjects, 103 were male, 66.5%, and 52 were female who is 33.5%.

Table 1: Distribution of Age category of the patients

Age category	N (%)
20-29	4(2.6)
30-39	23(14.8)
40-49	32(20.6)
50-59	36(23.2)
60-69	30(19.4)
70-79	24(15.5)
80-89	5(3.2)
90-99	1(0.6)
Total	155(100)

The age category of the patient showed more were at the age of 50-59(23.2%), followed by 40-49 (20.6%) least were 90-99(0.6%). The mean age of the patients was 54.58 ± 15.08.

Figure 1: Distribution of number of day's patient stayed in the hospital



About 14.9% of patients stayed at the hospital for 7 Days. The mean number of hospital stays was 11.41±6.01 Days.

Table2: Distribution of the chief complaints of the patients

Chief complaints	N(%)
Fever &cough	26(16.8)
Fever+cough+ headache +loss of appetite	3(1.9)
Fever+weakness+loose stools + cough	19(12.3)
Cough	5(3.2)
Intermittent cough	1(0.6)

Cough+weakness	6(3.9)
Fever+weakness+altered sensorium	1(0.6)
Fever+weakness	16(10.3)
Fatigue+loss of appetite	1(0.6)
Fever+weakness+cold +cough	32(20.6)
Breathlessness	8(5.2)
Fever+headache +throat pain	1(0.6)
Fever+cough+generalised weakness	2(1.3)
Cough +loose stools	1(0.6)
Generalised weakness+breast lump	1(0.6)
Chest pain	2(1.3)
AsymptomaticCovid	2(1.3)
Fever+generalisedweakness+cough+cold+loss of taste+loss of smell	23(14.8)
Loose stools	1(0.6)
Lower back pain	1(0.6)
Abdominal Pain	1(0.6)
Reinfection with covid19	1(0.6)
Giddiness+chest discomfort+breathlessness	1(0.6)
Total	155(100)

Out of 155 numbers of subjects, 14.6% had both diabetes and hypertension and, 12% had only diabetes, 43% of subjects had no co-morbid conditions.

Out of 155 patients, 97 had a mixed diet pattern of 62.6%, whereas 48(30.9%) followed a vegetarian diet; Diabetic and low salt diets were 9(5.8%) of subjects.

Table 3: Distribution of vitals findings

	Systolic BP	Diastolic BP	Systolic BP at discharge	Diastolic BP at discharge	Respiratory rate	RR at discharge
N	155	155	155	155	155	155
Mean ± SD	125.61 ± 16.03	80.20± 9.72	114.33± 30.08	75.19 ± 21.75	21.99 ± 4.30	20.41 ± 5.29
	Pulse rate	Pulse rate at discharge	Temperature (F)	Partial pressure of oxygen	Partial pressure of oxygen at discharge	Cost of vital test
N	155	155	155	155	155	155
Mean	84.18	79.48	98.76	95.14	96.77	100

The mean systolic BP was 225.6 at the time of admission and 114.3 at discharge. The respiratory rate was 21.9 at entry and 20.4 at discharge. The pulse rate was 84.1 at admission and 79.4 at discharge. The mean temperature at the time of admission was 98.76, and the mean partial pressure of oxygen at admission and discharge was 95.14 and 96.77, respectively. The total cost of the necessary test was 100rs

Table 4: Distribution of HRCT report

HRCT Report	N(%)
Patchy areas of ground glass opacities	23(14.9)
Extensive patchy consolidation and ground glass opacities	7(4.5)
Multiple irregular pneumonitis	2(1.3)
Data not available	123(79.3)
Total	155(100)

Out of 155 subjects, 123 observations of data were not available. This is 79.3%. Found Patchy areas of ground-glass opacities in 14.9% of subjects. Also, multiple irregular pneumonitides were observed in 1.3% of subjects.

Table5: Distribution of HRCT Score

HRCT score	N(%)
1/40	1(0.6)
11/25	1(0.6)
12./40	1(0.6)
13/25	1(0.6)
16	1(0.6)
18/40	2(1.3)
24/40	1(0.6)
4/25	1(0.6)
5/25	1(0.6)
6/25	1(0.6)
7/25	2(1.3)
8/25	1(0.6)
9/25	1(0.6)
data not available	140(90.3)
Total	155(100)

Out of 155 subjects, 140 subject data was unavailable, which is 90.3% and 1.3% of subjects had scores of 18/40 and 7/25.

Table6: Distribution of Positivity confirmatory test

Type of test	No. of observations	Percentage
Rapid-RTPCR	0	0
RT-PCR	151	97.4
Rapid RTPCR + RT-PCR	4	2.6
Total	155	100

Out of all the subjects, 97.4% were confirmed positive by RT-PCR only, whereas 2.6%tested showed positive by both Rapid RT-PCR and RT-PCR, and admission was made based on Rapid RT-PCR alone.

Table 7; Severity category

Severity category	N(%)
Mild	20(12.9)
Moderate	118(76.1)
Severe	17(11.0)
Total	155(100)

Out of 155 subjects, 12.9% were diagnosed with mild disease, 76.1% were diagnosed with moderate, and 11% were diagnosed with severe disease.

Table 8: Distribution of Chest x-ray report

Chest X ray report	N(%)
data not available	77(49.7)
bilateral infiltrate and haziness+cardiomegaly	7(4.5)
Normal	4(2.6)
patchy areas of consolidation and poor respiratory effort	56(36.1)
Extensive haziness	3(1.9)
Pleural effusion	1(0.6)
Lungs hyper Inflation	1(0.6)
Prominent Broncho vascular marking	4(2.6)
Cardiomegaly+right hemi diaphragm	1(0.6)
Aorta is unfolded	1(0.6)

Total	155(100)

Found Patchy areas of consolidation were in 36.1% of the subjects, bilateral infiltrates and haziness with cardiomegaly were found in 4.5% of subjects, Found extensive haziness in 1.9%of the issues, and Prominent Broncho vascular marking was found in 2.6% of subjects. Other inferences included were pleural effusion, hemi diaphragm, and hyperinflation of the lungs

Table 9: Distribution of hematology report

Hematology report	Mean + SD
N	155
HB	13.59 ± 2.76
HB At discharge	13.54 ± 2.77
Platelets	2.70 ± 0.910
Platelets at discharge	3.03 ± 1.35
WBC	7520.30 ± 3841.12
WBC at discharge	8578.90 ± 4261.83
Neutrophils	76.12 ± 51.51
Neutrophils at discharge	65.56± 15.46
Lymphocytes	20.67± 12.86
Lymphocytes at discharge	27.57± 27.50
MCV	86.37±8.43
MCV at discharge	88.18±4.80
MCH	29.83±1.963
MCH Discharge	29.60±1.60
MCHC	35.47±1.88
MCHC at discharge	35.38±1.82
Total hematology cost	1188.38± 82.92

The mean hemoglobin at the time of admission was 13.59 ±2.76, and Hb at discharge was 13.5 ±2.7. Platelets at admission and discharge were 2.7±0.9 and 3.03±1.35, respectively. WBC at admission and discharge was 7520.3±3841.2 and 8578.9±4261.8, respectively. The neutrophil count at entry was 76.1±51.9 and at discharge was 65.5±15.4. Lymphocytes at admission and discharge were 20.6±12.8 and 27.5±27.5, respectively. The MCV at entry was 86.3±8.4and at discharge was 88.1±4.8. Found MCH at admission was 29.8±1.9; at discharge, it was recorded as 29.6±1.6. MCHC at admission was found to be 35.4±1.8, and at discharge, it was 35.38±1.8. The total cost of the hematological test was 1188.38±82.9

Table10 : Distribution of hepatology report

Hepatology report	Mean + SD
N	155
Direct bilirubin	2.39 ± 25.04
Direct bilirubin at discharge	0.30 ± 0.12
Indirect bilirubin	0.70 ± 0.71
Indirect bilirubin at discharge	0.69 ± 0.41
AG ratio	1.03 ± 0.15
AG ratio at discharge	1.06 ± 0.12
Serum albumin	3.62 ± 0.62
serum albumin at discharge	3.73± 0.33
Serum globulin	3.56± 0.51
Serum globulin at discharge	3.53± 0.34
Total protein	6.93±1.11
Total protein at discharge	7.06± 0.46
SGOT	34.66±21.88
SGOT at discharge	33.38±17.10
SGPT	43.35±29.19
SGPT at discharge	51.94±20.26
BUN	15.82 ± 9.93
BUN at discharge	19.02 ± 7.07
Total hepatology cost	

Found the mean direct bilirubin value at admission was 2.3, and at discharge, saw it as 0.3. The mean of indirect bilirubin at admission & discharge was 0.7 and 0.69. The mean A/G ratio at admission & discharge was 1.03 & 1.06. The mean SGOT at admission & discharge was 34.6 and 33.3. The mean SGPT at entry was 43.3 and at release were 51.9. The mean serum albumin at the entrance was found to be 3.6and at discharge, it was 3.73. The mean serum globulin at admission was found to be 3.5and at release, it was 3.5. The mean total protein at the entrance was found to be 6.9and at discharge; it was 7.06. The mean Blood Urea Nitrogen at admission and discharge was 15.8 and 19.0, respectively.

Table11: Distribution of serum electrolytes

Serum electrolytes	Serum Sodium	Serum sodium at discharge	Serum potassium	Serum potassium discharge	Serum chloride	Serum chloride at discharge
Numbers	155	155	155	155	155	155
Mean	137.90	137.90	4.85	4.17	103.84	102.65
Std. Deviation	7.24	5.17	4.56	0.60	10.72	4.02

The mean serum sodium, potassium, and Chloride, at admission and discharge were 137.9±7.2 and 137.9±5.1.; 4.8±4.5 and 4.1±0.6; 103.8±10.7 and 102.6±4.0. The mean Blood Urea Nitrogen at admission and discharge was 15.8±9.9 and 19.0±7.1, respectively.

Table 12: Distribution of covid specific tests

Covid specific test	D Dimer	D dimer at discharge	CRP	CRP at discharge	LDH	LDH discharge	Total cost of covid specific test
Valid	155	155	155	155	155	155	155
Mean	1912.29	813.24	56.99	50.91	320.52	261.77	2800
Std. Deviation	8214.60	2266.88	324.04	449.46	184.19	126.12	0.00

The mean D Dimer value at admission and discharge was 1912.29 and 813.24. The mean of CRP at admission and discharge was 56.9 and 50.91. The mean LDH value at admission and discharge was 320.52and 261.7, respectively. The total cost of these Covid specific tests was 2800/ INR.

Table13: Distribution of clinical outcome of the patients

Clinical outcome	N(%)
Completely recovered	129(83.2)
Home Quarantine	12(7.7)
Transferred to other hospital	14(9.0)
Total	155(100)

About 83% of subjects recovered completely during their hospital stay, 7.7% were advised to home quarantine after discharge, and 9% were transferred to other hospitals before completion of treatment.

Table 14: Distribution of antibiotics & Antiviral

Antibiotics N(%)	
Yes	145(93.5)
Azithromycin	92(59.4)
Piperacillin + tazobactam	32(20.6)
Clindamycin	2(1.3)
Ceftriaxone	94(60.6)
Cefoperazone	16(10.3)
Linezolid	9(5.8)
Doxycycline.,	54(34.8)
Meropenem	6(3.9)
Teicoplanin	1(0.6)
Vancomycin	1(0.6)
Polymyxin B	2(1.3)
Anti-viral drugs N(%)	
Yes	120(77.4)
Oseltamivir	80(51.6)
Favipiravir	19(12.3)
Remdesivir	64(41.3)

Antibiotics was administered for 93.5% of the subjects, Ceftriaxone was the most prescribed antibiotic (60%), followed by Azithromycin (59.4).whereas drugs like vancomycin and teicoplanin were administered to (0.6) of subjects only.

About 77% of subjects were prescribed antivirals,51% were prescribed oseltamivir, 12% were prescribed favipiravir, and 41% were prescribed remdesivir

Table15: Distribution of Anti emetics

Anti-emetic	N(%)
inj emeset 4 mg	17(10.9)
N/A	135(87.1)
tab emeset 4 mg	2(1.2)
Tab. Phenergan (Promethazine) 25mg	1(0.6)
Total	155(100)

Emeset (Ondansetran) is the widely used anti emetic drugs, interestingly on one patients were prescribed with phenargan (Promethazine)

Table 16: Distribution of other category of drugs

Prescribed	N(%)
Anti-helminthics	46(29.7)
Analgesics	72(46.2)
Corticosteroids	106(68.4)
Bronchodilator	14(9)
Anti-histamine	14(9)
Expectorant	23(14.8)
Mucolytics (acetylcysteine)	24(15.4)
Leukotriene antagonist	6(3.9)
Immunomodulators (HCQ)	42(27.1)
Blood thinners	23(14.8)
Anticoagulant	113(72.9)
Potassium reducing agents (k-bind)	9(5.8)
Anti-septic agents (betadine gargle)	1(0.6)
Laxatives (lactulose)	4(2.5)
Alkalizers (inj+ tab forms of sodium bicarbonate)	2(1.2) + 4(2.6)
Anti-anaemic (erythropoietin)	1(0.6)
Alpha receptor blockers (silodosin + tamsulosin)	3(1.8) + 1(0.6)
Anti-anginal (nitro-glycerine + isosorbide dinitrate)	1(0.6) + 1(0.6)
Thrombolytic (Tenecteplase)	1(0.6)
Sedatives (clonazepam + alprazolam +zolpidem)	4(2.5) + 1(0.6) +2(1.2)
Anti-fungal (voriconazole)	1(0.6)
Anti-fibrosis[pirfenidone] (200mg) + (400mg)	1(0.6) + 2(1.2)
Anti-hypothyroidism drugs [levothyroxine]100mcg+50mcg+25mcg	10(6.4) + 2(1.2) + 1(0.6)

Corticosteroids were administered68.4% of subjects, 72.9% were prescribed anticoagulants 15.4% of subjects were administered mucolytics. Whereas prescribing drugs like antiseptics were prescribed only for 0.6% of subjects

Table17: Distribution of Antiulcer /antacids

Antacids	N (%)
Inj pan 40mg	33(21.2%)
Inj pan 40mg/ tab pan40mg	4(2.5%)
Inj pan 40mg/ sypsucrafil	3(1.9%)
Inj. pantoprazole 40mg + Tab.Ranitidine 150mg	1(0.6%)
N/A	25(16.1%)

SypSucrofil D 2tspX 5days	1(0.6%)
T pan 40mg	68(43.8%)
T Pan 40mg+Syp Gaviscon 10ml	2(1.2%)
Trantac 150mg /t pan 40mg	5(3.2%)
tab omez 20 mg	3(1.9%)
Tab pan 40mg+ Sypmucaine gel-2tsp+Syp Gaviscon 2tsp	1(0.6%)
tab rantac 150mg	8(5.1%)
Tab.Ranitidine 150mg +Syp.Sucralfate	1(0.6%)
Total	155(100%)

Prescribed pantoprazole injection in 21% & tablet form in 43%, ranitidine 5.1%, and omeprazole 1.9%. oxetaciane, sucralfate, aluminum hydroxide, magnesium trisilicate, and milk of magnesia preparations are prescribed in various combinations.

Table 18: Distribution of Anti diabetics

Anti-diabetic drugs	N(%)
H actrapidsc	11(7.1%)
Inj H mixtard+Tabjanumet 50/500mg+t. Gemer+Inj Human insulin	1(0.6%)
inj H actrapid , inj lantus	1(0.6%)
inj H actrapid/ inj tresiba 15ui	1(0.6%)
inj Hactrapid, t.metformin+glimiperide+ t.torglip+	1(0.6%)
inj mixtard, h.actrapid, inj tresiba	1(0.6%)
inj Tresiba	1(0.6%)
Inj.Humanmixtard+ Tab.Glycomet GP2forte	1(0.6%)
Inj.Humanmixtard+ Tab.Jalra (5/500	1(0.6%)

Insulin Q8/hr X 5days	1(0.6%)
N/A	120(77.4%)
t diapride + t vilapride + H. actrapid	1(0.6%)
T Glimepiride 1 mg X 7 days + Human Actropid	1(0.6%)
T melmet SR 50mgX8days + T Glimepiride 1 mg X 4days	1(0.6%)
T. GlucoerumX 6 days	1(0.6%)
t. glycinorm + H. actrapid	1(0.6%)
t. glycinorm+t.vildagliptin+H. actrapid	1(0.6%)
t. glycomet GP	5(3.2%)
t. glycomet GP +t supermet xl +	1(0.6%)
Tab.Gluciphor G1	1(0.6%)
Tab.Glycomet(Metformin500mg)+Tab.Gemer (Glimepride+ Metformin)	1(0.6%)
Tab.JalraM(Vildagliptin 50mg+Metformin 500mg)+ Inj.Basalog (Insulin glargine) + Tab.Forxiga (Dapagliflozin)	1(0.6%)
Total	155(100%)

Human insulin was administered subcutaneously in 7.1% of the subjects. Glimepiride (0.5mg) + metformin (500mg) was administered to 3.2%of the subjects in combination.Also other drugs like phosphate monohydrate, glimepiride, insulin glargine, vildagliptin, insulin degludec, glycerol,zinc,glimepiride, gliclazide were administered with metformin as combinations.

Table19: Distribution of Antipsychotic drugs

Antipsychotics	N(%)
N/A	148(95.5)
Tab Haloperidol 2.5 mg + Tab. Haloperidol 5mg	1(0.6) +2(1.2)
Tab. Haloperidol 5mg +Tab.Promethazine25mg	1(0.6)
Total	155(100)

Haloperidol (4.8%) was used in different doses, and other antipsychotic drugs, like promethazine, were 0.6%.

Table 20: Distribution of Antihypertensive drugs

Antihypertensive drugs	N(%)
clinidipine tab 20mg,	1(0.6)
N/A	120(77.4)
newtel 40mg	1(0.6)
t amlong 5mg	2(1.2)
t amlong 5mg BO+ t. temisartan 40mg+t propranolol 20mg	1(0.6)
t amlong+ atenolol+losartan	1(0.6)
T Cardivas 3.125mg	1(0.6)
t cilacar 10mg OD /tab metpureXL 25mg OD	1(0.6)
T metosartan 25mg	1(0.6)
t olmezest, /met xl	1(0.6)
t prolomet 50mg	1(0.6)
T. Enalopril	1(0.6)
T. Erite LNX4mg+ T prolometxe	1(0.6)
T. metasartanX6days+ T amlong X6days	1(0.6)
t. telma , t metolar	1(0.6)
t.telma 40mg	2(1.2)
T.Telmikino X5days+ Tab OzotelX5days+T Cardivas 3.125mg	1(0.6)
Tab Concof 5mg X 10days	1(0.6)
Tab Cresar H X6days	1(0.6)
Tab Maxovas 0.2mg+ t. Cilacar 5mgX8days	1(0.6)
Tab olmezest-20mg	3(1.9)
Tab. Telmisartan 20mg	1(0.6)
Tab.Arkanim(Clonidine 100mcg)+Tab.Nebicord SM (Nebivolol+ Amlodipine)+ Tab.Olmesartan 20mg	1(0.6)
Tab.Cilamet (Metoprolol+Clinidipine)+Tab.Prazopress (Prazosin)+ Tab.moxovas (Moxonidine)+Tab.Amlong (Amlodipine)	1(0.6)
Tab.MetpureXL(Metoprolol 25mg) + Tab.Arbitel AM(Telmisartan 40mg+Amlodipine5mg)	1(0.6)
Tab.olmesartan 20mg+tab.Amlong 5mg	1(0.6)
Tab.Olmezest 25mg	4(2.5)
Tab.Prolomet XL 12.5mg X12days	1(0.6)
Tab.Telma H + Tab.Prolomet XL	1(0.6)
Total	155(100)

Telmisartan and amlodipine were administered at 1.2% Olmesartan was prescribed to 2.5% of patients. Other anti-hypertensive's combined with telmisartan are metoprolol, enalapril, propranolol, losartan, nebivolol, cilnidipine, and prazosin.

Table 21: Distribution of Anti hyperlipidaemic

Anti-hyperlipidemic	N(%)
ATORVAS 20MG x 3DAYS	3(1.9)
Cap.Rosuvas gold (Rosuvastatin 10mg)	1(0.6)
N/A	139
t roseday 10mg	2(1.2)
t storvas 10 mg	4(2.5)
t storvas 40mg+	1(0.6)
T. Clopitorra 20mg	1(0.6)
T.Rosuvas 5mg	1(0.6)
tab ecosprinAV	1(0.6)
Tab Unistar 10mgX8days + Unistac gold X6 days	1(0.6)
Tab.Atorva 40mg +Tab.Rosuvas 10 mg	1(0.6)
Total	155(100)

Atorvastatin was administered in 2.5%, other antihyperlipidemic like rosuvastatin; too, and atorvastatin 20mg was administered to 1.9% of the subjects

Table 22 Distribution of Diuretic drugs

Diuretics	N(%)
Inj lasix @10mg/hr	4(2.5)
inj lasix 40mg	2(1.2)
Inj.Lasix 40mg+Tab.Aldarone 100mg	1(0.6)
N/A	146(94.2)
tab lasix 40mg + Tab.Aldactone+injlasix 40 mg	1(0.6)
Tab.Dytor (Torsemide)	1(0.6)
Total	155(100)

Furosemide was administered in infusion form for 2.5% of subjects, intravenously in 1.2% as monotherapy, and as a combination with amiodarone tab for 0.6%, whereas torsemide was the least prescribed diuretic (0.6%)

Table 23: Distribution of anti-depressants

Anti-depressants	N(%)
N/A	146(94.2)
T Bupron XL	1(0.6)
t escitalopram 10mg	2(1.2)
Tab Eliwel 10 mg	1(0.6)
Tab Tryptomer 10mg	1(0.6)
Tab. Mirtazapine 7.5mg +Tab. Escitalopram 10mg	1(0.6)
Tab.Nexito plus (Escitalopram +Clonazepam)	1(0.6)
Total	155(100)

Tab tryptomer , mirtazapine, escitalopram were given to 0.6% subjects and tab escitalopram was administered to 1.2% of subjects as antidepressant

Table24: Distribution of the various antibiotics used & its costs

Antibiotic	N(%)	Average/Median cost	Mean + SD
Azithromycin	89 (57.4)	119.5	68.61 ± 59.28
Piperacillin + Tazobactum	25 (16.1)	450	72.1 ± 166
Clindamycin	2(1.3)	225	2.90 ± 25.47
Ceftriaxone	95(61.29)	60.5	343.2 ± 441.58
Cephaferazone + Sulbactum	16(10.3)	641.57	66.95 ± 195.83
Linezolid	9(5.8)	2841	164.9 ± 666.56
Doxycyclin	21(13.5)	38	5.14 ± 13.04
Meropenam	5(3.2)	110	3.54 ± 19.49
Ticoplanin	1(0.6)	800	5.16 ± 64.25
Vancomycin	1(0.6)	285.25	1.8 ± 22.91
Polymixin	2(1.2)	500	6.45± 56.61
Total cost of the antibiotics		124.5	224 ± 295.73

Table25: Distribution of antidepressants

Anti-depressants	N(%)
No antidepressants	146(94.2)
T Bupron XL	1(0.6)
t escitalopram 10mg	2(1.2)
Tab Eliwel 10 mg	1(0.6)

Tab Tryptomer 10mg	1(0.6)
Tab. Mirtazapine 7.5mg +Tab. Escitalopram 10mg	1(0.6)
Tab.Nexito plus (Escitalopram +Clonazepam)	1(0.6)
Total	155(100)

Tab tryptomer , mirtazapine, escitalopram were given to 0.6% subjects and tab escitalopram was administered to 1.2% of subjects as antidepressants.

Table 26.1: Distribution of antiviral and its cost

Anti-viral	*frequency*	*Average cost*	*Mean cost + SD*
Oseltamivir	80(51.6)	629	324.4 ± 315.35
Fabipiravir	19(12.3)	458	50.24 ± 143.63
Remdesivir	64(41.3)	4500	1248.37 ± 2021.29

The major cost of antiviral drug is Remdisivr followed by Oseltamivir and Fabipiravir.

Table 26.2: Cost analysis of blood thinner and anticoagulants

Anticoagulants/Anti platelets	*N(%)*	*Mean cost + SD*
Blood thinners	23(14.8)	3.38±21.88
Anticoagulants	113(72.9%)	226.05±208.7

The anti coagulants were used more in the Covid disease management followed by blood thinners

Discussion:

The treatment of Covid infection was a great challenge to the health care workers treating it. In a short period, Found variants of COVID-19 like alpha, beta, gamma, and delta during the second wave in various parts of the world, which imposed challenges to treating it. Delta variant was most common in South India & there was a massive evolution in the medicines for the treatment of COVID-19 infection.

Our study aimed to understand the various treatment protocols used in Sagar Hospitals to treat the COVID-19 infection. The patients were admitted to the hospital based on the severity. Mild cases were home quarantined, and Moderate to severe cases was hospitalized for the treatment. The study also compares the treatment between the first and second waves. In India, given sufficient time was to manage the first wave of COVID-19 due to the imposition of a Lockdown in March 2020. This reduced the sudden outbreak of infection in India. The death rate was less in the first wave when compared to the second wave.

Selected The cases were randomly from the medical records department. Out of the 155 collected instances, 103(66.5%) were males, and 52(33.5%) were females. This value doesn't tell us anything about the distribution of infection among the two genders as randomly picked. The result obtained was similar to the results obtained by Pier Francesco et al., where the male patients were 66%, and female patients were 34 %(11).

The age-wise distribution of the COVID-19 cases admitted to the Sagar Hospitals was to be maximum in the patients of age 50-59years which is 23.2%. The contributing factors to the result can be the co-morbidities associated with age. This age group is in between the earning and retiring ages. Zhang et al., in the study, found that the infection was nearly 76.93% in patients in the age group 15-64 years (20). The most negligible chance of disease in the age group is 90-99(0.6%). The average life span of a person is expected to be 69.66 years.

Found The mean of hospital stay by the patient was to be 11.41days. The days of hospital stay vary from country to country and from state to state. It also depends on the severity of the case. Gayathri Thirurengadam, Marappa Lakshmi, and Ravanan Ramanujam conducted a study to analyze the contributing factors to the length of hospital stay in South Indian Tertiary care Hospitals among COVID-19 patients and found that the mean of the hospital stay was 17 days [8-13]. (12) The contributing factors are co-morbidities like Diabetes, Hypertension, cardiac-related issues, and COPD/Asthma.

The significant complaints during hospital admission are fever, cough, and cold around the globe. Fever (n=72) was the most common clinical presentation in the study conducted by Peddoju Moulika et al. to evaluate drug utilization Patterns (5). In our study, fever was the most common clinical presentation in patients with COVID-19 infection.110 (70.9%) patients presented with fever. During June 2020 and December 2020, the most common complaints were fever, cough, generalized weakness, and cold. Later, commonly encountered loss of taste and smell along with fever, cough, and cold were due to the mutations caused by the virus to encourage its growth inside the human body. In addition, there was a complaint of re-infection too in the study. This also can be due to the mutations by the virus.

70(45.2%) of 155 had Hypertension as the most common co-morbidity, followed by 67(43.2%) Diabetes Mellitus and 22(14.2%) Hypothyroidism. The other co-morbidities include 14(9%) ischemic heart disease, 6(3.9%) Bronchial asthma, 5 (3.2%) Chronic kidney disease, and 3(2%) Benign Prostate Hyperplasia. Depression, osteoarthritis, acute kidney disease, pyelonephritis, seizure, polycystic kidney disease, dyslipidemia, nephrotic syndrome, and dementia had a minor frequency of 1. The results were similar to those obtained by Peddoju Moulika et al.. In this multicentre study, Diabetes Mellitus and Hypertension were the most common co-morbidity affecting 32% of the patients included in the study(5). It tells us that the severity of the disease and the length of hospital stay depend on the co-morbidities present in the patient.

The vital signs didn't significantly change compared to admission and discharge. For example, the mean of Systolic BP and Diastolic BP during entry was 125.6 and 80.2, respectively, within the normal range according to JNC classification 8. The mean blood pressure at discharge was 114.3/75.1 mmHg. Mahmut Akpek conducted a study to check whether COVID-19 can cause Hypertension. In that study, we found that the blood pressure post-COVID-19 or at discharge[126.5/81.8 mmHg] was high when compared to admission[120.9/78.5mmHg] (13), which is in contrast to our study where the blood pressure was less during discharge. It can be due to corticosteroids in patients with COVID-19 infection.

The mean respiratory rate at admission and discharge was 21.75cpm and 20.41cpm, respectively. However, there is an increase in RR due to shortness of breath and breathlessness as the oxygen

is not sufficiently supplied to the lungs due to the infection. Our study's results are high compared to the survey conducted by Pier Francesco Caruso et al., which found the mean was 18(11).

84.18bpm and 79.48bpm were the means of the heart rate found during admission and at discharge, respectively. There is not much significance in heart rate values during entry and at release. The results are similar to the study conducted by Pier Francesco Caruso et al., where the mean heart rate was 79 bpm. (11)

The mean temperature during admission was 98.76°F. The value is increased as the standard clinical presentation during entry was fever. It is similar to the Pier Francesco Caruso et al., where the mean was 36°C (96.8°F) (27). The mean saturated partial pressure of oxygen was 95.17% on admission and 96.77% on discharge. There was an improvement in the saturated partial pressure of oxygen at discharge. Found The mean was 96% in a study conducted by Pier Francesco Caruso et al., which was analogous to ours. (11)

The most commonly preferred positivity conformity test was RT-PCR, used in 151(97.42%) out of 155 patients. Rapid-RTPCR was used only in 4(2.5%) of 155 patients. A study by Thomas Ferte et al. found that RT-PCR was of high specificity and sensitivity when compared to Antigen testing (14).

The patients were divided into mild, moderate, and severe, depending upon the laboratory data, x-ray report, and HRCT report. In our study, 118(76.1%) patients were of the moderate category, 20(12.9%) patients were of the mild category, and 17(11.0%) patients were in a severe category. It doesn't give a clear severity distribution among COVID-19 patients as picked the cases randomly. The mild severity patients would get home quarantined, so the admission of mild disease patients was reduced. Performed Liver and kidney function tests to analyze the changes caused by COVID-19 infection in organs like the Kidney and Liver. Serum Albumin and Globulin are the proteins produced by the Liver. There are changes in these values during an infection or inflammation. The mean of the values of S.Albumin is 3.62 g/dl. Albumin production is reduced during infection, so the serum albumin is reduced. The mean of the values of S.Globulin is 3.5g/dl. The value of S.Globulin is increased because of an infection. They make up the protein responsible for eliciting the immune response in the body. GOT and SGPT are the major enzymes found in the Liver; any changes to these enzymes indicate liver dysfunction. The mean value of SGOT was 34.66U/l.This value contrasts with the value obtained in the study conducted by Davide Brinati et al., where the value is 46.6U/l(23). The mean value of SGPT obtained from our study was 51.9U/l. This value is similar to the value obtained by the study conducted by Davide Brinati, where the mean value is 54.2U/l (16). BUN and S.Creatinine values are used to assess kidney function. The mean BUN value obtained in the study was 15.8mg/dl, and that of S.Creatinine was 1.1mg/dl. Both the values are to be within the normal range. Found the abnormal values were in CKD, AKD, pyelonephritis, and PKD patients. Found the values of electrolytes were lie between the normal ranges. The patients obtained the values of Complete Blood Count to decide the severity of the disease. The hemoglobin values were similar during admission and discharge, i.e., the mean of the value was 13.5g/dl. Generally, during COVID-19, the hemoglobin values are reduced due to altered iron homeostasis. (15). The mean of platelets was 2.7 lakhs/cumm and 3.03 lakhs /cumm during admission and discharge, respectively—found thrombocytopenia and thrombocytosis in patients with the infection (15). Davide Brinate et al. conducted a study to detect the COVID-19 infection from Routine Blood exams and found that the mean of platelets was 2.26 lakhs/cumm (16). The results obtained

were similar to the study conducted by us.7520.3 cells/cumm, and 8578.9 cells /cumm were the mean of the WBC count obtained during admission and discharge, respectively. Both leucocytosis and leucopenia are encountered in COVID-19 infection (15). Davide Brinate et al. conducted a study to detect the COVID19 infection from Routine Blood exams and found that the mean WBC count was 8500cells/cumm (16). The lymphocyte counts are found to reduce during the early disease. The mean lymphocyte count during admission was 20.69%, and at discharge,27.57%. The values of Neutrophils are increased in the infection. The mean of Neutrophil count was 76.12% [admission] and 65.56% [discharge].

The values of D-Dimer and CRP were found to increase in case of COVID-19 infection. Found that COVID-19 was to increase the viscosity of the blood. Thereby, there is an increase in the D-Dimer value. D-Dimer is a by-product of the metabolism of fibrinogen in the blood. It directly indicates the number of clots present in the body. It is a Gold standard method to detect a blood clot in the blood vessels. The mean of the D-Dimer value was 1664.7ng/ml during admission. Peddoju Moulika et al. obtained the value of 1017ng/ml, which is analogous to our study (5). The value of CRP was increased in case of infection. It is a protein synthesized by the liver in response to inflammation. The mean value of CRP was 50.45mg/l during admission. The value is similar to the result obtained by Peddoju Moulika et al., where the value is 54.32mg/dl (5). The values of DDimer (613.86ng/ml) and CRP (41.97mg/l) were found to be improved during the hospital stay and at discharge. Out of 155 patients, 129(83.2%) recovered completely from COVID19 infection. Gradually, reduced the symptoms, and the consecutive RT-PCR reports were negative. The patients were discharged later. 12(7.7%) patients were advised for home quarantine and reduced The symptoms & negative RT-PCR report. The patient was discharged under caution. 14(9.0%) patients were transferred to other hospitals. The transfer may be due to financial issues of the patient as it was a tertiary care hospital. The COVID-19 treatment protocol includes antibiotics, antivirals, anthelmintics, vitamin supplements, blood thinners, and supportive medications to treat COVID-19 infection and co-morbidities. Antibiotics were widely used for the treatment of COVID-19 infection. The most widely used antibiotic was Ceftriaxone (94, 60.6%), a cell wall synthesis inhibitor, followed by Azithromycin (92, 59.4%), a protein synthesis inhibitor. These two antibiotics were widely used in the treatment of COVID-19 infection in the first wave. Doxycycline (54, 34.8%) and Linezolid (9, 5.8%) were extensively used to treat COVID-19 infection in the second wave. Other antibiotics like Piperacillin tazobactam(32,20.6%), Clindamycin(2,1.3%), Cefoperazone-Sulbactam(16,10.3%), Meropenem(6,3.9%), Teicoplanin(1,0.6%), Vancomycin(1,0.6%) and Polymixin B(2,1.3%) were the other antibiotics used to treat COVID-19 infection . Doxycycline(n=103) was the most prescribed antibiotic in the study conducted by Peddoju Moulika et al. in various parts of Karnataka, Tamil Nadu, and Telangana, followed by Piperacillin-Tazobactum(n=99), Ceftriaxone(n=30), Meropenem(n=18), and the least used antibiotic was cefotaxime(n=1) and Cefipime-Tazobactum(n=1). (5)The most commonly used antibiotic was Moxifloxacin(98.8%), followed by CeftriaxoneTazobactum(38.2%), Cefoperazone-Tazobactum(20.6%), and Cefoperazone Sulbactam(20.0%) in a study conducted by Feng Sun et al. in China(6). Azithromycin was the most widely used antibiotic in the study conducted in Indonesia by Ida bagusyorky Brahmantya, Cokorda Agung Wahyu Purunamasidhi, and I Wayan Sumardika. (7)

Antivirals are the most important component of the COVID-19 treatment protocol. The three most commonly used antivirals are Oseltamivir, Favipiravir, and Remdesivir. Oseltamivir

inhibits the neuraminidase enzyme, which is expressed on the viral surface. This enzyme is found to help in the movement of the virus in the respiratory tract. Favipiravir is a broad-spectrum inhibitor of viral RNA polymerase. RNA polymerase is an enzyme required for RNA production and helps in viral replication. Remedesvir, in its active form, acts as a nucleoside analog and inhibits the RNA polymerase of the SARSCoV-2. Oseltamivir was the most widely used antiviral, which was administered to 80 (51.6%) patients, followed by Remdesivir, administered to 64(41.3%) patients, and Favipiravir administered to 19(12.3%) patients. Remdesivir (n=39) was the most prescribed antiviral, followed by Oseltamivir (n=19), Favipiravir (n=4), and Ulinastatin (n=2) in the study conducted by Peddoju Moulika et al., in various parts of Karnataka, Telangana, and Tamil Nadu.(5) The commonly used antiviral was Oseltamivir(75.8%) followed by □- interferon(43.0%), Lopinavir/Ritonavir(13.9%), Arbidol(8.5%) and Ribavirin(1.8%) in the study conducted by Feng Sun et al,in China.(6) Lopinavir /Ritonavir, Arbidol and Ribavirin were not used in our hospital to treat Covid-19 infection. Ivermectin was the only antihelmintic used in the treatment of COVID-19 infection. Ivermectin acts by inhibiting host importin alpha/beta1 nuclear transport proteins, which are a part of a key intracellular transport process. It is also found to interfere with the attachment of spike protein to the human cell. (17) Ivermectin was administered to 46(29.7%) patients. The administration of Ivermectin started during the second wave. Initially, Ivermectin was not administered. Analgesics were administered to reduce fever as it was the most common clinical presentation during admission. Paracetamol was the most common analgesic used, followed by tramadol. It was administered in both oral and parenteral forms. Corticosteroids were boons in the treatment of COVID-19 infection. Corticosteroids inhibit a pro-inflammatory gene that encodes for chemokines, cytokines, cell adhesion molecules, and the acute inflammatory response. Corticosteroid was used in 106(68.4%) patients. the most commonly used corticosteroid was Dexamethasone, followed by Methylprednisolone. Budesonide was also used as an inhaler in patients complaining of asthma. The results are similar to the study conducted by Peddoju Moulika et al., where the corticosteroids used were Methylprednisolone, Dexamethasone, and Budesonide. (5) Bronchodilators are widely used in the treatment of COVID-19. They are found to cause dilation of bronchi, thereby increasing the amount of oxygen supply to the lungs. It was prescribed to 141(91.0%) patients. The most commonly used bronchodilators were Levosalbutamol, ipratropium bromide, formoterol, etc. The most widely used immunomodulator is Hydroxychloroquine. It interferes with the endocytic pathway, blocks sialic acid receptors, restricts pH-mediated spike protein cleavage at the ACE2 binding site, and prevents cytokine storm(18). It was extensively administered during the early phase of the infection. It was administered to 42(27.1%) patients.

Blood thinners like aspirin, and ticagrelor was administered to patients having co-morbidities like IHD, CAD, and HTN. It was administered to 23(14.8%) patients. Anticoagulants were extensively used as the COVID-19 infection was found to cause an increase in the viscosity of the blood. Clexane and heparin were used in the treatment of COVID-19 infection. It was prescribed to 113(72.9%) patients. Prescribed Antihistamines, Luecotriene antagonist, and Expectorants were to treat cough and cold. The most commonly prescribed antihistamine was Levocitrizine which was given at 5 mg. Leukotriene antagonist was given to reduce mucous production in the respiratory tract. The only leukotriene antagonist prescribed was Montelukast sodium. Expectorants were used in the treatment of wet cough or cough that involves sputum production. Ascoril syrup was used, which had ambroxol, levalbuterol, and guaifenesin as its

components. Antiulcer or antacid medications are used to avoid any gastric disturbances caused by the medications used to treat the COVID-19 infection, especially antibiotics and antivirals. Found The most widely used antiulcer medication was Pantoprazole (75%), a proton pump inhibitor that reduces the secretion of acid in the stomach. Ranitidine, a histamine -2 receptor blocker, was given to 9.5% of the patients. It reduces the acid secretion in the stomach by blocking the H-2 receptor in the gastric cells. Sucralfate and milk of magnesia were also prescribed to protect the gastric mucosal layer from damage. Acetylcysteine was the most prescribed mucolytic given to 15.3% of the patients. It decreases the viscosity of secretions, especially the mucous in the respiratory tract. the study conducted by Peddoju Moulika et al. that acetylcysteine was prescribed to 26.7% of the patients admitted for the treatment of COVID-19 infection. (5) From our study, we learned that Diabetes Mellitus and Hypertension are the most common co-morbidities found in the patients admitted for the management of COVID-19. We have seen that corticosteroids are a boon in treating this infection but are found to hurt patients with co-morbidities like DM and HTN. Insulin was used extensively(7.1%) in treating Diabetes Mellitus in Patients with COVID-19. The treatment also included the combination of drugs like metformin, glimepiride, vildagliptin, etc., and insulin. The management of Hypertension in COVID-19 patients involves the use of combinations of drugs. A blocker is combined with an ACE inhibitor, ARB antagonist, Diuretic, calcium channel blocker, and centrally acting antihypertensive. Olmesartan (3.1%) was widely prescribed for treating hypertension in COVID-19. The most commonly used Beta blocker is Metoprolol, which is a cardioselective blocker. Hypothyroidism is also found to influence the severity of the infection and the number of days of hospital stay. Levothyroxine (8.2%) was the most commonly administered ant hypothyroid medication. The dose of Levothyroxine depends on the values of TSH, T4, and T3. Various doses available are 25mcg, 50mcg, 75mcg and 100 mcg. Antiemetics were used to avoid nausea and vomiting in subjects with COVID-19. Ondansetron (12.1%) was widely used for the same. It is a 5-HT3 receptor blocker.

The other supportive medications used were Potassium reducing agents (Calcium polycistronic sulphonate- 5.8%), Antiseptic (Betadine gargle-0.6%), Alkalisers(sodium bicarbonate -3.2%), Anti-anaemia(Erythropoietin alpha -0.6%), Thrombolytic (Tenecteplase-0.6%), Laxatives(Lactulose-2.5%) ,and Antifungal(Voriconazole-0.6%). Pirfenidone is a medication used in the treatment of idiopathic pulmonary fibrosis. It reduces lung fibrosis by down-regulation of the production of growth factors and procollagens I and II(19). It was administered to the most severe patients admitted to ICU and are on mechanical ventilation. The X-ray and HRCT reports of the patients showed extensive patchy consolidations. Diuretics are mainly used to treat hypertension and other cardiac-related issues. A Loop diuretic was commonly used. Furosemide (4.9%) was the most used diuretic followed by Amiodarone (1.2%) and Torsemide (0.6%). Sedatives and Antidepressants were used to treat patients in ICU who were in severe condition. Benzodiazepines were commonly administered to critically ill patients. The majorly prescribed antidepressant was escitalopram. The total cost of the medications was Rs.17 322.55. This cost includes all the medications used to treat COVID-19 infection, excluding the IV fluids. The costs of medications are found to change from place to place and from hospital to hospital.

Conclusions:

The treatment of COVID-19 includes various medications like antibiotics, antivirals, anthelmintics, immunomodulators, corticosteroids, and other supportive drugs.

A Pharmacoeconomics study determines the cost of medications used to treat COVID-19 infection in our study.

The antibiotics were generally used with cell wall synthesis inhibitors (penicillin, cephalosporins) and protein synthesis inhibitors (Aminoglycosides, Macrolides, tetracyclines). The combinations used were Piperacillin/Tazobactam + Azithromycin, Ceftriaxone + Azithromycin, Cefoperazone/Sulbactam + Azithromycin, Ceftriaxone +Doxycycline and Piperacillin/Tazobactam +Doxycycline. Antiviral medications used were Oseltamivir, Favipiravir, and Remdesivir. A loading dose was administered, which was followed by a maintenance dose. The loading dose was twice the maintenance dose. The immunomodulators used were Hydroxychloroquine and Tocilizumab. Hydroxychloroquine was extensively used during the initial phase of the COVID-19 infection.

Administered Corticosteroids only to patients who had moderate to severe disease. The choice of corticosteroid depends on the condition of the patient. Tocilizumab, an anti-interleukin 6, was administered to one patient, costing Rs.44,000. The drug was not used much in patients with COVID-19. The total cost calculated from the study mainly focuses on the medications given to the patient. The study did not include other medical expenses like ward charges and supportive measures prices. The other supportive medications include antihistamines, antitussives, and mucolytics for the treatment of cough and cold, a major clinical presentation of COVID-19. The treatment protocol followed in our hospital was on par with the ICMR guidelines for the treatment of COVID-19.

Limitations of the study:

1. The sample size is too small due to six months & limited time to access the medical records department. Hence collected Only 155 cases.
2. There was a lack of laboratory data in the medical records of initial COVID-19 admissions due to the fear of infection by the health care professionals.

Future directions:

- The treatment of COVID-19 was regularly changing due to the virus's mutations, and the number of prescribed drugs per patient increased. However, the chances of ADR increased in the patients. Hence the continuation of these studies may be beneficial for further.
- The secondary infection studies, like black fungus-associated studies, required further.
- Can be taken Antimicrobial resistance studies in these disease conditions. .

References:

1. Chedid M, Waked R, Haddad E, Chetata N, Saliba G, Choucair J. Antibiotics in treatment of COVID-19 complications: a review of frequency, indications, and efficacy. Journal of Infection and Public Health. 2021;14(5):570-576

2. Colavizza G. COVID-19 research in Wikipedia. Quantitative science studies. 2020 Dec 1;1(4):1349-80

3. Dirlikov E, Fechter-Leggett E, Thorne SL, Worrell CM, Smith-Grant JC, Chang J, Oster AM, Bjork A, Young S, Perez AU, Aden T. CDC Deployments to state, tribal, local, and territorial health departments for COVID-19 emergency public health response—United States, January 21–July 25, 2020. Morbidity and Mortality Weekly Report. 2020 Oct 2;69(39):1398.

4. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, Sun C, Sylvia S, Rozelle S, Raat H, Zhou H. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. Infectious diseases of poverty. 2020 Dec;9(1):1- 2

5. Kamsali Hema, Peddoju Moulika, Dinesh Kumar Kukunuri, Ganta Saidhulu, Dhivya K, Karthik K. Evaluation of Drug Utilisation Pattern and Clinical Presentation in Covid19 Patients Based on the Disease Severity. International Journal of Novel Trends in Pharmaceutical Sciences. 2021;11(2):25-33.

6. Sun F, Kou H, Wang S, Lu Y, Zhao H, Li W et al. An analytical study of drug utilization, disease progression, and adverse events among 165 COVID-19 patients. Annals of Translational Medicine. 2021;9(4):306-306.

7. Yorky Brahmantya I, Agung Wahyu Purnamasidhi C, Sumardika I. COVID-19 Pharmacological Treatment at the Udayana University Hospital in April-May 2020. Biomedical and Pharmacology Journal. 2021;14(02):971-977

8. 15.Sieswerda E, de Boer M, Bonten M, Boersma W, Jonkers R, Aleva R et al. Recommendations for antibacterial therapy in adults with COVID-19 – an evidence based guideline. Clinical Microbiology and Infection. 2021;27(1):61-66.

9. 16.16. Indari O, Jakhmola S, Manivannan E, Jha H. An Update on Antiviral Therapy Against SARS-CoV-2: How Far Have We Come?. Frontiers in Pharmacology. 2021;12.

10. 17.Shiley K, Lautenbach E, Lee I. The Use of Antimicrobial Agents after Diagnosis of Viral Respiratory Tract Infections in Hospitalized Adults: Antibiotics or Anxiolytics?. Infection Control & Hospital Epidemiology. 2010;31(11):1177- 1183.

11. 18.Caruso P, Angelotti G, Greco M, Albini M, Savevski V, Azzolini E et al. The effect of COVID-19 epidemic on vital signs in hospitalized patients: a pre-post heat-map study from a large teaching hospital. Journal of Clinical Monitoring and Computing. 2021;.

12. Thiruvengadam G, Lakshmi M, Ramanujam R. A Study of Factors Affecting the Length of Hospital Stay of COVID-19 Patients by Cox-Proportional Hazard Modelin a South Indian Tertiary Care Hospital. Journal of Primary Care & Community Health. 2021;12:215013272110002

13. 20. Akpek M. Does COVID-19 Cause Hypertension?. Angiology. 2021;:000331972110539.

14. 21.Ferté T, Ramel V, Cazanave C, Lafon M, Bébéar C, Malvy D et al. Accuracy of COVID-19 rapid antigenic tests compared to RT-PCR in a student population: The StudyCov study. Journal of Clinical Virology. 2021;141:104878

15. 22.Samprathi M, Jayashree M. Biomarkers in COVID-19: An Up-To-Date Review. Frontiers in

Pediatrics. 2021;8.

16. 23.Brinati D, Campagner A, Ferrari D, Locatelli M, Banfi G, Cabitza F. Detection of COVID-19 Infection from Routine Blood Exams with Machine Learning: A Feasibility Study. Journal of Medical Systems. 2020;44(8).

17. 24.Momekov G, Momekova D. Ivermectin as a potential COVID-19 treatment from the pharmacokinetic point of view: antiviral levels are not likely attainable with known dosing regimens. Biotechnology & Biotechnological Equipment. 2020;34(1):469-474.

18. 25.Satarker S, Ahuja T, Banerjee M, E V, Dogra S, Agarwal T et al. Hydroxychloroquine in COVID-19: Potential Mechanism of Action Against SARSCoV-2. Current Pharmacology Reports. 2020;6(5):203-211.

19. 26.Momen A, Khan F, Saber S, Sultana A, Alam R, Raihan S et al. Usefulness of Pirfenidone in Covid Lung: A Case Series. European Journal of Medical and Health Sciences. 2021;3(1):24-26.

20. Cortis D. On Determining the Age Distribution of COVID-19 Pandemic. Frontiers in Public Health. 2020;8.