

Clinical Characteristics, Interventions and Outcomes for Patients with Moderate to Severe Covid-19 at Machakos Level 5 Hospital, Kenya.

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Abstract- Background

The Covid-19 pandemic that begun in Wuhan china and rapidly spread to the whole world brought significant challenges to the healthcare systems. The symptoms and management of the disease varried across the globe as the we awaited the completion of clinical trials to determine the definitive treatment of the disease. The objective of this study was to describe the clinical characteristics, treatments and outcomes of patients with moderate to severe Covid-19 disease in a tertiary hospital in Kenya.

Methodology

This was a single-center, descriptive, retrospective cohort study. Medical records were reviewed for all patients with laboratory-confirmed moderate to severe SARS-CoV-2 infection. Data were collected using a pre-developed tool and exported to MS Excel then later exported to SPSS for analysis. Data analysis involved frequency distributions for categorical variables and descriptive statistics for continuous variables.

Results

A total of 64 patients' records were analyzed with of the patients presenting with difficulty in breathing 37 (57.8%) and cough 34(53.1%), 25 patients presented with hypoxia (SpO₂<92%). A total of 36 patients out of the 64 admitted were on oxygen therapy at some point during their hospital stay with 15 of them dying representing 42%. The mean duration of stay in the hospital was 8.97 days.

Conclusion

This descriptive study provides information on the range of symptoms, treatments, and outcomes available for patients seeking Covid-19 in resource-limited settings in Africa. The unavailability of some laboratory and radiological investigations could be contributing factors to poor outcomes.

Index Terms- Clinical characteristics, Treatment, Outcomes.

List of abbreviations and acronyms

ACF- active case finding
ANOVA- Analysis of variance
ARDS- acute respiratory distress syndrome
CDC - centres for disease control and prevention
CFR- Case fatality rate
COVID-19- CoronaVirus Disease 2019
CPAP- continuous positive airway pressure
DKA- Diabetic ketoacidosis. ICU - intensive care unit
DM- Diabetes mellitus
HDU- high dependency unit
HTN- hypertension.
MERS- Middle east respiratory syndrome
MKL5- Machakos level 5 hospital.
NCDs- Non communicable diseases
RNA- Ribonucleic acid

rRT-PCR- Real-Time Reverse Transcription-Polymerase Chain Reaction
SARS COV 2- Severe acute respiratory syndrome coronavirus 2
SPSS-Statistical package for the social sciences
WHO- world health organisation

I. INTRODUCTION

The coronavirus disease 2019 (Covid-19) whose is a viral disease caused by a novel virus that was first discovered in Wuhan China in December 2019(1). The disease rapidly spread throughout China and to the rest of the world, infecting and killing many (2). The first case in Kenya was reported on March 13, 2020 (3)(4) and as of September 26, 2020, we had a total number of 37,707 cases with 682 deaths. In Machakos County, the first case was reported on May 9, 2020 (5) and as of September 26, 2020, we had 1,308 cases and 26 deaths reported(6).

Machakos level 5 hospital (MKL5) is the tertiary referral facility in Machakos county (7) and lies between two Covid -19 hotspots (Nairobi and Mombasa counties). Before Covid-19, the hospital operated a six-bed Intensive Care Unit (ICU). To cater for existing patients and Covid-19 patients, the unit pared down to a three-bed ICU and one ICU unit to hold patients suspected to have Covid -19. In addition, one 12-bed ward was converted to a transition ward to cater for suspected Covid-19 patients who did not require ventilation, a 12-bed ward for patients with confirmed moderate/ severe Covid-19 with six ICU beds, and 6 ward beds with cardiac monitors. It should be noted that in Machakos Level V Hospital ICU beds include basic cardiac monitors, ventilators, wall-mounted oxygen ports, infusion pumps +/- attached suction pumps (8). Patients with confirmed Covid-19

Machakos county has 5 isolation units inclusive of Machakos Level 5 hospital isolation unit which caters to moderate to severe patients. Moderate to severe patients as per Machakos level 5 internal guideline and the Ministry of Health interim guidelines were defined as patients whose oxygen requirements were above 10litre/min or oxygen saturation levels of lower than 92% (9).

It is important to have detailed data on demographic characteristics, underlying medical conditions, and clinical outcomes for people hospitalized with confirmed Covid-19. These data can inform preventive strategies and community-specific interventions for infectious respiratory diseases in low and middle-income areas such as Machakos county. This study aimed to describe the clinical characteristics, treatments, and outcomes in patients with moderate /severe Covid-19 hospitalized in the MKL5 isolation unit between June and September 2020. Specifically, the study aimed to i) outline clinical characteristics and demographics of patients with moderate/severe Covid-19 hospitalized in the MKL5 isolation unit, ii) assess treatment interventions of patients with moderate/severe Covid-19 hospitalized in the MKL5 isolation unit, and iii) evaluate clinical outcomes of patients with moderate/severe Covid-19 hospitalized in the MKL5 isolation unit.

1.5 Significance of the study

There are various stakeholders to whom this study shall be significant. For the patients, the understanding of what influences patient outcomes will lead to improved mortality and morbidity rates.

To health care workers, this study will be the source of information on how patients are likely to present and what outcomes to expect.

For policymakers, this research will provide data to inform Covid-19 protocols in a low resource center. As the policies will come from the healthcare providers' past decisions there will be increased ownership and implementation of policies arising from the information collected.

II. METHODOLOGY

Study Area

Machakos Level 5 Hospital is a teaching and referral hospital, situated about 60 kilometers Southwest of Nairobi city. It has a bed capacity of 300 with several departments/sectors namely, medical department, surgical department, maternity department (maternal & child health), and specialized unit services which include ICU, isolation unit, cancer centre and renal unit. The isolation unit has 3 wards, HDU, which is a holding area for critically ill COVID-19 patients, and (central) isolation ward for fully admitted, moderately sick, and critically ill COVID-19 patients, which has a capacity of 16 beds. There is also a holding/transition ward for admitting patients suspected to have Covid-19 as they wait for their results.

Study Design

This was a single-center, descriptive, retrospective cohort study. We reviewed medical records (patient files) nursing records, laboratory findings, and radiological examinations for all patients with laboratory-confirmed moderate to severe SARS-CoV-2 infection. The admission data of these patients were collected using a case record form modified from the standardized International Severe Acute Respiratory and Emerging Infection Consortium case report forms. We collected data on age, sex, occupation, chronic medical histories, symptoms from onset hospital admission (fever, cough, dyspnoea, myalgia, malaise, rhinorrhoea, arthralgia, chest pain, headache, and vomiting), vital signs at ICU admission (heart rate, respiratory rate, blood pressure, temperature, SPO2), laboratory values on admission (hemoglobin concentration, lymphocyte count, platelet count, coexisted infection, treatment (oxygen therapy, vasoconstrictive agents,

antiviral agents, antibacterial agents, corticosteroids, thrombolytics, analgesics), Outcomes (length of stay, discharged alive or dead, transferred to another facility). The study population included all patients with moderate to severe covid-19 hospitalized at Machakos level Covid-19 isolation unit. There was no sample calculation in this case since all patients who were admitted to the isolation unit were evaluated.

Data Collection Methods

Data were collected from patient medical records using a pre-developed data collection tool. The data collection tool was pre-tested before data collection began. Before analysis, quantitative data was exported to MS Excel then later exported to SPSS for analysis. The collected data was cleaned, categorized, coded, and stored in password-protected folders.

Data Analysis Methods and Procedures

Data were collected using structured questionnaires and then entered in Microsoft Excel™. Data cleaning was done before any analysis could commence. Data analysis involved frequency distributions for categorical variables and descriptive statistics (means, medians, standard deviations) for continuous variables. Data was presented using bar charts, pie charts, and frequency distribution tables. Continuous variables were compared by using independent group t-tests where applicable while categorical variables were expressed as frequencies and percentages and compared by Pearson's chi-square. A two-sided α of less than 0.05 was considered statistically significant. All statistical analyses were performed with the SPSS (version 26.0) software.

Ethical Considerations

The research team obtained ethical clearance from an accredited ethics review board and a license from National Commission for Science, Technology, and Innovation. Permission to access patient files for data collection was obtained from the medical superintendent of Machakos Level 5 Hospital. All redacted data was captured anonymously from patient files. Personal identifiers were not captured. Data was stored under password protection and accessed only by members of the research team.

III. RESULTS

Patient demographics

A total of 64 patients' records were analyzed with the youngest patient being 24 years old and the oldest being 90 years old. The mean age was 50years. The males made up most of the patients at 41 (64%). The patients' ages were arranged in age groups with most patients being in the age group of 50-59 years followed by those in the 30-39 years age group.

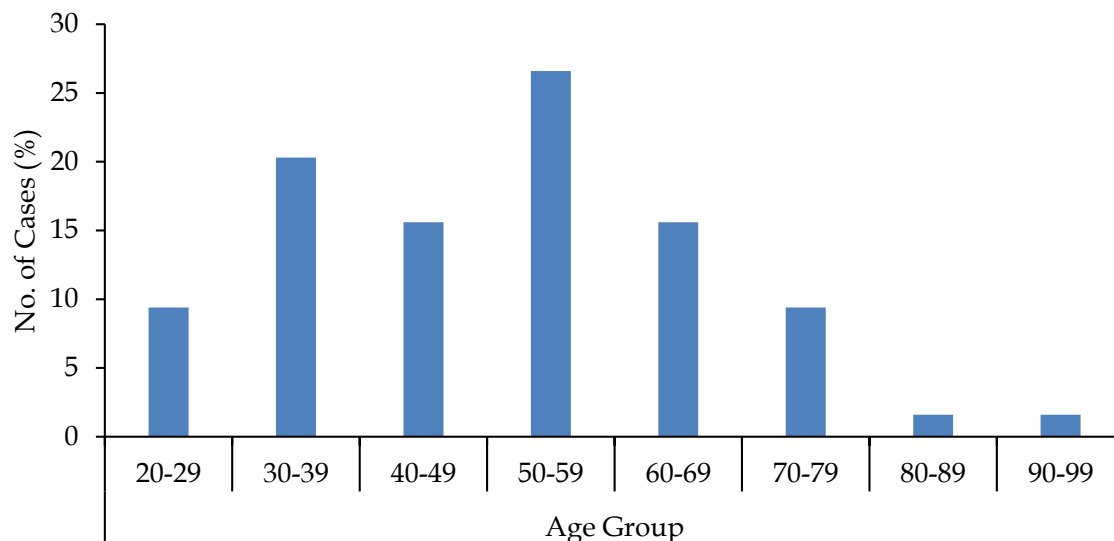


Fig 4.1 Age distribution for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward 2020

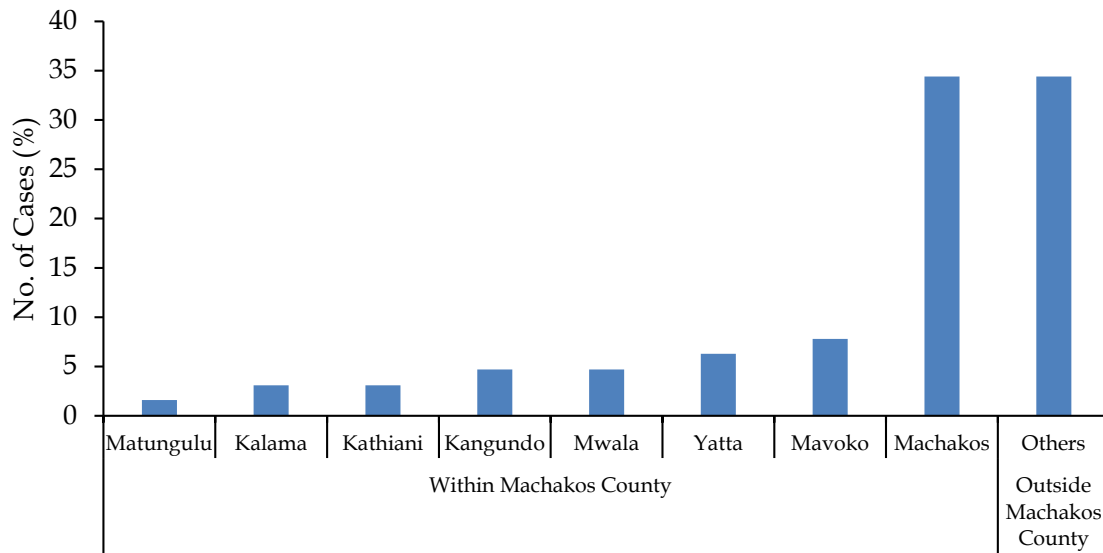


Fig 4.2 Residence of for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

Patients were drawn from various parts of Machakos county and outside the county. Machakos town had the highest number of patients residing there.

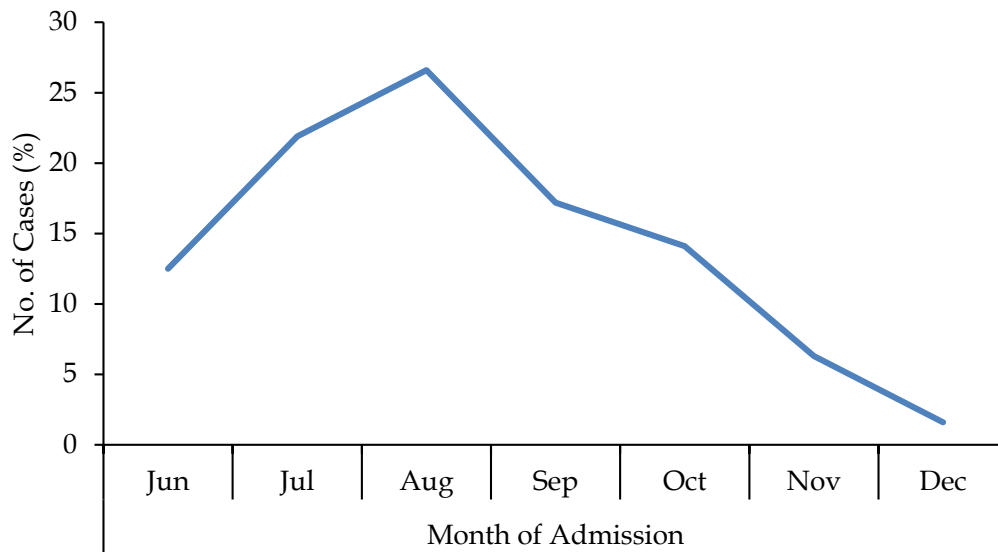


Fig 4.3 Month of admission for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

Admissions into the isolation ward started in June and continued to rise exponentially, peaking in August, and then dropping in the next months.

Table 1: Length of stay in hospital Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

	N	Minimum (Days)	Maximum (Days)	Mean	Std. Deviation
Length of Stay	64	0	34	8.97	7.387
Valid N	64				

The length of stay in the hospital for the patients ranged from zero days (shortest stay) to 34 days (longest stay). The mean duration of stay in the hospital for the patients was 8.97 days.

Patient symptoms

Most of the patients presented with difficulty in breathing 37 (57.8%) and cough 34(53.1%). Of the 64 patients, 25 presented with hypoxia (SpO₂<92%).

Table 2: Presenting symptoms for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

Symptoms	Presented with the Symptom	
	Yes (%)	No (%)
Shortness of Breath	22(34.4%)	42(65.6%)
Tiredness	9(14.1%)	55(85.9%)
Vomiting	8(12.5%)	56(87.5%)
Diarrhea	6(9.4%)	58(90.6%)
SPO2<92%	25(39.1%)	39(60.9%)
Fatigue	10(15.6%)	54(84.4%)
Cough	34(53.1%)	30(46.9%)
Fever	25(39.1%)	39(60.9%)
Headache	7(10.9%)	57(89.1%)
Chest Pain	6(9.4%)	46(71.9%)
Difficulty in Breathing	37(57.8%)	27(42.2%)
Joint Pain	7(10.9%)	57(89.1%)
Muscle Pain	4(6.3%)	60(93.8%)
Sore throat	6(9.4%)	58(90.6%)
Loss of Taste	2(3.1%)	62(96.9%)
Loss of Smell	2(3.1%)	62(96.9%)
Seizure	1(1.6%)	63(98.4%)
Others	21(32.8%)	43(67.2%)

Table 3: Relationship between symptoms and SpO₂ on Admission Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

Symptoms	SpO ₂ on Admission			
		Hypoxic	Normal	Severely Hypoxic
Difficulty in Breathing	Yes	14(37.8%)	9(24.3%)	14(37.8%)
	No	7(25.9%)	17(63%)	3(11.1%)
Fever	Yes	8(32%)	10(40%)	7(28%)
	No	13(33.3%)	16(41%)	10(25.6%)
Cough	Yes	12(35.3%)	11(32.4%)	11(32.4%)
	No	9(30%)	15(50%)	6(20%)
Fatigue	Yes	2(20%)	5(50%)	3(30%)
	No	19(35.2%)	21(38.9%)	14(25.9%)
Shortness of Breath	Yes	9(40.9%)	7(31.8%)	6(27.3%)
	No	12(28.6%)	19(45.2%)	11(26.2%)

Most of the patients who had difficulty in breathing were either hypoxic or severely hypoxic on admission (75.6%).

Pulse rate on admission was only captured for 48 patients, for 53 during their stay and for 43 on discharge. 11 (17.2%) of the patients had a high PR on admission, 14 (21.9%) at mid-stay, and 12(18.%)on discharge. Of the 64 patients, 42 (65.6%) were admitted with high blood pressure, 38 (59.4%) had high BP during their stay, and 33 (51.6%) on discharge.

Treatment and Outcome

Oxygen therapy was given to more than 50% of the patients admitted with 37 (57.8%) patients receiving oxygen via different modalities and flow rates. Antibiotics were administered to 60 out of the 64 patients representing 94 %. Of all patients. 15 of the patients who were on antibiotics died while 35 and 10 were discharged and transferred respectively. Thrombolytics were used in 35 patients, analgesics in 34 patients, and corticosteroids in only 17 patients.

Table 4: Relationship between pharmacotherapy and patient outcome for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

		Patient Outcome		
		Death	Discharged	Transferred
Antibiotics	Yes	15(25%)	35(58.3%)	10(16.7%)
	No	0(0%)	2(50%)	2(50%)
Thrombolytics	Yes	8(22.9%)	22(62.9%)	5(14.3%)
	No	7(24.1%)	15(51.7%)	7(24.1%)
Analgesic	Yes	8(23.5%)	16(47.1%)	10(29.4%)
	No	7(23.3%)	21(70%)	2(6.7%)
Corticosteroids	Yes	4(23.5%)	12(70.6%)	1(5.9%)
	No	11(23.4%)	25(53.2%)	11(23.4%)

A total of 36 patients out of the 64 admitted were on oxygen therapy at some point during their hospital stay with 15 of them dying representing 42%.

48% of the patients who were discharged and 35% of the patients who died were on oxygen therapy. There was a significant association between being on oxygen therapy and death with a p-value of 0.049. There was a high likelihood of dying if the patient was on oxygen therapy.

Of the 64 patients admitted, 37(57.8%) were discharged home, 12(12.8%) were transferred to other facilities and 15 (23.4%) died.

Table 5: Relationship between SpO2 on admission and patient outcomes for Covid-19 patients admitted at Machakos Level 5 Hospital Isolation Ward in 2020

SpO2 on Admission	Patient Outcome		
	Death	Discharged	Transferred
Hypoxic	4(19%)	12(57.1%)	5(23.8%)
Normal	4(15.4%)	17(65.4%)	5(19.2%)
Severely Hypoxic	7(41.2%)	8(47.1%)	2(11.8%)
Total	15(23.4%)	37(57.8%)	12(18.8%)

The correlation between SPO2 on admission and patient outcomes was not statistically significant with a p-value of 0.342.

Laboratory investigations

The following investigations were recommended for the patients on admission and some for monitoring; Full blood count, liver function tests, urea and electrolytes, Random blood sugar, CRP, D-dimers, and Genexpert.

However, some of the tests were not available at the hospital and patients had to get them from elsewhere. Some could not do the tests due to costs.

Most of the patients who presented with high white blood cell counts were discharged compared to those who had low counts. Low RBC count was associated with death with most patients having low RBC count dying (60%).

There was no association between lymphocyte count and the outcome of the patients.

90% of patients who had high lymphocyte count were discharged while only 43% of those who had low lymphocyte count were discharged.

IV. DISCUSSION

Covid-19 has mostly affected adults with men bearing the biggest burden of the disease across the world. Many theories as to why men are more affected by the virus have been peddled, However, none has yet been proven scientifically sound. (reference). Testing rates in children is also low in our setup which might explain why there are fewer children with confirmed Covid-19 disease(reference) Machakos and Mavoko sub-counties accounted for most of the patients (45%). These sub-counties are in the metropolis where transmission is propagated by economic activities and gathering in social and recreation places. Of note, is the number of clients who hailed from outside the county. The hospital was serving as a regional referral center for patients from neighboring counties that did not have the facilities for managing severe Covid-19.

The first patient was admitted in June and the number kept rising exponentially until August in which the majority of the patients were admitted (45%). The months of July and August are cold seasons in the country and there are yet to be confirmed theories that the virus spreads more during such conditions. The number of patients declined from then onwards until December when less than 5% of clients were admitted. This can be attributed to the industrial action by health care workers that took place during that period and lead to the closure of the hospital. The cases reported in the country followed the same pattern with a peak in August and another peak in October. The cases dropped rapidly up to December when the lowest number of cases were reported in the country. This is however not corroborated by the numbers reported worldwide which continued to rise even after August peaking in January 2021 (32, 20).

In terms of the presenting symptoms, most of the patients presented with upper respiratory system symptoms including cough and difficulty in breathing which were the most common symptoms reported at 53% and 58% respectively though at a slower rate compared to other studies (77% and 63% respectively) (33). Patients presenting with fever were however fewer at 40% compared to 98% reported in other studies(34) Fever has also been reported as a common symptom among Covid-19 patients. In this study, gastrointestinal symptoms such as diarrhea and vomiting have also been reported in some patients. Loss of appetite, loss of taste, and loss of smell are rare symptoms associated with Covid-19 disease (20).

Hypoxia, defined as oxygen levels below 92% was experienced by 39% of the patients on admission and it was a predictor for poor outcomes with 41% of the severely hypoxic patients dying.

Management of the Covid-19 patients was mainly supportive. The ministry of health guidelines on Covid-19 management and the hospital protocols were followed and patients were managed based on the presenting symptoms (22).

Prophylactic use anticoagulants (Low molecular heparins) was recommended for all hospitalized patients but this was not always available in the hospital and some patients did not receive this treatment. Corticosteroids were also recommended in severely ill patients(6) the outcomes for patients who started corticosteroid therapy early were better than for those who started later.

Most patients who were severely hypoxic on admission died and there was a statistically significant relationship between oxygen therapy and death. This could be because the patients who needed oxygen were severely sick with a poor prognosis hence the outcome. Lymphocytopenia has been reported as a prominent feature in severely ill patients and to be associated with poor outcomes(34). In our study, there was a relationship between high lymphocyte count and survival as most of the patients who had a high lymphocyte count (90%) were discharged home. The survival rate for patients on oxygen was low with only 58% being discharged alive. This could be

attributed to the severity of the disease with those being severely ill and hypoxic having a poor prognosis. This finding is corroborated by findings from other studies that found high mortality rates in ventilated patients(3).

Limitation

The study population for this study was limited to Machakos level 5 hospital and this may not be generalizable to patients seeking treatments in other hospitals with different resource levels.

Conclusion

This descriptive study provides information on the range of symptoms, treatments, and outcomes available for patients seeking Covid-19 in resource-limited settings in Africa. The unavailability of some laboratory and radiological investigations could be contributing factors to poor outcomes.

Conflict of Interest

The authors have no conflict of interest to declare

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