

Clinical Characteristics and Outcomes of Patients with COVID Admitted to a Tertiary Care
Centre

A Retrospective Study at Tshepong Hospital

by

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Dedication

To the millions who lost their lives to COVID-19,

Gone but never forgotten

Presentations/Publications arising from this Project

None at the time of submission

Abstract

Introduction

In December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified in China. It has since then rapidly spread across the globe causing millions to die. In March 2020, the WHO declared coronavirus disease 2019 (COVID-19) a pandemic. It's clinical presentation and outcomes have been variable across the world. Thus, an analysis of the clinical characteristic and outcomes of patients with COVID-19 at a local setting, namely Tshepong Hospital.

Objective

To determine the clinical presentation and outcomes, and correlate clinical and biochemical parameters to outcomes of patients admitted with COVID-19 at Tshepong Hospital.

Method

This is a single centre retrospective review of all patients with COVID-19 admitted at Tshepong Hospital during the period 1 June – 31 July 2020. The study contains both inferential and descriptive elements.

Results

A total of 200 patients were admitted with COVID-19 during this study period, of which 135 were female and 65 males. The mean age was 53 years with no significant gender differences. 63% of patients had hypertension as a coexisting condition while 35% had diabetes mellitus. Presence of co-morbid conditions were associated with severe disease. Dyspnoea (73%) and cough (94%) were the predominant symptoms. Laboratory parameters including elevated white cell count, C-reactive protein, urea, and creatinine were associated with severe disease. Of the 200 patients, 36 were deemed as severe. 34 of these patients required ICU admissions. 17 demised showing a case fatality rate of 8%. Treatment options given were in keeping with guidelines.

Conclusion

COVID-19 has proven to be a clinical and therapeutic challenge. Its main factors being its novelty and variable presentation across the globe. This study has shown that a local setting, not all data is congruent with national or global trends. This speaks to the need of more centres and countries looking at their own variation of COVID-19 presentations, thus challenging the clinical and therapeutic decisions around the disease.

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To Don Zachariah, thank you for your support and guidance through this process. Thank you for being an inspiration and the pearls of wisdom you have given me.

To my parents, thank you for all the sacrifices you have made for myself and my brother. None of this would be possible without you.

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List of Abbreviations

ACE2	Angiotensin-converting enzyme 2
ACE-I	Angiotensin-converting enzyme inhibitor
ARB	Angiotensin 2 receptor blocker
ARDS	Acute respiratory distress syndrome
AT1R	Angiotensin 2 Type 1 receptor
CFR	Case fatality rate
CKD	Chronic Kidney Disease
COPD	Chronic obstructive pulmonary disease
COVID-19	Coronavirus disease 2019
CPAP	Continuous Positive Airway Pressure
CVD	Cardiovascular Disease
ECMO	Extracorporeal membrane oxygenation
eGFR	Estimated glomerular filtration rate
HIV	Human immunodeficiency virus
HREC	Human Research Ethics Committee
ICU	Intensive Care Unit
NAAT	Nucleic acid amplification test
NHLS	National Health Laboratory Service
NICD	National Institute of Communicable Diseases

RNA	Ribonucleic acid
RSA	Republic of South Africa
RT-LAMP	Reverse transcription loop mediated isothermal amplification
RT-PCR	Reverse transcriptase polymerase chain reaction
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
UK	United Kingdom
VL	Viral load
WHO	World Health Organisation

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Chapter One: Protocol with Extended Literature Review

Introduction

In December 2019, the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified in Wuhan, China (1). The World Health Organisation (WHO) declared coronavirus disease 2019 (COVID-19) a pandemic on 11 March 2020 and has since then rapidly spread across the globe (2). The first case reported in the Republic of South Africa (RSA) was on 5 March 2020 (3). To date, November 2021, 2,900,000 cases have been reported in the country. The worldwide figure stands at 250,360,000 worldwide with a mortality of 5,000,000. COVID-19 causes multiorgan dysfunction, most prominent of which are COVID-19 pneumonia, acute respiratory distress syndrome (ARDS), thromboembolic disease, cardiac injury, and death (4).

The clinical presentation and outcomes have been variable throughout the globe. Therefore, it is important to analyse the clinical behaviour in a local setting. Our study plans to look at the clinical characteristics and outcomes of patients diagnosed with COVID-19 admitted to a tertiary health care complex in North West Province, from during the peak winter months of June to July 2020.

Epidemiology

According to the National Institute of Communicable Diseases (NICD), the disease predominantly affects adults, the median age in South Africa being 38 years, and children less than 10 years only accounting for 3% of confirmed cases (5). Incidence of the disease was found to be highest among males in the 70-79 age group (19.1 cases per 100 000 persons). This is in keeping with global trends showing similar statistics for age. Despite a definite propensity for the elder age group, the consistency does not hold true for the distribution between males and females. Global statistics report a male predominance. In the

United Kingdom (UK), 60% of admissions for patients with COVID-19 were male (6). South Africa however, reported 56% of cases to be female, with an overall incidence of 9.3 cases per 100 000 persons compared to 7.5 cases per 100 000 persons for males (5). Healthcare worker epidemiology on a global scale reported an average of 18%, nurses being the most affected. Data about healthcare worker prevalence in South Africa is scanty.

As of November 2021, WHO estimated the global case fatality rate (CFR) to be 2% (7). This varies across the different parts of the world, South Africa reporting a CFR of 3.1%. These values need to be interpreted with caution, as many factors affect the CFR, including test limitations, testing rates and patient demographics.

The leading cause of death in patients with COVID-19 is respiratory failure from ARDS (8). Overall global mortality from ARDS is 39%. Those who required mechanical ventilation have a mortality between 36% to 53% (9). Other complications include myocardial injury, kidney, or liver injury and multiorgan dysfunction.

Prognostic factors that have been linked to increased risk of unfavourable outcomes include: age (> 50), male sex, smoking, comorbidities (diabetes, cardiovascular disease, hypertension, chronic obstructive pulmonary disease (COPD), obesity, malignancy), leucocytosis ($>10 \times 10^9/L$), thrombocytopenia ($<150 \times 10^9/L$), elevated inflammatory markers (C-reactive protein), D-Dimer and Troponin T (10). Interestingly, anaemia (Haemoglobin $<12g/dl$) is associated with an increased risk for severe COVID (11).

Pathophysiology

Although the exact pathophysiology of COVID-19 infection is not known, it is understood as a primarily respiratory infection, although other systems are involved (12). It is confirmed that the angiotensin-converting enzyme 2 (ACE2) receptor in humans is the binding site for the SARS-CoV-2 (13). The spike glycoprotein receptor binding domain of the virus has a

unique feature which may have higher affinity for the angiotensin-converting enzyme 2 (ACE2) on host cells. Evidence suggests that the SARS-CoV-2 downregulates ACE2, resulting in accumulation of angiotensin-2, which activates angiotensin 2 type 1 receptor (AT1R) which promotes vasoconstriction and is pro-inflammatory and hence can lead to multi-organ failure (14).

Genetic analysis of datasets taken from major physiological systems prove specific organs more susceptible to SARS-CoV-2 based on ACE2 expression. These include the lungs, heart, kidney, gastrointestinal tract and haemoglobin and hence explains the common manifestations of COVID-19 (15) (16).

Clinical manifestations are organ specific, with the respiratory and cardiac system being the most common. In patients with respiratory involvement, manifestations include bronchopneumonia, pulmonary embolism, and ARDS. Cardiac manifestations described include acute coronary syndrome, arrhythmias and heart failure. Other manifestations include gastroenteritis, acute kidney injury and myositis (17).

In patients who demised from respiratory failure, autopsy studies revealed certain common findings. This includes exudative diffuse alveolar damage combined with the presence of microthrombi (18). Thrombotic material at a macroscopic and microscopic level are noted to cause pulmonary artery occlusion. Severe endothelial damage was identified (19). Of note, autopsy studies have often identified SARS-CoV-2 in the myocardium (20).

Endothelial disease is the hypothesis of COVID-19. Platelet activation and endothelial dysfunction have proven to be significant features of hospitalised patients. They are likely associated with critical illness and death (21).

Diagnosis

Molecular testing is required to confirm COVID-19 (22). Various diagnostic tests exist, whether to detect current or previous infections, including nucleic acid amplification test (NAAT), antigen testing and serological testing. The preferred initial diagnostic test is NAAT, most commonly real-time reverse transcriptase polymerase chain reaction (RT-PCR) (23). Pooled sensitivity is 86% and specificity 96% (22). Specimens should be taken from upper (nasopharyngeal or oropharyngeal) or lower respiratory (sputum, tracheal aspirate or bronchoalveolar lavage) tracts. Antigen tests have the benefit of being performed rapidly and at the point of care thus faster time to results. However, they are less sensitive than NAATs so the possibility of false negatives must be considered (24). Serological tests detect antibodies to SARS-CoV-2 in the blood and can identify those who have had COVID-19 previously as well as current infection with prolonged symptoms. There is limited use in diagnosis as they are less likely to be reactive in the acute setting (25).

Treatment

There are limited proven options for the prevention and treatment of COVID-19 (26). No specific antiviral or vaccine currently. Therefore, it is paramount to enhance the immune response against COVID-19 as well as appropriate organ supportive strategies (27).

Examples of potential antivirals included remdesivir, chloroquine and lopinavir/ritonavir, however further research is needed for its efficacy (27).

Immune modulatory agents that have shown benefit include corticosteroids, thromboprophylaxis and vitamins. The RECOVERY trial in June 2020 demonstrated the benefit of dexamethasone in COVID-19 (28). It showed a significant reduction in 28-day mortality in patients who required mechanical ventilation. Thromboprophylaxis in patients with COVID-19 is an important therapeutic agent due to the hypercoagulable state. Multiple

studies have proven the benefit of enoxaparin at therapeutic doses (1mg/kg) (29). The role of vitamins, A-E, is due to their potential antioxidant, antimicrobial, and immunomodulatory effect in ARDS (26).

Organ support, specifically respiratory, should be timely and effective to improve survival and reduce complications. A meta-analysis showed the incidence of ARDS to be 15% and up to 85% of ICU admissions due to respiratory failure and hypoxia.(27) Oxygen therapy ranges from nasal cannula to extracorporeal membrane oxygenation (ECMO), depending on patient requirements. Circulatory support is just as important. The recommendation is conservative fluid administration while maintaining reasonable mean arterial pressure with appropriate use of vasopressors.(27) Other organ support is individualized to the patient.

More research is required to assess efficacy of antivirals and adjunctive therapy.

Summary

COVID-19 has proven to be a clinical and therapeutic challenge for clinicians globally. The main contributors being its novelty to the world and its variability in presentation and prognosis across different parts of the world. This stresses the need to have data representing local effect of the disease. This study aims to investigate the clinical characteristics and clinical outcomes of patients with COVID-19 admitted to Tshepong hospital during the peak winter months June and July 2020 and hence understand the risk factors for developing disease from COVID-19 needing admission.

Aim

To describe the clinical characteristics and outcomes of COVID-19 in patients admitted at Tshepong Hospital between June and July 2020.

Objectives

- To determine the pattern of clinical presentation of COVID-19.
- To assess clinical outcomes of COVID-19.
- To determine the effect of clinical presentation parameters and comorbidities on outcome and risk for progression of severe disease.

Methodology

Study Design

This is a single centre retrospective review of all patients with COVID-19 admitted at Tshepong Hospital during the period 1 June – 31 July 2020. The study contains both inferential and descriptive elements.

Inclusion Criteria

Patients diagnosed with COVID-19 by means of the SARS-CoV-2 PCR and admitted to Tshepong Hospital from 1 June 2020 – 31 July 2020.

Age 13 and older

Exclusion Criteria

Antenatal, maternal, and paediatric data has been excluded from this write up. Also, outpatients with COVID-19 will not be evaluated due to poor follow up.

Data Extraction

Data pertaining to clinical parameters and outcomes will be extracted from all included patients. Data will be collected for the following parameters (see appendix):

- Demographics
- Comorbidities
- HIV status
- Symptoms
- Admission vital signs
- Biochemistry
- Chest X-ray findings
- Treatment
- Oxygen requirement
- Disease Severity
 - Mild – Not oxygen requiring
 - Moderate – Nasal cannula to Polymask
 - Severe – High-Flow to Mechanical ventilation
- Length of admission before outcome
- Outcome (discharge, demise)

Retrospective review of hospital files will identify patients. Data deemed suitable will be extracted from these files and cross referenced with National Health Laboratory Services (NHLS) electronic platform and used to populate an Excel spreadsheet. Deletion of patient names and substitution with study numbers will maintain patient confidentiality.

Statistical Analysis

Descriptive statistics

Continuous variables were described using the mean and standard deviation or median and interquartile range when variables were not normally distributed. The independent t-test was used to compare means of continuous variables by sex or the Mann-Whitney test for comparison of median values by sex of patients. Pearson's chi square test determined the association between categorical variables (or Fischer's exact for sparse data) using a statistical significance threshold of 0.05.

Inferential statistics

Multivariate Cox proportional hazard models were used to determine factors associated with severe disease and mortality at presentation (for example age, presence of comorbid conditions and baseline laboratory parameters). Independent variables were selected *a priori* for the multivariate analyses or by using a univariate p value <0.20. Log-log plots were used to assess the proportional-hazards assumption.

The following analyses will be taken:

- The clinical characteristics of patients with COVID-19 will be described in terms of:
 - Demographics
 - Clinical presentation
- Clinical outcomes of patients with COVID-19 admitted to Tshepong Hospital
- To determine the effect of the clinical parameters on outcomes

Ethics

This protocol will be submitted to the University of Witwatersrand Human Research Ethics Committee (HREC). Consent for the use of patients' hospital records will be obtained by the academic head of the department of internal medicine and CEO of Tshepong Hospital. Individual patient consent will not be required because retrospective data will be used.

Timing

	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Literature Review												
Preparing Protocol												
Protocol Assessment												
Ethics Application												
Data Collection												
Data Analysis												
Thesis Write Up												

Funding

No additional funding is required.

Limitations

The study is retrospective and thus relies on the quality of record keeping. This may be a limitation due to inadequate notes or lost records. This study is based on a specific cohort of patients admitted within a short time frame and at a single centre, and thus does not necessarily represent the country.

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Chapter 2: Submissible Article

Clinical Characteristics and Outcomes of Patients with COVID-19 in a Tertiary Care Centre - A Retrospective Study at Tshepong Hospital

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Author's contributions: Dixit Anil Dullabh was the principal investigator and primary author of the protocol and final manuscript. Don Zachariah conceptualized the study and assisted with the study design, editing, and approving of the final manuscript.

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Abstract

Introduction

In December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified in China. In March 2020, the WHO declared coronavirus disease 2019 (COVID-19) a pandemic. It has since then, rapidly spread across the globe causing millions of deaths. It has a wide clinical presentation and outcomes have been variable across the world. Thus, an analysis of the clinical characteristic and outcomes of patients with COVID-19 at a local setting, namely the Tshepong hospital was undertaken.

Objective

To determine the clinical presentation and outcomes, and correlate clinical and biochemical parameters to outcomes of patients with COVID-19 at Tshepong hospital

Method

This is a single centre retrospective review of all patients with COVID-19 admitted at Tshepong Hospital during peak of the first wave ; from 1 June 2020 to 31 July 2020. The study contains both inferential and descriptive elements.

Results

A total of 200 patients were admitted with COVID-19 during this study period, of which 135 were female and 65 males. The mean age was 53 years with no significant gender differences. Sixty three percent of these patients requiring admission had hypertension as a coexisting condition while 35% had diabetes mellitus. Presence of co-morbid conditions were associated with severe disease. Dyspnoea (73%) and cough (94%) were the predominant symptoms. Laboratory parameters including elevated white cell count, c-reactive protein, urea, and creatinine were associated with severe disease. Of the 200 patients, 36 were deemed as severe. Thirty-four of these patients required ICU admissions. 17 demised showing a case fatality rate of 8%. Treatment options given were in keeping with guidelines.

Conclusion

COVID-19 has proven to be a clinical and therapeutic challenge. Its main factors being its novelty and variable presentation across the globe and hence has shown varying presentations and outcomes in different parts of the world. This study has shown that a local setting, not all data is congruent when compared to other similar studies. This speaks to the need of more centres and countries looking at their own variation of COVID-19 presentations, thus challenging the clinical and therapeutic decisions around the disease.

Introduction

In December 2019, the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified in Wuhan, China (1). The World Health Organisation (WHO) declared coronavirus disease 2019 (COVID-19) a pandemic on 11 March 2020 and has since then rapidly spread across the globe (2). The first case reported in the Republic of South Africa (RSA) was on 5 March 2020 (3). To date, November 2021, 2,900,000 cases have been reported in the country. The worldwide figure stands at 250,360,000 worldwide with a mortality of 5,000,000. COVID-19 causes multiorgan dysfunction, most prominent of which are COVID-19 pneumonia, acute respiratory distress syndrome (ARDS), thromboembolic disease, cardiac injury, and death (4).

The clinical presentation and outcomes have been variable throughout the globe. According to the National Institute of Communicable Diseases (NICD), the disease predominantly affects adults, the median age in South Africa being 38 years, and children less than 10 years only accounted for 3% of confirmed cases (5). Incidence of the disease was found to be highest among males in the 70-79 age group (19.1 cases per 100 000 persons). This is in keeping with global trends showing similar statistics for age. Despite a definite propensity for the elder age group, the consistency does not hold true for the distribution between males and females. Global statistics report a male predominance. In the United Kingdom (UK), 60% of admissions for patients with COVID-19 were male (6). South Africa however, reported 56% of cases to be female, with an overall incidence of 9.3 cases per 100 000 persons compared to 7.5 cases per 100 000 persons for males (5).

WHO estimated the global case fatality rate (CFR) to be 2% (7). This varies across the different parts of the world, South Africa reporting a CFR of 3.1%. The leading cause of

death in patients with COVID-19 is respiratory failure from ARDS, with an estimation of 39% (8).

Although the exact pathophysiology of COVID-19 infection is not known, it is understood as a primarily respiratory infection, although other systems are involved (9). It is confirmed that the angiotensin-converting enzyme 2 (ACE2) receptor in humans is the binding site for the SARS-CoV-2 (10). Evidence suggests that the SARS-CoV-2 downregulates ACE2, resulting in accumulation of angiotensin-2, which activates angiotensin 2 type 1 receptor (AT1R), promoting vasoconstriction and is also pro-inflammatory and hence can lead to multi-organ failure (11). Thus, organs which express ACE2 are most susceptible to SARS-CoV-2. These include the lungs, heart, kidney, gastrointestinal tract and haemoglobin and hence explains the common manifestations of COVID-19 (12) (13). Based on several autopsies, endothelial dysfunction is a proposed hypothesis of COVID-19. Platelet activation and endothelial dysfunction have proven to be significant features of hospitalised patients. They are associated with critical illness and death (14).

Molecular testing is required to confirm COVID-19 (15). Various diagnostic tests exist, whether to detect current or previous infections, including nucleic acid amplification test (NAAT), antigen testing and serological testing. The preferred initial diagnostic test is NAAT, most commonly real-time reverse transcriptase polymerase chain reaction (RT-PCR) (16). Pooled sensitivity is 86% and specificity 96% (15). Specimens should be taken from upper (nasopharyngeal or oropharyngeal) or lower respiratory (sputum, tracheal aspirate or bronchoalveolar lavage) tracts.

There are limited proven options for the prevention and treatment of COVID-19 (17). No specific antiviral or vaccine currently. Immune modulatory agents that have shown benefit include corticosteroids, thromboprophylaxis and vitamins. The RECOVERY trial in June

2020 demonstrated the benefit of dexamethasone in COVID-19 (18). It proved a significant reduction in 28-day mortality in patients who required mechanical ventilation. Organ support, specifically respiratory, should be timely and effective to improve survival and reduce complications. A meta-analysis showed the incidence of ARDS to be 15% and up to 85% of ICU admissions due to respiratory failure and hypoxia (19). Oxygen therapy ranges from nasal cannula to extracorporeal membrane oxygenation (ECMO) with circulatory support. The recommendation is conservative fluid administration while maintaining reasonable mean arterial pressure with appropriate use of vasopressors (19).

Aim of the Study

Due to global variations in characteristics and outcomes of patients with COVID-19, it stresses a need to have data representing its effect at a local setting. Thus, this study sought to describe clinical characteristics and outcomes of patients with COVID-19 admitted to Tshepong Hospital between June and July 2020 during the peak winter months.

Materials and Methods

Study Population and Study Design

This is a single centre retrospective review of all patients with COVID-19 admitted at Tshepong Hospital during the period 1 June 2020 to 31 July 2020. The study contains both inferential and descriptive elements. Retrospective review of hospital files will identify patients. Data deemed suitable will be extracted from these files. Deletion of patient names and substitution with study numbers will maintain patient confidentiality.

Measurement Tools

A data collection sheet (Appendix 1) was uploaded to Microsoft Excel for ease of statistical analysis.

Statistical Analysis

Descriptive statistics

Continuous variables were described using the mean and standard deviation or median and interquartile range when variables were not normally distributed. The independent t-test was used to compare means of continuous variables by sex or the Mann-Whitney test for comparison of median values by sex of patients. Pearson's chi square test determined the association between categorical variables (or Fischer's exact for sparse data) using a statistical significance threshold of 0.05.

Inferential statistics

Multivariate Cox proportional hazard models were used to determine factors associated with severe disease and mortality at presentation (for example age, presence of comorbid conditions and baseline laboratory parameters). Independent variables were selected *a priori* for the multivariate analyses or by using a univariate p value <0.20. Log-log plots were used to assess the proportional-hazards assumption.

Limitations

The study is retrospective and thus relies on the quality of record keeping. This may be a limitation due to inadequate notes or lost records.

This study is based on a specific cohort of patients admitted within a short time frame and at a single centre, and thus does not necessarily represent the country.

Ethical Considerations

Each patient was assigned a patient number. Data was subsequently captured with patient anonymity being maintained. Permission to collect data was obtained from the Head of the Department of Internal Medicine, as well as the Chief Executive Officer at the Klerksdorp/Tshepong Hospital Complex. Ethical clearance was obtained from the Human Research Ethics Committee (Medical) at the University of the Witwatersrand, Johannesburg (Clearance Certificate Number M201046).

Results

Table 1a: Demographic and clinical characteristics of SARS-CoV-2 patients admitted to Tshepong Hospital between June-July 2020 by sex

Characteristics	Total, N=200	Females, n=130	Males, n=70	P value
Demographics:				
Age (Years)				0.912
Mean $\pm$ SD	53.5 $\pm$ 15.7	52.4 $\pm$ 15.3	55.3 $\pm$ 16.3	0.215
<30	12 (6.0%)	9 (6.9%)	3 (4.3%)	
30-39	32 (16.0%)	22 (16.9%)	10 (14.3%)	
40-49	30 (15.0%)	19 (14.6%)	11 (15.7%)	
50-59	46 (23.0%)	30 (23.1%)	16 (22.9%)	
60+	80 (40.0%)	50 (38.5%)	30 (42.9%)	
Race				0.155
Black	194 (97.0%)	128 (98.5%)	66 (94.3%)	
White	5 (2.5%)	2 (1.5%)	3 (4.3%)	
Coloured	1 (0.5%)	0 (0.0%)	1 (1.4%)	
Clinical:				
Smoking history				
Never smoked	138 (69.0%)	100 (76.9%)	38 (54.3%)	
Smoker	62 (31.0%)	30 (23.1%)	32 (45.7%)	
HIV status				0.271
Negative	157 (78.5%)	99 (76.2%)	58 (82.9%)	
Positive	43 (21.5%)	31 (23.9%)	12 (17.1%)	
Median CD4 count	352 $\pm$ 224.9	365.8 $\pm$ 226.2	318 $\pm$ 227.9	0.546
Median log ₁₀ VL* (IQR)	0 (0-2.1)	0 (0-2.2)	0 (0-1.0)	0.630
ARV regimen				0.826
TDF/FTC/EFV	18 (41.9%)	14 (45.2%)	4 (33.3%)	
TDF/3TC/DTG	14 (32.6%)	8 (25.8%)	6 (50.0%)	
AZT/3TC/Aluvia	6 (14.0%)	4 (12.9%)	2 (16.7%)	
AZT/3TC/DTG	2 (4.7%)	2 (6.5%)	0 (0.0%)	
ABC/3TC/EFV	1 (2.3%)	1 (3.2%)	0 (0.0%)	
Unknown	2 (4.7%)	2 (6.5%)	0 (0.0%)	
Hypertension	125 (62.5%)	83 (63.8%)	42 (60.0%)	0.592
Hypertension treatment				0.143
ACE inhibitor +other	77 (61.6%)	51 (61.5%)	26 (61.9%)	
Calcium channel blocker +other	22 (17.6%)	12 (14.5%)	10 (23.8%)	
Diuretics	25 (20.0%)	20 (24.1%)	5 (11.9%)	
Angiotensin receptor	1 (0.8%)	0 (0.0%)	1 (2.4%)	
Diabetes	70 (35.0%)	47 (36.2%)	23 (32.9%)	0.641
Diabetes treatment				0.699
Metformin	53 (75.7%)	36 (76.6%)	17 (73.9%)	
Sulfonylureas	2 (2.9%)	2 (4.3%)	0 (0.0%)	
Insulin	9 (12.9%)	6 (12.8%)	3 (13.0%)	
Unknown	6 (8.6%)	3 (6.4%)	3 (13.0%)	
Dyslipidemia	68 (34.0%)	46 (35.4%)	22 (31.4%)	0.573

Dyslipidemia treatment	54 (79.4%)	36 (78.3%)	18 (81.2%)	1.000
COPD	11 (5.5%)	5 (3.9%)	6 (8.6%)	0.162
Interstitial lung disease	11 (5.5%)	5 (3.9%)	6 (8.6%)	1.000
Cardiovascular disease	64 (32.0%)	42 (32.3%)	22 (31.4%)	0.899
Chronic kidney disease	19 (9.5%)	15 (11.5%)	4 (5.7%)	0.214

Abbreviations: SD standard deviation, *LDL VL values assigned value of zero, VL viral load, IQR interquartile range, ARV antiretroviral, TDF Tenofovir, FTC Emtricitabine, 3TC Lamivudine, EFV Efavirenz, DTG Dolutegravir, AZT Zidovudine, ABC Abacavir, COPD chronic obstructive pulmonary disease.

Demographic Information

A total of 200 patients were enrolled into the study, and of these, 130 (65%) were female and 70 (35%) were male. The mean age of patients was 53.5 years and 40% of patients aged 60+. The majority (97%) of the patients were of African ethnicity.

Clinical Characteristics

Of the 200 patients enrolled. One hundred and twenty-five (63%) of these patients were hypertensive and 70 (35%) were diabetic. Of note seventy-seven (61.6%) of 125 hypertensive patients had a treatment regimen containing an ACE-I. Forty-three (21.5%) of patients were HIV positive of which 95% were on treatment. Mean CD4 of 352. It is important to note that there was no statistical significance between clinical characteristics of patients needing admission for SARS-CoV-2.

Table 1b: Demographic and clinical characteristics of SARS-CoV-2 patients admitted to Tshepong Hospital between June-July 2020 stratified by severity of disease

Characteristics	Total, N=200	Non severe disease, n=164	Severe disease, n=36	P value
Mean Age (Years), SD	53.5 ± 15.7	51.7 ± 15.6	61 ± 13.4	0.001
Smoking history (n=yes)	62 (31.0%)	51 (31.1%)	11 (30.6%)	0.949
Positive HIV status	43 (21.5%)	36 (22.0%)	7 (19.4%)	0.740
Hypertensive	125 (62.5%)	95 (57.9%)	30 (83.3%)	0.004
Diabetic	70 (35.0%)	49 (29.9%)	21 (58.3%)	0.001
Dyslipidemia (n=yes)	68 (34.0%)	47 (28.7%)	21 (58.3%)	0.001
Interstitial lung disease (n=yes)	3 (1.5%)	3 (1.8%)	0 (0.0%)	1.000
COPD (n=yes)	11 (5.5%)	9 (5.5%)	2 (5.6%)	0.987
Cardiovascular disease (n=yes)	64 (32.0%)	47 (28.7%)	17 (47.2%)	0.031
Chronic kidney disease (n=yes)	19 (9.5%)	10 (6.1%)	9 (25.0%)	<0.001

Abbreviations: SD standard deviation, COPD chronic obstructive pulmonary disease.

Demographic and Clinical Characteristics Stratified by Severity of Disease

Severity of disease is defined and stratified by highest need of oxygen supplementation or ventilatory support. Severe disease included patients requiring high flow oxygen, non-invasive and invasive ventilation. Older age was associated with more severe disease (p value 0.001). Patients having co-existing comorbid conditions of hypertension (83%) , diabetes (58%) , dyslipidaemia (58%) , cardiovascular disease (47%) and chronic kidney disease (25%) had a statistically significant association with more severe disease.

Table 2a: Symptoms and pattern of clinical presentation of SARS-CoV-2 among patients admitted to Tshepong Hospital between June-July 2020 by sex

Characteristic	N= 200	Females	Males	P value
Symptoms at presentation				
Cough	188 (94.0%)	123 (94.6%)	65 (92.9%)	0.618
Dyspnoea	146 (73.0%)	98 (75.4%)	48 (68.6%)	0.301
Sore throat	93 (46.5%)	60 (46.2%)	33 (47.1%)	0.894
Anosmia	51 (25.5%)	34 (26.2%)	17 (24.3%)	0.772
Fever	66 (33.0%)	39 (30.0%)	27 (38.6%)	0.219
Myalgia	100 (50.0%)	66 (50.8%)	34 (48.6%)	0.767
Chest pain	22 (11.0%)	16 (12.3%)	6 (8.6%)	0.421
Gastroenteritis	15 (7.5%)	9 (6.9%)	6 (8.6%)	0.673
Headache	72 (36.0%)	48 (36.9%)	24 (34.3%)	0.711
Exposure to a positive SARS-CoV-2 contact	63 (31.5%)	37 (28.5%)	26 (37.1%)	0.207
Median duration of symptoms (IQR)	5 (3-7) days	5 (3-7) days	5 (3-7) days	1.000
Admission vitals				
Heart rate (beats/min)	98.5 (87-110)	98 (88-108)	100 (75-118)	0.452
Systolic blood pressure (mmHg)	129 (119-141)	128 (119-141)	134 (120-142)	0.295
Diastolic blood pressure	76 (67-85)	75 (66-82)	78 (79-87)	0.116
Oxygen saturation (%)	88 (81-94)	89 (84-94)	85 (75-92)	0.015
Finger prick glucose	6.4 (5.5-8.4)	6.4 (5.6-8.0)	6.4 (5.3-10.9)	0.800
Respiratory rate (breaths/min)	24 (22-26)	24 (22-26)	24 (22-28)	0.093
Admission parameters				
Haemoglobin (g/dL)	13.6 (12.5-14.5)	13.4 (12.2-14.1)	14.5 (13.5-15.6)	<0.001
White cell count ($\times 10^9/L$)	8.0 (5.9-10.5)	8.0 (5.6-10.1)	8.0 (6.3-10.7)	0.625
Platelet count ($\times 10^9/L$)	250 (196-329)	252 (194-333)	243 (198-310)	0.198
C-reactive protein (mg/L)	114 (51-189)	104 (40-185)	122 (75-219)	0.079
D-dimer (mg/L)	0.4 (0.2-1.3)	0.4 (0.2-1.3)	0.5 (0.2-1.2)	0.418
Troponin T (ng/L)	8 (4-24)	6.5 (4-22.5)	12 (5-27)	0.336
HBA1c (%)	6.9 (0-9.9)	6.7 (0-10.0)	7.1 (0-9.8)	0.428
Sodium (mmol/L)	136 (133-138)	136 (133-138)	135 (133-138)	0.450
Potassium (mmol/L)	4.9 (4.4-5.2)	4.9 (4.3-5.2)	5.0 (4.4-5.2)	0.394
Chloride (mmol/L)	97 (93-100)	97 (92-101)	97 (93-100)	0.391
Bicarbonate (mmol/L)	20 (18-23)	20 (18-23)	20 (18-23)	1.000
Urea ($\mu\text{mol/L}$)	5 (3.8-7.6)	4.7 (3.5-7.7)	6.0 (4.5-7.4)	0.043
Creatinine (mmol/L)	85 (69-106)	77 (66-100)	91 (79-111)	0.001
eGFR (ml/min/1.73m^2)	40 (30-51)	36 (26-46)	51 (33-57)	0.016
Chest x-ray finding				0.235
Bilateral infiltrates	120 (70.6%)	77 (69.4%)	43 (72.9%)	
Clear	36 (21.2%)	26 (23.4%)	10 (17.0%)	
Diffuse infiltrates	7 (4.1%)	5 (4.5%)	2 (3.4%)	
Left sided infiltrates	2 (1.2%)	0 (0.0%)	2 (3.4%)	
Right sided infiltrates	1 (0.6%)	1 (0.9%)	0 (0.0%)	
Bilateral bronchopneumonia	1 (0.6%)	0 (0.0%)	1 (1.7%)	
Left pleural effusion	1 (0.6%)	0 (0.0%)	1 (1.7%)	

Ground glass opacity	1 (0.6%)	1 (0.9%)	0 (0.0%)	
Perihilar infiltrates	1 (0.6%)	1 (0.9%)	0 (0.0%)	
Severity of disease				0.221
Mild	59 (29.5%)	41 (31.5%)	18 (25.7%)	
Moderate	105 (52.5%)	70 (53.9%)	35 (50.0%)	
Severe	36 (18.0%)	19 (14.6%)	17 (24.3%)	
Duration of admission/days (IQR)	4 (2-7)	4 (2-6)	5 (3-7)	0.037
Oxygen requirement (n=Yes)				
Room air	60 (30.0%)	42 (32.3%)	18 (25.7%)	0.332
Nasal cannula	48 (24.0%)	38 (29.2%)	10 (14.3%)	0.018
Poly mask	73 (36.5%)	39 (30.0%)	34 (48.6%)	0.009
High flow oxygen	13 (6.5%)	8 (6.2%)	5 (7.1%)	0.787
CPAP	1 (0.5%)	1 (0.8%)	0 (0.0%)	0.462
Mechanical ventilation	4 (2.0%)	2 (1.5%)	2 (2.9%)	0.525
ICU admission	35 (17.5%)	17 (13.1%)	18 (25.7%)	0.025

Abbreviations: IQR interquartile range, EGFR estimated glomerular filtration rate, ICU intensive care unit, CPAP continuous positive airway pressure therapy.

Symptoms and Clinical Presentation

Generally, there were no significant gender differences between symptoms and clinical presentation. However, some statistically significant differences were observed. Oxygen saturation, haemoglobin, urea, creatinine, eGFR, duration of hospital stay, requirement for oxygen and ICU admission were proportionally higher in males than females.

Table 2b. Symptoms and pattern of clinical presentation of SARS-CoV-2 among patients admitted to Tshepong Hospital between June-July 2020, stratified by severity of disease

Characteristics	Total, N=200	Non severe disease, n=164	Severe disease, n=36	P value
Symptoms at presentation (n=Yes)				
Cough	188 (94.0%)	152 (92.7%)	36 (100.0%)	0.094
Dyspnoea	146 (73.0%)	111 (67.7%)	35 (97.2%)	<0.001
Sore throat	93 (46.5%)	78 (47.6%)	15 (41.7%)	0.521
Anosmia	51 (25.5%)	44 (26.8%)	7 (19.4%)	0.357
Fever	66 (33.0%)	51 (31.1%)	15 (41.7%)	0.222
Myalgia	100 (50.0%)	77 (47.0%)	23 (63.9%)	0.066
Chest pain	22 (11.0%)	20 (12.2%)	2 (5.6%)	0.249
Gastroenteritis	15 (7.5%)	11 (6.7%)	4 (11.1%)	0.481
Headache	72 (36.0%)	56 (34.2%)	16 (44.4%)	0.244
Exposure to a positive SARS-CoV-2 contact	63 (31.5%)	51 (31.1%)	12 (33.3%)	0.794
Median duration of symptoms (IQR)	5 (3-7) days	4 (3-7) days	6.5 (3-7) days	0.229
Admission vitals				
Heart rate (beats/min)	98.5 (87-110)	98 (86.5-107)	103 (91.5-118.5)	0.051
Systolic blood pressure (mmHg)	129 (119-141)	130 (120-142)	128 (112-135)	0.123
Diastolic blood pressure	76 (67-85)	77 (69-85)	70 (65-83)	0.042
Oxygen saturation (%)	88 (81-94)	89 (85-94)	70 (53-82)	<0.001
Finger prick glucose	6.4 (5.5-8.4)	6.1 (5.3-7.8)	9.1 (6.3-19.3)	<0.001
Respiratory rate (breaths/min)	24 (22-26)	24 (20-26)	26 (24-28)	0.003
Admission parameters				
Haemoglobin (g/dL)	13.6 (12.5-14.5)	13.5 (12.5-14.5)	14.1 (12.6-15.1)	0.233
White cell count (x 10 ⁹ /L)	8.0 (5.9-10.5)	7.7 (5.7-9.8)	9.6 (7.1-13.0)	0.007
Platelet count (x 10 ⁹ /L)	250 (196-329)	251 (196-335)	241 (184-306)	0.343
C-reactive protein (mg/L)	114 (51-189)	95 (38-154)	196 (130-305)	<0.001
D-dimer (mg/L)	0.4 (0.2-1.3)	0.3 (0.2-0.8)	2.1 (0.5-7.0)	<0.001
Troponin T (ng/L)	8 (4-24)	6 (4-17)	21 (12-50)	0.003
HBA1c (%)	6.9 (0-9.9)	6.3 (0-9.7)	7.4 (6.8-10.5)	0.080
Sodium (mmol/L)	136 (133-138)	136 (133-138)	134 (130-139)	0.038
Potassium (mmol/L)	4.9 (4.4-5.2)	4.8 (4.3-5.2)	5.1 (4.6-5.5)	0.046
Chloride (mmol/L)	97 (93-100)	98 (93-101)	94 (91-98)	0.009
Bicarbonate (mmol/L)	20 (18-23)	21 (19-23)	18 (15-20)	0.003
Urea (umol/L)	5 (3.8-7.6)	4.6 (3.7-6.4)	7.4 (5.4-11.6)	<0.001
Creatinine (mmol/L)	85 (69-106)	80 (68-97)	110 (90-167)	<0.001
eGFR (ml/min/1.73m ²)	40 (30-51)	43 (30-54)	35 (29-48)	0.269
Chest x-ray finding				0.002
Bilateral infiltrates	120 (70.6%)	87 (63.5%)	33 (100.0%)	

Clear	36 (21.2%)	36 (26.3%)	0 (0.0%)	
Diffuse infiltrates	7 (4.1%)	7 (5.1%)	0 (0.0%)	
Left sided infiltrates	2 (1.2%)	2 (1.5%)	0 (0.0%)	
Right sided infiltrates	1 (0.6%)	1 (0.7%)	0 (0.0%)	
Bilateral bronchopneumonia	1 (0.6%)	1 (0.7%)	0 (0.0%)	
Left pleural effusion	1 (0.6%)	1 (0.7%)	0 (0.0%)	
Ground glass opacity	1 (0.6%)	1 (0.7%)	0 (0.0%)	
Perihilar infiltrates	1 (0.6%)	1 (0.7%)	0 (0.0%)	
Oxygen requirement (n=Yes)				
Room air	60 (30.0%)	60 (36.6%)	0 (0.0%)	<0.001
Nasal cannula	48 (24.0%)	47 (28.7%)	1 (2.8%)	0.001
Poly mask	73 (36.5%)	56 (34.2%)	17 (47.2%)	0.140
High flow oxygen	13 (6.5%)	0 (0.0%)	13 (36.1%)	0.001
CPAP	1 (0.5%)	0 (0.0%)	1 (2.8%)	0.032
Mechanical ventilation	4 (2.0%)	0 (0.0%)	4 (11.1%)	<0.001
ICU admission	35 (17.5%)	1 (0.6%)	34 (94.4%)	<0.001

Abbreviations: IQR interquartile range, EGFR estimated glomerular filtration rate, ICU intensive care unit, CPAP continuous positive airway pressure therapy.

Symptoms and Clinical Characteristics Stratified by Severity of Disease

Ninety-seven percent (n=35) of patients with severe disease presented with dyspnoea which was statistically significant (p-value <0.001). Patients with severe disease had a lower median diastolic blood pressure (70) and a lower median oxygen saturation (70). They also had a higher median respiratory rate (26) and higher finger prick glucose (9.1). Several blood parameters were different between patients with severe and non-severe disease. Median differences were statistically significant in severe disease for white cell count, c-reactive protein, d-dimer, troponin T, sodium, potassium, chloride, bicarbonate, urea, creatinine. Chest X-Ray findings also differed, with higher proportions of bilateral infiltrates in the severe group (p-value 0.002).

Table 3. Treatment options administered to SARS-CoV-2 among patients admitted to Tshepong Hospital between June-July 2020

Therapy received (n=Yes)	N (%)	Non severe disease	Severe disease	P value
Steroid	155 (77.5%)	120 (73.2%)	35 (97.2%)	<0.001
Enoxaparin, 0,5 mg/kg	101 (50.5%)	90 (54.9%)	11 (30.6%)	0.006
Enoxaparin, 1.0 mg/kg	86 (43.0%)	62 (37.8%)	24 (66.7%)	0.006
Vitamin C	189 (94.5%)	154 (93.9%)	35 (97.2%)	0.429
Vitamin D	189 (94.5%)	154 (93.9%)	35 (97.2%)	0.429
Zinc	189 (94.5%)	154 (93.9%)	35 (97.2%)	0.429
Antibiotic	145 (72.5%)	110 (67.1%)	35 (97.2%)	<0.001
Outcome				<0.001
Recovered	183 (91.5%)	164 (100.0%)	19 (52.8%)	
Demised	17 (8.5%)	0 (0.0%)	17 (47.2%)	

Treatment Options

Patients in the severe group had statistically significant higher use of steroids, higher doses of Enoxaparin as well as more likely to receive antibiotics.

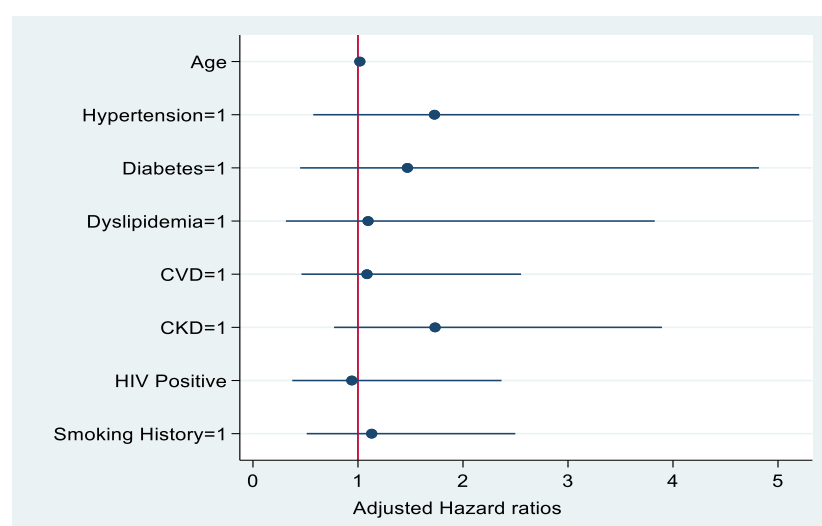
None of the non-severe group demised, while 47% (n=17) of the severe group demised.

Table 4: Baseline factors associated with severe disease or death

Variable	Severe disease N= 36 (100.0%)	Unadjusted HAR 95% CI	Adjusted HAR, 95% CI	Died N= 17 (100.0%)	Unadjusted HAR 95% CI	Adjusted HAR, 95% CI
Age	36 (100.0%)	1.03 [1.00-1.05]	1.02 [0.99-1.05]	17 (100.0%)	1.04 [1.00-1.08]	1.03 [0.98-1.07]
Hypertensive, (ref=no hypertension)	30 (83.3%)	2.84 [1.18-6.83]	1.73 [0.57-5.20]	15 (88.2%)	4.04 [0.92-17.7]	1.66 [0.30-9.33]
Diabetic, (ref=no diabetes)	21 (58.3%)	2.32 [1.16-4.65]	1.47 [0.45-4.82]	10 (58.8%)	2.60 [0.94-7.20]	1.31 [0.29-5.87]
Had Dyslipidaemia, (ref=no dyslipidaemia)	21 (58.3%)	2.21 [1.10-4.44]	1.10 [0.31-3.83]	10 (58.8%)	2.70 [0.98-7.49]	1.28 [0.25-6.48]
Previous smoker,	11 (30.6%)	0.78 [0.38-1.62]	1.13 [0.51-2.50]	3 (17.7%)	0.48 [0.13-1.61]	0.63 [0.17-2.36]

(ref=non-smoker)						
Had CVD, (ref=no CVD)	17 (47.2%)	1.83 [0.93-3.62]	1.09 [0.46-2.55]	8 (47.1%)	1.89 [0.71-5.06]	0.99 [0.32-3.11]
Had CKD, (ref=no CKD)	9 (25.0%)	2.08 [0.96-4.50]	1.73 [0.77-3.89]	5 (29.4%)	3.06 [1.05-8.62]	2.00 [0.66-6.09]
HIV positive, (ref=HIV negative)	7 (19.4%)	0.58 [0.25-1.34]	0.94 [0.37-2.37]	2 (11.8%)	0.43 [0.10-1.89]	0.70 [0.15-3.28]

Figure 1a: Multivariate model showing baseline clinical factors associated with severe disease among study participants

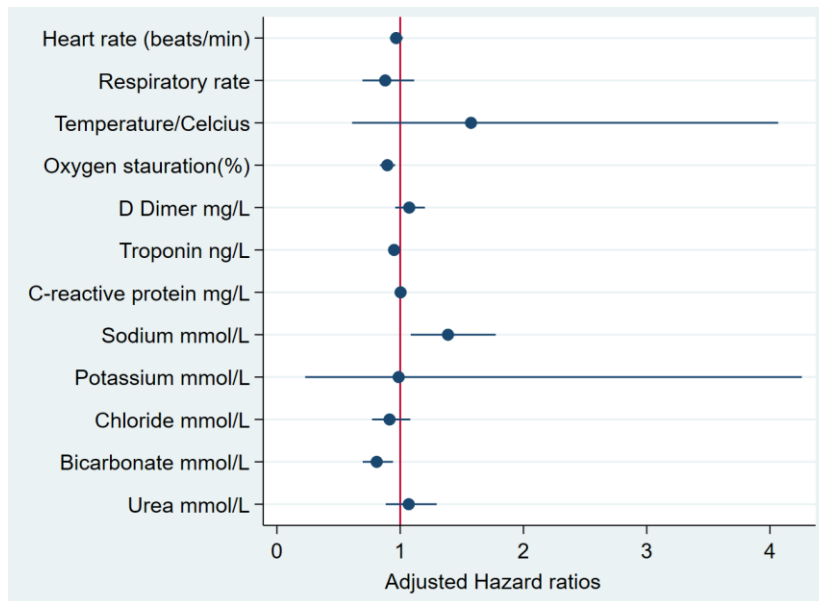


Factors associated with severe disease

At a univariate level, comorbidities were associated with severe disease. Patients with hypertension were 2.8 times more likely to have severe disease than those without.

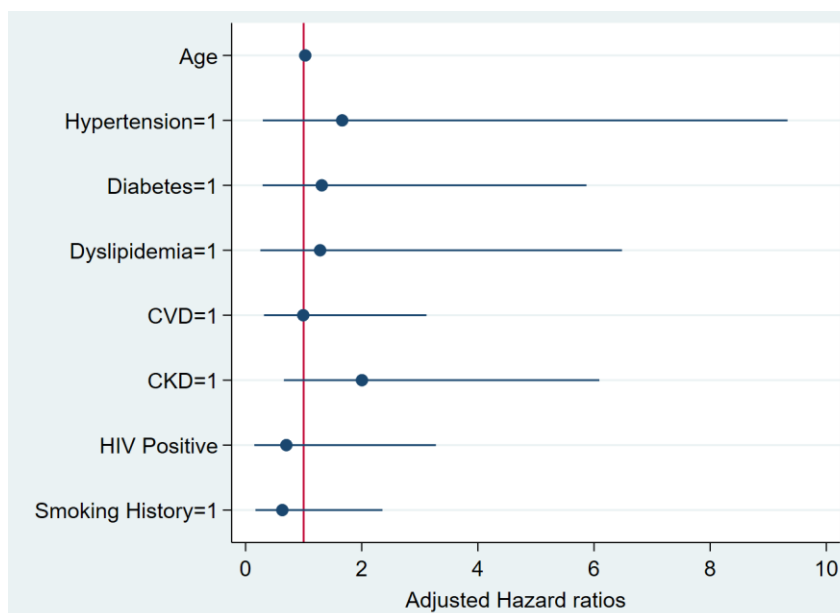
Diabetes was associated with 2.3 times more chance of having severe disease and those with CKD had a 2 times more likely chance of having severe disease. The same was observed in a multivariate model. The hazards of dying were 1.7 times greater in patients with hypertension than those without. The same holds true for diabetes (1.31) and CKD (2.00). It is noted that none of these reached statistical significance as all confidence intervals overlapped the null hypothesis.

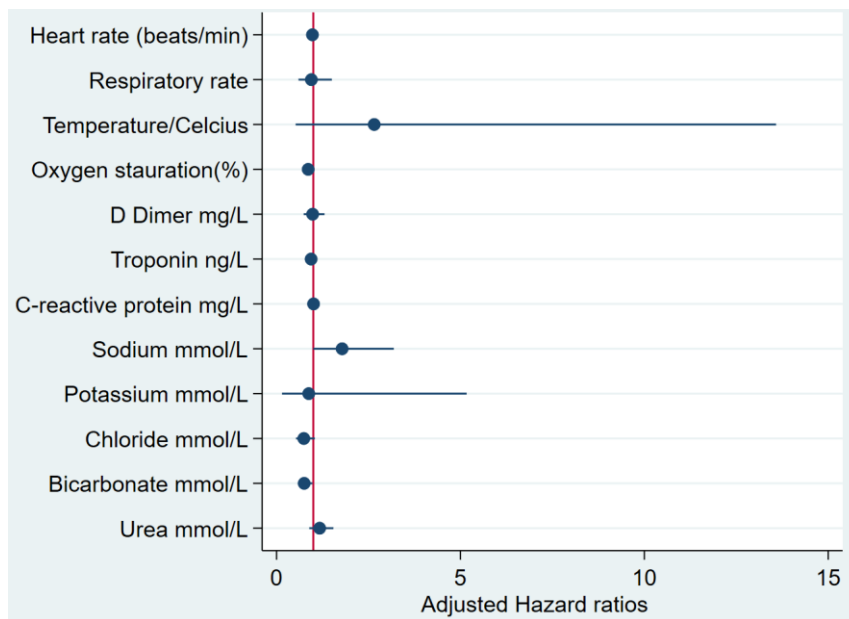
Figure 1b: Baseline laboratory parameters associated with severe disease



It is noted that higher temperatures, d-dimer, sodium, and urea levels were associated with severe disease. Higher levels of oxygen saturation, bicarbonate levels and chloride levels were protective of severe disease, and this was statistically significant.

Figure 1c: Factors associated with mortality





The above tables attempt to correlate factors with association of mortality; however, confidence intervals are wide and so none of the covariates are significant. In terms of the blood parameters, higher sodium levels were associated with increased risk of death, while higher oxygen, bicarbonate and chloride levels were protective. This was statistically significant.

Discussion

A total of 200 patients with COVID-19 were admitted to Tshepong hospital between June-July 2000. There was a strong female predominance (65%) which is in keeping with the general South African statistics of 56% (5). The median age of the study group was 53 years, notably higher than the median of 38 years of age in studies done across the country (5). This is possibly accounted for as this study did not look at outpatients diagnosed with COVID-19, the relatively small study group and the fixed period patients were enrolled.

The two most prevalent comorbidities in the study group were hypertension (63%) and diabetes mellitus (35%). HIV accounted for 22% of patients of which 95% were on ART. There were no significant gender differences noted. Baseline characteristics associated with severe disease in this study group included: age and existing comorbid illness. This is in keeping with national and global trends (20). Interestingly, use of ACE-I had no association or risk of severe disease as previously thought. Unfortunately, this study was unable to assess control and evidence of complications of these comorbid conditions.

Admission symptoms and laboratory parameters did not differ between genders. The most common symptoms being cough (94%) and dyspnoea (73%) with myalgia present in 50% of patients. Admission vital signs were similar as were the admission blood results. Some differences were seen in blood parameters between males and females. These include: Hb, urea and creatinine, which were significantly higher in males. This can be accounted for as normal variations due to the natural biological differences between genders. With respect to severity of disease, there were associations made. Patients complaining of dyspnoea were associated with increased severity of disease. Patients with severe disease had a lower mean diastolic blood pressure (70mmHg), lower oxygen saturation (70%) and higher respiratory rates. This is in keeping with global standards.

Regarding treatment options, as expected per guidelines, those in the severe group received higher steroid use and therapeutic doses of clexane.

Of the 200 patients enrolled, 164 were in the non-severe group and 36 in the severe group. 94% of patients in the severe group required ICU admission. There was a 92% recovery rate. Of the 8% that did demise, 47% were from the severe group and none from the non-severe group. This CFR of 8% is substantially higher than the CFR at a national and global level, 3.1% and 2% respectively (7). This could be explained by varying treatment protocols by different hospitals as well as the relatively small population size.

Due to the sparsity of the data collected, it was a challenge to draw any conclusions regarding the factors associated with mortality. However, the data was able to notice certain factors that was associated with severe disease as well as certain factors that were protective of it.

At a univariate as well and multivariate analysis, the presence of existing comorbid conditions, namely hypertension, diabetes and chronic kidney disease were associated with more severe disease. However due to the small number of patients with outcome, these did not reach statistical significance.

Similarly baseline laboratory parameters were associated with severe disease. Increase sodium, urea, creatinine, d-dimer, and c-reactive protein were associated with severe disease. Interestingly higher levels of oxygen saturation, bicarbonate and chloride levels were protective of severe disease. These were statistically significant.

Conclusion

COVID-19 has proven to be a challenge both clinically and therapeutically worldwide. Its main contributory factors being its novelty as well as variable presentations across the globe. Our study has shown that not all data, even at a national level, can be extrapolated to a local level as shown by the differences demonstrable even with a small population group.

This stresses the need for data representing the disease effect at a local level as national and global statistics may not always be relevant. It also stresses the need for clear documentation to combat incomplete files and work up.

We are yet to see how the disease will evolve over time and this may change the outlook of clinical and therapeutic decisions of COVID-19. And with time more studies of its effect at different levels may deem necessary.

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Chapter 3: Appendices

Appendix 1: Data Collection Sheet

Study Number: _____

Demographics:

Sex (F/M)	Age (Years)	Race (B/A/M/W)

Body Habitus:

Weight (kg)	Height (m)	Body Mass Index (kg/m ²)

HIV status:

Negative/Positive	CD4 count	Viral load	ARV regimen

Comorbidities:

Comorbidity	Target organ damage	Treatment

Was the patient taking an ACE-I/ARB (Yes/No): _____

Smoking History:

Yes/No	Pack year history (packs per year)

Did the patient have a positive COVID-19 contact? (Yes/No): _____

Presenting Symptom:

Symptom	Yes/No
Cough	
Dyspnoea	
Sore Throat	
Anosmia	
Fever	
Myalgia	
Chest pain	
Gastroenteritis	
Headache	
Other	
(If yes – specify)	

Duration of Symptoms (days): _____

Admission vitals:

Heart rate (Beats per minute)	Blood pressure (mmHg)	Oxygen saturation (%)	Finger prick glucose (mmol)	Respiratory Rate (Breaths per minute)

Admission parameters:

Haemoglobin (g/dL)	White cell count (x 10 ⁹ /L)	Platelet Count (x 10 ⁹ /L)	C-reactive protein (mg/L)	D-Dimer (mg/L)	Troponin T (ng/L)	HBA1c (%)

Sodium (mmol/L)	Potassium (mmol/L)	Chloride (mmol/L)	Bicarbonate (mmol/L)	Urea (mmol/L)	Creatinine (umol/L)	eGFR (ml/min/1.73m ²)

Chest X-ray findings: _____

Did patient require ICU admission? (Yes/No): _____

Oxygen Requirement:

Type of Oxygen	Yes/No
Nasal cannula	
Polymask	
High flow oxygen	
CPAP	
Mechanical ventilation	

Treatment:

Drug	Yes/No
Steroid	
Clexane (Daily/BD)	
Vitamin C	
Vitamin D	
Zinc	
Other	
(If yes – specify)	

Outcome:

Length of admission (days)	Outcome (discharge/demise)

Appendix 2: HREC Clearance Certificate



R49 Dr D Dullabh

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL) CLEARANCE CERTIFICATE NO. M201046

NAME:
(Principal Investigator)

Dr D Dullabh

DEPARTMENT:

School of Clinical Medicine
Department of Medicine
Division of Internal Medicine
Medical School
University

PROJECT TITLE:

*Clinical characteristics and outcomes of patients with
COVID-19 admitted to a tertiary care centre -
a retrospective study at Tshepong Hospital*

DATE CONSIDERED:

2020/10/30

DECISION:

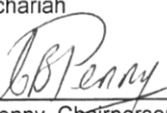
Approved unconditionally

CONDITIONS:

SUPERVISOR:

Dr D Zachariah

APPROVED BY:


Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL:

2021/06/21

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report.** When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **October** and therefore reports and re-certification will be due in the month of **October** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator

Date