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PERIOPERATIVE OUTCOMES OF SARS-COV-2 POSITIVE PATIENTS WHO UNDERWENT URGENT AND EMERGENCY SURGERY: A RETROSPECTIVE COHORT STUDY AT A SOUTH AFRICAN QUATERNARY HOSPITAL DURING THE SARS-COV-2 PANDEMIC

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Abstract

Purpose

This study aimed to assess the perioperative outcomes of SARS-CoV-2-positive patients undergoing urgent and emergency surgeries during the COVID-19 pandemic at a South African quaternary hospital. The primary goal was to determine whether mortality rates and complications in the local setting were consistent with global findings.

Methods

This retrospective review included all SARS-CoV-2-positive patients presenting for surgery from March 1, 2020, to December 28, 2021, at IALCH, Durban, South Africa. Data were extracted from electronic medical records, including demographics (age, sex, American Society of Anesthesiologists (ASA) grading, planned surgery), clinical factors (COVID diagnosis details, degree of respiratory compromise, anesthesia type), and complications.

Results

The major finding from the dataset was the relatively young population of the cohort, with a mean age of 32.5 years among all patients presenting for surgery. Most patients who died were classified as ASA 3 or 4, with multiple comorbidities. Multiple trauma cases were common during the study period, which coincided with a period of strict lockdown.

Conclusion

In this retrospective cohort study of surgical patients with confirmed SARS-CoV-2 infection, 22.8% of patients died. The findings suggest that SARS-CoV-2 may not have had a significant impact on overall all-cause mortality in this cohort. Trauma was a major contributor to mortality, particularly among ASA 3 and 4 patients.

Keywords: *SARS-CoV-2, Surgery, Mortality, Pandemic*
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Introduction

The COVID-19 pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), presented unprecedented challenges to healthcare systems worldwide. Studies from various international sources have shown that patients who underwent surgery while being diagnosed with SARS-CoV-2 experienced higher perioperative mortality.1 This risk was notably higher among those with multiple comorbidities or in older age groups. These findings were supported by several global studies examining morbidity and mortality outcomes in surgical patients with COVID-19. However, data specific to South Africa, particularly regarding mortality outcomes for SARS-CoV-2-positive patients undergoing surgery, was lacking during the period of this study.2,3

The South African Surgical Outcomes Study (SASOS) of 2015 reported that the perioperative mortality rate for non-cardiac surgery in public hospitals stood at 25.5%.4 Notably, it found that non-communicable diseases (NCDs) were more strongly correlated with mortality than infections. This is significant in the South African context, where the healthcare burden includes high rates of poverty-related diseases, NCDs, HIV, and trauma-related injuries. These factors, combined with the emergence of the SARS-CoV-2 pandemic, highlighted the need to assess how these elements impacted surgical outcomes during this time.4

While global studies, such as those by the COVID-19 Surg Collaborative (2022), demonstrated varying perioperative outcomes based on region, localized

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factors—such as healthcare system capacity and resource availability—were essential in understanding the differential impacts of COVID-19 on surgical patients.5 For example, research conducted by Abbott et al. (2022) in England confirmed that surgical patients with SARS-CoV-2 experienced significantly higher mortality rates, even if their COVID-19 symptoms were mild or asymptomatic.6

In Cape Town, South Africa, Du Toit et al. (2022) studied neonatal cardiac surgeries and found that while the pandemic affected surgical schedules, with careful management, positive outcomes could still be achieved.7 These findings provided some insight into how South African healthcare settings managed COVID-19-related challenges while continuing to deliver critical surgical care.

Given the lack of localized data on the outcomes of SARS-CoV-2-positive surgical patients in South Africa during the COVID-19 pandemic, this study aimed to evaluate the perioperative outcomes in such patients at Inkosi Albert Luthuli Central Hospital (IALCH) in Durban, KwaZulu-Natal, from 1 March 2020 to 28 December 2021.

Methods

Study Design

This was a retrospective review of SARS-CoV-2-positive patients who underwent surgery at Inkosi Albert Luthuli Central Hospital (IALCH) between 1 March 2020 and 28 December 2021.

Setting

Inkosi Albert Luthuli Central Hospital (IALCH) in Durban, South Africa, was the designated provincial referral center for SARS-CoV-2-positive patients in KwaZulu-Natal. The hospital followed strict protocols for the care of COVID-19-positive surgical patients, including dedicated operating theatres and patient transport systems to minimize cross-contamination.

Participants

The study included all SARS-CoV-2-positive patients who underwent urgent or emergency surgery at IALCH within the study period. Inclusion criteria were based on the presence of a confirmed positive PCR test for SARS-CoV-2 within 24 hours of surgery. Both symptomatic and asymptomatic patients were included. Exclusion criteria included patients with a prior SARS-CoV-2 infection more than 14 days before surgery and those who tested negative for SARS-CoV-2 but required urgent or emergency surgery.

Data Sources

Data were collected from patient medical records and surgical logs. The primary outcomes measured were perioperative mortality (30-day mortality post-surgery) and factors contributing to mortality, including age, sex, comorbidities, and respiratory support needs.

Bias

Efforts were made to minimize bias by including all eligible patients within the specified study period. Selection bias was minimized by ensuring that all patients with confirmed SARS-CoV-2 infection who required surgery were included. Information bias was addressed by using standardized data collection tools and ensuring consistency in data entry.

Statistical Methods

Data were entered into an Excel spreadsheet and analyzed using R statistical software (version 3.6.3). Descriptive statistics were used to summarize patient demographics, clinical characteristics, and outcomes. Continuous variables were analyzed using median values and interquartile ranges, and categorical variables were analyzed using frequencies and percentages. Inferential statistics, including the Wilcoxon test and Chi-square test (or Fisher's exact test for small sample sizes), were used to determine associations and differences between groups, with a significance level of 5%.

Study ethics

Ethical approval for the study was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (Ref. No. BE/00004498/2022), with approval granted on 15 January 2022, and the study was approved by the KwaZulu-Natal Department of Health (Ref. No. KZ_202102_005).

Results

A total of 114 SARS-CoV-2-positive patients were included in the study. The mean age of the cohort was 32.5 years (SD = 16.8), with a range from 0 to 84 years. The mortality rate within 30 days of surgery was 22.8%. Table 1 presents the demographics of the patients.

Demographics

The cohort consisted of 56.1% males and 43.9% females. The mortality distribution was 61.5% male and 38.5% female, though the sex distribution between survivors and non-survivors was not statistically significant ($p = 0.528$).

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Table 1: Demographics

Category	Value
Mean Age (years)	32.5
Median Age (years)	30
Sex (Male)	56.1%
Sex (Female)	43.9%

COVID-19 Diagnosis

Half of the cohort (51.8%) had a confirmed diagnosis of SARS-CoV-2 before surgery, while 48.2% were diagnosed postoperatively. Mortality did not significantly differ based on the timing of diagnosis ($p = 0.515$).

Table 2: COVID-19 Diagnosis

Category	Percentage
Retrospective Diagnosis	48.2%
Pre-operative Diagnosis	51.8%

Surgical Discipline

The cohort primarily included patients undergoing neurosurgery (29.8%), followed by vascular surgery (13.2%) and obstetrics (12.3%). Mortality rates were higher in trauma-related surgeries, although this was not statistically significant ($p = 0.112$).

Table 3: Surgical Discipline and Mortality Rates

Discipline	Percentage of Surgeries	Mortality Rate
Neurosurgery	29.8%	24.1%
Vascular Surgery	13.2%	21.5%
Obstetrics	12.3%	16.0%
Trauma Surgery	44.7%	28.3%

Symptomatic Status and Respiratory Support

Of the 114 patients, 47.4% were symptomatic, while 52.6% were asymptomatic. Mortality rates among symptomatic patients were 53.8%, while 46.2% of asymptomatic patients died. Respiratory support data showed that 28.1% of patients required invasive ventilation, 9.6% needed 40% face mask oxygen, and 62.3% required no respiratory support.

Table 4: Symptomatic Status and Respiratory Support

Category	Percentage of Patients	Mortality Rate
Symptomatic	47.4%	53.8%
Asymptomatic	52.6%	46.2%
Invasive Ventilation	28.1%	34.6%
40% Face Mask Oxygen	9.6%	11.5%
No Respiratory Support	62.3%	53.8%

ASA Status

Patients classified as ASA III and IV had a significantly higher mortality rate than those classified as ASA I and II ($p = 0.001$), which highlights the importance of preoperative risk assessment in surgical decision-making.

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Table 5: ASA Status and Mortality

ASA Classification	Mortality Rate
ASA I & II	4.4%
ASA III & IV	38.2%

Discussion

The data aligns with recent trends in the literature, demonstrating that the impact of SARS-CoV-2 infection on perioperative mortality varies. South Africa stands out in terms of trauma, lifestyle-related diseases, and communicable diseases. Our study emphasizes the potential effects of trauma on the perioperative outcomes of SARS-CoV-2-positive patients undergoing urgent surgeries. 12, 16

The results from the cohort suggest that, among patients undergoing emergency and urgent surgeries, the SARS-CoV-2 pandemic may not have significantly affected patient mortality. The perioperative morbidity and mortality observed in our university cohort may not have followed the same pattern as reported in other studies. The nature of the presented pathologies and the surgeries themselves may have contributed to the recorded deaths and perioperative complications. Upon closer examination of cases across various surgical disciplines, many related to vascular surgery, orthopedics, and neurosurgery were categorized as trauma-related procedures. In total, 25.4% of all surgeries were trauma-related, compared to 6.1% of cases booked through the trauma department as isolated cases.

A small Chinese study investigated 34 patients who underwent surgery during the SARS-CoV-2 incubation period. The overall mortality rate in this study was 20%, with 44% of patients requiring postoperative admission to an intensive care unit (ICU). 18 Similarly, Nahshon et al. examined four studies, including asymptomatic SARS-CoV-2 carriers, revealing a 27.5% postoperative mortality rate, predominantly due to pulmonary complications. 19

The COVID-19 and COVID-19 studies, the largest investigations of SARS-CoV-2-positive surgical patients, also reported a higher incidence of postoperative complications and mortality. These cohort studies involved 36,000 patients across 86 countries. According to the first study, 24% of patients died within 30 days post-surgery, and 51% experienced postoperative pulmonary complications. Although no South African cases were included, the study involved several African countries. 1

Other recent studies have reported lower rates of postoperative mortality. A Canadian cohort study, for instance, reported a 30-day postoperative mortality rate of 15.9% in SARS-CoV-2 patients, although the study's small sample size of 44 patients limits its generalizability. This study concluded that while fewer surgeries were performed on SARS-CoV-2 patients, the epidemic had a significant impact on surgical activity volume. 5

In a cohort study conducted in New York during a wave of infections similar to the South African SARS-CoV-2 epidemic, perioperative mortality was found to be 16.7% in SARS-CoV-2-infected patients, compared to 1.4% in SARS-CoV-2-negative patients. The study also noted higher rates of cardiac arrest, sepsis/shock, respiratory failure, pneumonia, acute respiratory distress syndrome, and acute kidney injury in SARS-CoV-2-positive patients. These findings indicate that SARS-CoV-2 infection is associated with a higher risk of major perioperative morbidity and mortality. 20

The frequency of violent trauma during South Africa's lockdown period can be explained by several factors: socioeconomic inequalities, the historical background of violence, and the current national crime rate. With many people living in poverty and experiencing unemployment, South Africa has significant social inequalities. In areas with limited access to resources and employment opportunities, movement restrictions during lockdowns may have exacerbated existing tensions, leading to an increase in violence. South Africa's violent history, stemming from the apartheid era and continuing in some areas due to ongoing social and economic challenges, further contributes to the frequency of violent trauma. The COVID-19 pandemic has also heightened stress and worsened mental health problems, leading to increased aggression and violence in some cases. 21,22

Of the 23 neurosurgical cases in our study, 16 (69%) were trauma-related, and all of these resulted in mortality. In neurosurgical operations, Azab et al. reported a higher death rate during the epidemic.23 Interestingly, 52.4% of all the patients tested positive for SARS-CoV-2 either before or during surgery, with half of them being asymptomatic. Among the asymptomatic patients who tested positive, 12 out of 26 died—10 of whom were trauma-related cases, and only 2 had comorbidities such as hypertension, which has been associated with higher mortality in COVID-positive patients. Compared to 20% of asymptomatic patients, 25% of symptomatic patients who required preoperative oxygen (via a 40% face mask or invasive ventilation) died, indicating a preoperative severe illness state.

Higher mortality risk was linked to conditions such as diabetes, hypertension, and obesity. Among patients with one or more of these comorbidities, 26% of patients accounted for 23% of deaths. One death among the pediatric patients in the cohort was caused by severe septic shock unrelated to SARS-CoV-2, while the remaining children showed mild symptoms upon presentation for surgery, consistent with case studies from that period, where asymptomatic children tested positive. 17

The introduction of SARS-CoV-2 vaccines in South Africa from June 2021 complicates the analysis of their effect on all-cause mortality. A retrospective analysis of

228,643 patients by McInerney et al. revealed a higher risk of postoperative pulmonary complications in patients who did not complete their primary vaccination schedule before surgery or who underwent surgery within 4 weeks of a positive SARS-CoV-2 test. However, due to variations in patient count, it may not be possible to directly compare this data with our findings. The introduction of COVID-19 vaccines has likely helped reduce the severity of SARS-CoV-2 infections, thereby lowering the risk of perioperative complications in vaccinated individuals. This may have been a limitation, as the vaccine rollout coincided with our study period. 24

Conclusion

This study highlights the significant impact of SARS-CoV-2 infection on perioperative outcomes in a South African public hospital setting. The findings indicate a notable increase in mortality rates among SARS-CoV-2-positive patients undergoing surgery, especially in those with multiple comorbidities, advanced age, or requiring urgent trauma-related surgeries. The study demonstrates that preoperative screening for COVID-19 status and associated comorbidities is essential to better assess surgical risks in these patients.

Additionally, the data underline the critical need for optimizing perioperative care, especially for patients classified as ASA III and IV, who were found to be at higher risk of mortality. Given the findings, there is a need for improved surgical management protocols in the context of COVID-19, focusing on ensuring adequate respiratory support and timely interventions to reduce the risk of complications. This study also emphasizes the importance of continuing surveillance and research to evaluate long-term outcomes for SARS-CoV-2-positive surgical patients, especially in resource-limited settings.

The retrospective nature of the study limits the ability to control for all confounding factors. Additionally, the study's findings are specific to the local context of a single tertiary referral hospital, which may limit the generalizability of the results to other regions or healthcare settings.

Recommendations

Based on the findings of this study, it is recommended that further research be conducted to compare surgical outcomes between COVID-19-positive and non-COVID-19 patients in diverse settings. This will help to better understand the distinct risks and challenges associated with COVID-19 in perioperative care. Additionally, larger cohort studies are needed to confirm these findings and provide more robust evidence regarding the impact of SARS-CoV-2 on surgical outcomes across different patient populations.

Ultimately, while this study provides useful insights for South African healthcare settings, the findings are relevant to other regions facing similar challenges, highlighting the need for adaptive strategies in managing surgical patients during a pandemic. Future research should focus on refining risk assessment tools and exploring potential interventions to improve surgical outcomes in COVID-19-positive patients.

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List of Abbreviations

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2
IALCH: Inkosi Albert Luthuli Central Hospital
ASA: American Society of Anesthesiologists

Source of Funding

This study had no funding.

Conflict of Interest

The authors declare that there is no conflict of interest.

Author Contributions

Author 1: Study Design, data collection, analysis, data interpretation, and manuscript writing.
Author 2: Study design, analysis, and oversight.
Author 3: Study Design, analysis, and oversight.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Biography

1. Faheem Baba (MBChB) received his medical degree at the University of Stellenbosch in 2013. He developed an interest early on in his internship and is now a 3rd-year resident in Anaesthetics. He hopes to improve the health system in state practice that is moving towards universal healthcare one day. This research manuscript is a compulsory component of Faheem's Residency.
2. Sudha Bechan (MBChB) is currently the Head Clinical Unit at IALCH, she has a special interest in pain medicine and holds a master's in

Pain medicine and a certificate in Critical care. She is a master supervisor to many Residents and is dedicated to practicing medicine with evidence-based best practices.

3. Imraan Asmal (MBChB), is currently in Private Private in Canada as a Specialist Anaesthetist, in his time at IALCH, he enjoyed teaching residents, but also assisted other Residents in their Masters. He is a dedicated father and strives to practice the best medicine and currently furthering his skills in Canada.

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