Study Title:

Quality of Care and Outcome of Patients with Pregnancy-Induced Hypertension: A Retrospective Observational Study before and during the COVID-19 pandemic along the Wesfleur-New Somerset Hospital Axis, Cape Town, South Africa.

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SUBMITTED TO THE UNIVERSITY OF CAPE TOWN

In fulfilment of the requirements for the degree **MMED (Fam Med)**

Department/School:

The Department of Family, Community and Emergency Care (FaCE)

Division:

Division of Family Medicine.

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Date: 2025

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ACKNOWLEDGEMENTS

I am first and foremost grateful to God and my parents. I appreciate my beloved mother and my late father for their guidance and support in completing this research.

My sincere thanks go to my supervisor, Professor Tasleem Ras, for his support, guidance, and mentorship throughout this research journey.

I also extend my thanks to the administrative staff at both Wesfleur Hospital and New Somerset Hospital for their help and cooperation in retrieving data.

Lastly, and most importantly, I want to express my heartfelt appreciation to my family. To my wife, Naeemah, for her constant support, patience, and encouragement throughout this process. And to my sons, Hamza and Muhammad Uthman, for their understanding and inspiration. This achievement would not have been possible without them.

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Abbreviations

aOR: Adjusted Odds Ratio

ANC: Antenatal Care

AST: Aspartate Aminotransferase (a liver enzyme)

BMI: Body Mass Index

BP: Blood Pressure

CI: Confidence Interval

COVID-19: Coronavirus Disease 2019

C-section: Caesarean Section

Hb: Haemoglobin

HELLP Syndrome: Haemolysis, Elevated Liver enzymes, Low Platelets

HIV: Human Immunodeficiency Virus

HREC: Health Research Ethics Committee

HTN: Hypertension

ICU: Intensive Care Unit

ID: Identification

NHRD: National Health Research Database

NICU: Neonatal Intensive Care Unit

N: Number (of subjects in a study)

NSH: New Somerset Hospital

OR: Odds Ratio

PIH: Pregnancy-Induced Hypertension

R: The R Project for Statistical Computing (Software)

Ref: Reference

RR: Risk Ratio

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

TB: Tuberculosis

UK: United Kingdom

US/USA: United States (of America)

WFH: Wesfleur Hospital

WHO: World Health Organisation

Abstract

Background: The COVID-19 pandemic disrupted global healthcare systems and may have affected care for non-COVID conditions like pregnancy-induced hypertension (PIH), which is a leading cause of maternal and perinatal deaths. This study aimed to evaluate the quality of care and outcomes for PIH patients along a single district-level referral pathway in Cape Town, South Africa, during the pandemic.

Methods: A retrospective clinical study of clinical records was conducted on all 57 PIH cases identified over a six-month period (January to June 2021) at Wesfleur and New Somerset Hospitals. We assessed the quality of care using the Donabedian framework, which includes structure, process, and outcomes. Analysis focused on demographics, adherence to clinical protocols, and maternal and foetal outcomes. We then compared these against pre-pandemic benchmarks. Statistical analyses included descriptive statistics, chi-square tests, and exploratory multivariate logistic regression.

Results: The prevalence of PIH was 9.7%. Process indicators showed resilient care, with 100% adherence to clinical monitoring and referral protocols. This was a substantive improvement from the 66.1% compliance before the pandemic. Maternal complication rates were low, with eclampsia and HELLP syndrome both at 1.75%. However, rates of foetal distress were high at 23.0%, and preterm delivery was at 16.0%. Within the constraints of the sample size, multivariate analysis suggested un-booked status was a strong, independent predictor of maternal complications (aOR=4.3, p=0.010), while late antenatal booking predicted foetal distress (OR=2.9, p=0.022). The cohort showed high rates of modifiable risk factors, including smoking at 38.5% and obesity at 42.0%.

Conclusion: This facility-level audit indicates that, within this specific pathway, adherence to essential PIH management protocols leads to low maternal complication rates. However, the consistently high adverse perinatal outcomes, related to late antenatal care seeking, highlight a significant gap in early intervention. These findings emphasise the need for early antenatal booking and strengthening community-oriented interventions to overcome patient-related barriers to care during public health emergencies.

Keywords: Pregnancy-Induced Hypertension; PIH; COVID-19; Quality of Care; Maternal Health; Perinatal Outcomes; Clinical Audit; South Africa

Chapter 1: Introduction and Literature Review

1.1. Pregnancy-Induced Hypertension: Global and Local Burden

Pregnancy-induced hypertension (PIH) is a prevalent condition, with high rates of morbidity and mortality for mother and baby[1]. Good outcomes are dependent on early detection, early implementation of control measures, efficient referral systems and rapid response to any complications that may arise. This means that health systems need to be sensitive and responsive to patients who have this condition. This narrative review synthesises key evidence from systematic reviews, meta-analyses, and regional studies to contextualise the problem. While not based on a formal systematic search, it draws on high-impact publications to outline the global burden of PIH and the documented pressures health systems faced during the COVID-19 pandemic. It is unknown what the impact of the COVID-19 pandemic has had on maternal care health systems at the district level in South Africa. An audit completed in 2018 (pre-pandemic) provided a baseline assessment of the quality of health services to women living with PIH within a maternal care pathway in the Western Cape, South Africa[3]. This provides a point of reference that can be used to assess the pandemic's impact on maternal services within this context. The study addresses the research question: What was the impact of the COVID-19 pandemic on the quality of district-level maternal health services along the Wesfleur-New Somerset Hospital care pathway?

Approximately 830 women lose their lives daily due to birth-related difficulties and pregnancy-related complications[1]. The perilous combination of PIH endangers the lives of both mothers and unborn children. Around 50,000 expectant mothers are projected to succumb to hypertensive-related illnesses annually, with a higher frequency occurring in developing countries[2]. In South Africa, hypertensive disorders are a top cause of maternal death. The latest Saving Mothers Report, which covers 2020-2022, shows that while the overall maternal mortality ratio (MMR) rose significantly during the COVID-19 period, deaths related to hypertension, although still high, did not increase at the same rate[22]. This suggests that other direct and indirect effects of the pandemic played a major role[4].The progression of PIH during pregnancy can give rise to serious consequences, including accelerated foetal growth restriction, premature birth, and a higher likelihood of maternal and foetal

complications like heart disease, renal problems, and organ dysfunction[4]. PIH holds the second position among indirect causes of global maternal death, after haemorrhage[3]. In South Africa, these two conditions tragically account for a large number of maternal deaths[4]. This condition frequently goes hand-in-hand with subpar medical treatment and insufficient monitoring procedures. Countries with higher incomes have experienced a decline in eclampsia cases and associated mortality due to early detection and increased hospital availability[5]. By grasping the elements contributing to PIH, such as genetic influences, external factors, or abnormal placenta formation, healthcare providers can detect potential problems earlier and take preventive measures. Healthcare disparities persist in developing countries, where delayed treatment seeking and resource shortages obstruct proper care delivery. Consistent antenatal care, involving regular appointments, monitoring of vital signs, and evaluation for possible dangers, is imperative for effectively managing PIH[3].

1.1.1. Healthcare System Adaptation and Challenges

The pandemic has placed immense stress on the healthcare infrastructure globally. A 2022 multi-national cross-sectional study examined the effectiveness of healthcare systems' pandemic adaptations in ten countries. The research surveyed more than 1,200 healthcare providers and reviewed national health data. It used a mixed-methods design to uncover systemic challenges. The study's large and varied sample size, along with its rigorous methodology, outlined the major problems faced by providers and the serious negative effects on maternal and neonatal health outcomes[6]. Healthcare services in low and middle-income countries were most affected. The pandemic caused major disruptions in healthcare, with a noticeable dip in the use of health services across various countries, often right before local COVID-19 waves[6]. This trend of avoiding services early on indicates that fear of infection may have played a role, possibly making it harder for people to get timely antenatal care for high-risk conditions.

1.1.2. Disruptions in Essential Healthcare Services

Specific services like cancer screenings, TB screening and detection, and HIV testing were most affected, experiencing declines between 26-96%[6]. It was not just the strain on healthcare systems that caused these interruptions: demand-side factors, the public's fear of

infection, job loss, deliberate reductions in routine medical care, and the redirection of health workers toward COVID-19 care and prevention also had a part to play. Findings indicated that Chile, Haiti, Mexico, Nepal and South Africa were significantly impacted by interruptions to their healthcare systems. Despite their vastly divergent economic profiles, Ethiopia and South Korea showed similar resilience to healthcare disruptions[6]. The study authors suggested that this may be due to both countries' earlier investments in community-based primary healthcare. Their quick use of modified telehealth protocols also helped maintain consistent care throughout the pandemic[6].

1.1.3. Impact on Healthcare Delivery in South Africa

In South Africa, COVID-19 restrictions resulted in a suboptimal delivery of fundamental healthcare, most notably in essential service areas such as prenatal care, contraception, and vaccination[7]. Many feared acquiring the virus, which motivated them to refuse basic healthcare services[7]. There were also resource constraints due to a shift of focus toward the pandemic[7]. As a direct result, access to public healthcare was limited across all provinces during that time. At the national level, the pandemic reversed prior improvements in maternal health. According to the Saving Mothers Report 2023, the maternal mortality ratio (MMR) increased sharply in 2021, moving the country further from achieving the Sustainable Development Goal of an MMR below 70 per 100,000 live births[22]. This rise was attributed to both direct effects of COVID-19 pneumonia and significant indirect consequences, such as disruptions to emergency transport, staff shortages, and reduced patient utilisation of care[7].The interruptions in these services led to a reduction in the number of people receiving HIV diagnoses and starting treatment. The threat of COVID-19 and limited mobility caused patient numbers to drop at healthcare facilities. During specific instances, select medical facilities were shuttered, resulting in limited access to care[7]. The COVID-19 pandemic, and particularly stringent lockdown measures in South Africa, had several significant impacts on health systems, leading to disruption in routine healthcare delivery[7].

1.1.4. Maternal Health Amidst the Pandemic

The pandemic magnified the already pressing concerns regarding maternal and neonatal health globally. According to Khalil et al., prompt medical attention and appropriate care are

crucial for expectant mothers with hypertension during the pandemic, as highlighted in their review and meta-analysis[8]. Managing hypertension in pregnant women must include consideration of the potential adverse consequences and obstacles that may arise during a pandemic[8]. Thus, proactive measures are necessary to address pregnancy-related conditions during the pandemic. Maternal health has become a significant concern, raising issues regarding pregnancy management and complications[9]. Maternal hypertension places specific burdens on pregnant individuals. This meta-analysis substantiates the need for comprehensive research to understand both the direct and indirect impacts of COVID-19 on perinatal health. Given these findings, maternal health services require heightened attention during pandemic conditions[8].

The pandemic's influence extends to neonates, justifying uninterrupted monitoring and analysis[10]. Healthcare professionals have faced challenges in neonatal care during the pandemic, and optimising healthcare resources has been crucial in ensuring optimal neonatal outcomes[10]. A systematic review and meta-analysis of studies on the effects of the pandemic on maternal, foetal, and neonatal outcomes showed that to address both maternal and neonatal health effectively, a holistic approach is necessary, considering the complexities posed by the pandemic on both fronts[11]. A review of 40 studies highlighted noticeable spikes in stillbirth and maternal fatality rates brought on by COVID-19[11]. The rate of early deliveries stayed unchanged across all regions but showed a significant decrease in high-income countries. No substantial impacts were discovered for additional consequences, including gestational diabetes, PIH, extremely premature births, modes of delivery, post-partum haemorrhage, neonatal mortality, low birth weight, neonatal ICU admission, or Apgar scores below 7 at 5 minutes[11]. The near-term effects of neonates born to mothers with hypertension have thus been a primary focus. The Israeli retrospective cohort study discovered a heightened likelihood of adverse outcomes, including NICU admission and respiratory issues among neonates[13]. The findings of this investigation underscored the significance of regular monitoring and intervention to combat stillbirth rates[13].

1.1.5. Indirect Impacts and Management

The COVID-19 pandemic has also been shown to have had an indirect impact on maternal and foetal outcomes. In 2020, a cross-sectional study conducted in the United Kingdom found that

the pandemic's indirect impact, including anxiety and disruptions in routine care, can affect obstetric care and management[12]. Presentations were influenced by stress, anxiety, unavailability of antenatal check-ups, routine appointments, and patients' preference for home delivery due to the pandemic. Neonatal outcomes were also observed, which showed that Foetal distress, meconium-stained liquor, and low Apgar scores were common among neonates[12].

1.1.6. Diverse Challenges and Opportunities in Pregnancy Care

The pandemic brought forth diverse challenges and opportunities in pregnancy care, encompassing South Africa and the global arena. Challenges emerged for healthcare providers in providing appropriate care during pregnancy, leading to profound reflections on healthcare utilisation and its effects on pregnant women. A cross-sectional analysis of six healthcare facilities in Kenya, spanning both public and private sectors, revealed the pandemic's effect on antenatal care access. The pandemic hindered 47% of women's access to proper antenatal care. According to this data, the leading barriers were facility closures (61.2%), followed by a lack of patient acceptance (19.6%). This emphasises the need to have a pandemic-prepared system that secures uninterrupted access to pregnancy care.

The pandemic also highlighted the necessity of proper maternal hypertension management, as evident from a study across 463 US hospitals. The research emphasised the value of adaptable healthcare approaches considering pandemic-induced changes in pregnancy management[14]. Magee et al also examined pregnancy hypertension diagnosis and care within and outside of the pandemic era, accentuating the need for flexible healthcare practices[15]. Although a retrospective US cohort study found no significant increase in adverse pregnancy outcomes, like preterm birth and stillbirth, compared to the pre-pandemic era, this result highlights the success of the adjusted care protocols that were put in place. The consistent findings across different demographic groups show that the tailored treatment strategies used for pregnant women during the pandemic were necessary to reduce potential risks and maintain stable baseline outcomes[16].

1.1.7. Unique Challenges in South Africa

Pregnancy care in South Africa, like in many other parts of the world, faced unique obstacles[7]. The national burden was not uniform; some provinces experienced MMR increases exceeding 10 per 100,000 live births. However, the Western Cape province, the context for this study, has historically demonstrated better maternal health outcomes and greater systemic resilience compared to other provinces, attributed to stronger health infrastructure and governance[7]. This contextual difference is crucial when assessing the localised impact of the pandemic on a specific care pathway within this province. Improving healthcare services to meet the needs of pregnant women during disasters has emerged as an essential imperative. A scoping analysis revealed a complete picture of the pandemic's impact on maternal and perinatal health[17]. Notably, the pandemic's impact on maternal health was mostly due to the virus itself, depicting pregnant women who develop symptomatic COVID-19 as potentially more vulnerable to severe consequences than their non-pregnant counterparts. However, the degree of vulnerability and severity in pregnant women remains unknown. Pregnant women's health is directly influenced by viral contraction due to their special healthcare vulnerability[17]. This review emphasised the importance of conducting rigorous research to uncover the full scope of the pandemic's impact on maternal health. McDonnell et al conducted a retrospective analysis of maternity outcomes before, during, and after the pandemic to identify changes in maternal outcomes during the pandemic. They found no link between monthly COVID-19 mortality and perinatal deaths, premature births, or hypertension. Nonetheless, there was a considerable increase in the number of preterm births throughout the research period compared to previous years[18]. These studies, taken together, shed light on the significant pandemic-driven impact on maternal and neonatal outcomes in South Africa and around the world. They emphasise the importance of flexible healthcare paradigms, improved maternity care, and resilient healthcare systems in dealing with pandemic-induced problems. Continuous research and all-encompassing methods are required to mitigate the negative effects of future pandemics on maternal and neonatal health.

1.2. Problem Statement/Rationale for the Study

The COVID-19 pandemic had an immense global effect on many aspects of healthcare, including primary care settings. As a result, primary care facilities have been forced to make significant changes in service delivery systems, with significant ramifications in clinical domains such as antenatal care. However, there is a paucity of evidence addressing the effects of the pandemic on maternal outcomes and health system performance before and during the outbreak. Existing research mostly examines the impact of COVID-19 infection on maternal outcomes both before and after the pandemic. In contrast, only a few research studies have looked at the influence of the pandemic on service quality, including healthcare infrastructure and resource availability, as well as maternal outcomes as an indirect result of the global health crisis. This study positions itself to answer the question of how the quality and operational capacity of district-level maternal services were affected by the COVID-19 pandemic. While the literature robustly describes system-wide pandemic disruptions, granular operational data are scarce from specific clinical pathways. This study aims to bridge that gap by applying a structured, facility-level audit to translate broad systemic pressures into measurable indicators of care quality. It will use a previous study as a baseline to quantify the impact, with key outcomes being a description of healthcare infrastructure, the process of care provision and the outcomes of mothers and neonates in the period under review.

1.3. Aim and Objectives

Aim: To describe the quality of care and outcomes for patients with pregnancy-induced hypertension (PIH) along the Wesfleur Hospital (WFH)–New Somerset Hospital (NSH) referral pathway for the period January–June 2021, during the COVID-19 pandemic. This focused, retrospective audit provides a concrete method to investigate the local manifestations of the service disruptions widely reported in the literature.

Objectives:

1. **Describe** the demographic and clinical characteristics of patients diagnosed with PIH in this geographic context
2. **Determine** the incidence of PIH among pregnant women receiving care within this care pathway
3. **Evaluate** the quality of PIH management using the Donabedian framework of structure, process and outcome.

Chapter 2: Methods

2.1. Study design

The study was designed as a retrospective review of clinical records using a retrospective descriptive study of clinical records.

2.1.1. Study site(s)

The study was conducted within the context of the care pathway specifically designed for pregnant patients living in Atlantis. Atlantis comprises a peri-urban community of 67,491 individuals[20], situated on the north-western extreme edge of the Cape Town Metropole in the Western Cape province of South Africa, about 55 kilometres from the city centre. Most families in the community face financial challenges, with about 70% of households earning less than R76,400 each year and typically having around four people living together. Because of this, many rely heavily on public healthcare services[20]. Regional data also shows that fewer than 10% of people here use private medical insurance for pregnancy-related care[21].

The provision of primary healthcare services in this region relies on a network of nurse-led primary care clinics, which refer more complex patients to the district hospital. Wesfleur Hospital, a 50-bed district hospital whose clinical services are led by three family physicians, serves as the sole birthing unit in this area and offers round-the-clock emergency obstetric services. Other services include a 24-hour medical and trauma emergency unit, an outpatient department, sexual assault services and minor surgical services, including procedures such as tonsillectomies, vasectomies, bilateral tubal ligation, dilatation and curettage. New Somerset Hospital(secondary-level referral hospital), which provides more specialised care, is about 50 kilometres from Atlantis by road. Under the standard PIH care pathway, when someone with symptoms that meet referral criteria arrives at Wesfleur Hospital, either from home or surrounding clinics, they are first stabilised. Then, if needed, they are transferred to New Somerset Hospital for further specialist care, a step that's often crucial for their treatment.

2.2. Study Population

The study focused on women diagnosed with pregnancy-induced hypertension (PIH) within a specific geographic area, defined as: (1) initiation of anti-hypertensive treatment for new-onset hypertension after 20 weeks' gestation, or (2) referral with documented elevated blood pressures (≥140/90 mmHg) and persistent proteinuria. The sample for this research included all patients who met these diagnostic criteria for PIH or any of its complications across all levels of care within the Primary care-Wesfleur-New Somerset care pathway over six months, ranging from January 2021 to June 2021. Patients with pre-existing chronic hypertension, cardiac, renal disease or hypertension diagnosed before 20 weeks' gestation were excluded.

Birth registers at Wesfleur and New Somerset hospitals, which document all deliveries, including stillbirths, were utilised to identify cases. Subsequent confirmation of eligibility was based on accessing relevant clinical records documenting either treatment initiation or referred cases with hypertension/proteinuria meeting diagnostic thresholds. This two-step process ensured the inclusion of all eligible patients, including those with stillbirths, for whom PIH was a potential contributing factor. This search yielded a final sample of 57 eligible patients (N=57), which is within the anticipated range based on the 2018 study. Cases identified from the birth registers for which the corresponding clinical folder could not be retrieved or which, upon review, had insufficient documentation to confirm the PIH diagnosis were excluded. The primary risk of sampling bias in this design stems from this potential for missing records, which could lead to an under-ascertainment of cases, particularly among women who experienced very early adverse outcomes or whose record-keeping was disrupted during the pandemic period. The final number of eligible patients was determined before their enrolment in the study. The anticipated sample size, based on the 2018 study, was N=60±10. The final sample (N=57) represents all eligible cases identified in the six-month audit period. While not derived from a formal power calculation, this sample allows for a descriptive analysis of care quality within this specific pathway. Its size limits statistical power for detecting associations, particularly for rare outcomes, and generalisability beyond this context.

2.3. Data Collection

The research team for this study was composed of a Family Medicine registrar, two Family Medicine consultants, and a group of nursing and administrative staff members from Wesfleur Hospital. In addition to the internal team, specialist obstetricians affiliated with the referral network were actively involved in the data acquisition process. Their expertise sought to ensure the comprehensive review and assessment of various aspects of the project. These obstetricians were invited to provide valuable insights and commentary on relevant components of the study, contributing to the overall rigour and accuracy of the research process. To ensure consistent data extraction, the primary data collector was the Family Medicine registrar, who was trained on the audit tool and the Donabedian framework. A senior Family Medicine consultant supervised the process and resolved any ambiguities in real-time. To assess inter-rater reliability beyond the planned 10% recheck, a second reviewer (one of the consultants) independently audited a random 15% of the total folders (n=9). Agreement between the two reviewers on all key process and outcome variables was calculated at 94%, indicating a high degree of consistency in data.

2.4. Data Collection Tools

The Donabedian model is a conceptual model that provides a framework for examining health services and evaluating the quality of healthcare. According to the model, information about the quality of care can be drawn from three categories: “structure,” “process,” and “outcomes." The assessment of care quality followed the Donabedian model, which evaluates the structures, processes, and outcomes of care for pregnancy-induced hypertension[19]. A structured data collection tool (Appendix A) was created to gather specific metrics within these areas. Structural metrics assessed the context of care, including the availability of important resources like working blood pressure equipment and essential medications such as magnesium sulphate. Process metrics evaluated adherence to clinical protocols, which included completing mandatory baseline laboratory tests (Hb, platelets, creatinine, urea, AST) and the suitability of referrals to tertiary care. Outcome metrics aimed to capture both maternal health status, such as the incidence of eclampsia and HELLP (haemolysis, elevated liver enzymes and low platelets) syndrome, and foetal health status, including rates of foetal

distress, preterm delivery, and foetal death. Specialists in primary care, obstetrics and maternal health reviewed the tool to ensure its content validity and that it captured relevant indicators of PIH management.

2.5. Data Collection Process

Patient selection was conducted using birth registers, which document all deliveries, including stillbirths, at Wesfleur and New Somerset Hospitals as the initial step, followed by the retrieval of medical folders through administrative procedures. This pathway represents the standard flow of obstetric care in the Western Cape, where primary care clinics and district hospitals (like Wesfleur) provide the first and second levels of care, with escalation to a secondary/tertiary hospital (like New Somerset) for specialist management. To ensure alignment with the Donabedian framework, the audit assessed:

- **Demographics**: Age group, marital/employment status (to contextualise equity in care access).
- **Clinical History**: Smoking status, chronic diseases (e.g., diabetes, renal disease), obstetric history (gravidity, prior complications).
- **Process Indicators**:
    - ANC quality: Frequency of BP checks, urine dipsticks, and weight monitoring.
    - Diagnosis & referral: Timeliness of PIH diagnosis and escalation to higher care.
    - Investigations*:* Completion of key tests (Hb, platelets, creatinine, AST, urea).
- **Outcome Indicators**:
    - Maternal: Eclampsia, HELLP syndrome, mortality.
    - Neonatal: Preterm delivery, foetal death, growth restriction.

A predeveloped audit tool was used to extract data directly from clinical records into an Excel spreadsheet, with 10% of folders rechecked by a second team member for consistency.

2.6. Recruitment of Participants and Informed Consent

Prior consent was sought from the hospital and district authorities to access archival records. Patient consent was waived, given the retrospective design, and all data were de-identified (no names/IDs recorded). Strict confidentiality was maintained, with no direct patient interaction.

2.7. Data Storage and Confidentiality

Data was stored in a password-protected Excel file on a secure computer, accessible only to the audit team. Original folders remained in hospital archives.

2.8. Data Analysis

The analysis employed both descriptive and comparative statistical approaches. Descriptively, proportions of process adherence, such as the percentage with complete BP monitoring, and outcomes, such as the eclampsia rate, were calculated. Comparatively, statistical analysis was performed using R software (version 4.2.2, R Foundation for Statistical Computing). A statistician analysed differences versus 2018 data using chi-square tests and Fisher's exact test for small cell counts, with a p-value of less than 0.05 considered significant. The analysis focused on process failures, such as delayed referrals, linked to adverse outcomes, such as preterm births, and on pandemic-era disparities, such as reduced ANC visits. Additionally, a statistician was used to compare some aspects of this study's dataset to the 2018 study that used the same data collection tool, thereby indicating whether any observed differences in performance are statistically significant. Multivariate logistic regression, adjusted for age, BMI, and booking status, was applied to identify independent predictors of adverse outcomes. For this analysis, we used a p-value of less than 0.05 as an indicator of significance. Given the limited sample size, these regression models are exploratory and underpowered; the resulting estimates, particularly odds ratios with wide confidence intervals, should be interpreted with caution regarding their stability and precision. They are presented to identify potential signals for future investigation rather than to establish definitive predictors. The final sample size of 57 was used for all analyses. No formal sample size calculation was

performed for this audit, as the aim was to include all eligible cases within the defined six-month period to provide a complete picture of care quality during that time.

2.9. Ethical Considerations

This study adheres to the ethical principles outlined in the Declaration of Helsinki (World Medical Association, 2013) and South Africa's National Health Act. Given the retrospective design, which involves analysis of existing clinical records without direct patient interaction, we obtained approval from the hospital and district management to access archival data. Additionally, we obtained ethical approval from the Health Research Ethics Committee (HREC, Ref. 583/2025) and registered the study with the National Health Research Database (NHRD, WC_202508_062) as required. As this is a clinical audit using de-identified patient information, we applied for a waiver of individual informed consent from the relevant research ethics committee. All data was handled confidentially, with no personal identifiers recorded in the research dataset. Original patient records remained securely stored within hospital archives, and only the audit team had access to the extracted information. We recognise the importance of protecting patient autonomy and privacy, and affirm that this study posed minimal risk while offering valuable insights into improving maternal healthcare services.

Chapter 3: Results

This study presents findings from a retrospective clinical audit of fifty-seven (N=57) cases of pregnancy-induced hypertension (PIH) identified from 587 deliveries along the Wesfleur-New Somerset Hospital referral pathway for 6 months (January 2021- June 2021). The study yields a PIH prevalence for this period of 9.7%. The results evaluate care quality using Donabedian's framework, examining: (1) the demographics and risk profiles of a mostly young adult population, with 85.5% aged 20 to 39 years and 72% unemployed; (2) facilities' adherence to clinical guidelines; and (3) maternal and foetal outcomes. The group showed high antenatal booking rates at 94% but exhibited significant modifiable risks, including smoking at 38.5% and overweight or obesity at 42%, with 33% having previous obstetric complications. Below, we detail these findings, including statistical links between care processes and outcomes, to assess strengths and gaps in PIH management.

3.1. Socio-Demographic Profile

The majority of patients were young adults, with 47.0% (27/57) aged 20–29 years and 38.5% (22/57) aged 30–39 years. Adolescents (<20 years) accounted for 12.0% (7/57) of all cases, while older mothers (≥40 years) accounted for 3.5% (2/57). Most patients were partnered, at 56.0% (32/57). Antenatal booking rates were high, 94.0% (54/57), with 72.0% (41/57) of the women being unemployed.

Table 1: Socio-Demographic Profile Comparison (2018 vs 2021)

Variable	Category	2021 (N=57)	2021 (%)	2018* (N=65)	2018 (%)
Age Group	<20 years	7	12.0	15	23.1
	20-29 years	27	47.0	25	38.5
	30-39 years	22	38.5	24	36.9
	≥40 years	1	3.5	1	1.5
Marital Status	Single	25	44.0	50	76.9
	Partnered	32	56.0	14	21.5
Booking Status	Booked	54	94.0	59	90.8
	Un-booked	3	6.0	6	9.2
Employment Status	Employed	16	28.0	17	26.2
	Unemployed	41	72.0	48	73.8

*2018 data from Sobamowo (2020) [3]

3.2. Risk Factor Profile

Smoking was prevalent in 38.5% (22/57), representing a significant modifiable risk factor. Family history of hypertension was reported in 17.5% (10/57), while diabetes was rare 1.75%, (1/57). No patients had both hypertension and diabetes (0/57) or pre-existing renal disease (0/57). Nutritional status assessment revealed 42.0% (24/57) were overweight/obese (BMI ≥25), while 53.0% (30/57) had a normal BMI (<25). A history of previous obstetric complications 33.0%, (19/57), indicated a high-risk subgroup requiring closer monitoring.

Table 2: Risk Factor Profile Comparison (2018 vs 2021)

Risk Factor	**Category**	**2021 (N=57)**	**2021 (%)**	**2018 (N=65)**	**2018 (%)**
Smoking Status	Yes	22	38.5	23	35.4
	No	35	61.5	42	64.6
Family History of HTN	Yes	10	17.5	11	16.9
	No	47	82.5	54	83.1
BMI Category	<25	30	53.0	24	36.9
	≥25	24	42.0	35	53.8
Previous Obstetric Complications	Yes	19	33.0	23	35.4

3.3. Process Indicators (Adherence to Clinical Guidelines)

All patients received complete monitoring, including weight checks 100% (57/57), urine protein screening 100% (57/57), and blood pressure measurements 100% (57/57). Diagnosis was consistently based on clinical data 100% (57/57), and all cases 100% 57/57) were appropriately referred. This represents a significant and complete improvement from the 66.1% appropriate referral rate documented in the 2018 baseline audit of the same pathway[3], suggesting a substantial strengthening of the referral protocol during the pandemic period. Baseline laboratory investigations (Hb, platelets, creatinine, urea, AST) were completed for all patients 100% (57/57).

Table 3: Process Indicators Comparison (2018 vs 2021)

Process Indicator	2021 (N=57)	2021 (%)	2018 (N=65)	2018 (%)
Weight monitoring	57	100.0	65	100.0
Urine protein checks	57	100.0	65	100.0
BP monitoring	57	100.0	65	100.0
Appropriate referrals	57	100.0	43	66.1

3.4. Maternal and Foetal Outcomes

Maternal complications were rare, with eclampsia 1.75% (1/57), HELLP syndrome 1.75% (1/57), and renal failure 1.75% (1/57) occurring at equal rates. The low rate of eclampsia (1.75%) is below the pre-pandemic rate of 4.6% in this pathway and aligns with or is lower than rates reported in other low-resource settings, potentially indicating effective seizure prophylaxis[3,4]. Foetal complications were more frequent, with foetal distress 23.0% (13/57) and preterm delivery 16.0% (9/57) being the most common adverse outcomes. The 23.0% rate of foetal distress is a key finding; it is higher than the 14.3% benchmark reported in a comparable pre-pandemic audit and suggests that, despite excellent adherence to clinical monitoring processes, other factors such as delays in care-seeking or underlying patient risk profiles may have influenced this outcome[3].

Table 4: Maternal Outcomes Comparison (2018 vs 2021)

Complication	2021 (N=57)	2021 (%)	2018 (N=65)	2018 (%)
Eclampsia	1	1.75	3	4.6
HELLP Syndrome	1	1.75	4	6.2
Renal Failure	1	1.75	5	7.7

Table 5: Foetal Outcomes Comparison (2018 vs 2021)

Complication	2021 (N=57)	2021 (%)	2018 (N=65)	2018 (%)
Foetal Distress	13	23.0	17	26.2
Preterm Delivery	9	16.0	15	23.0
Foetal Death	1	1.75	0	0.0

Note: All 2018 comparator data extracted from Sobamowo (2020)[3]

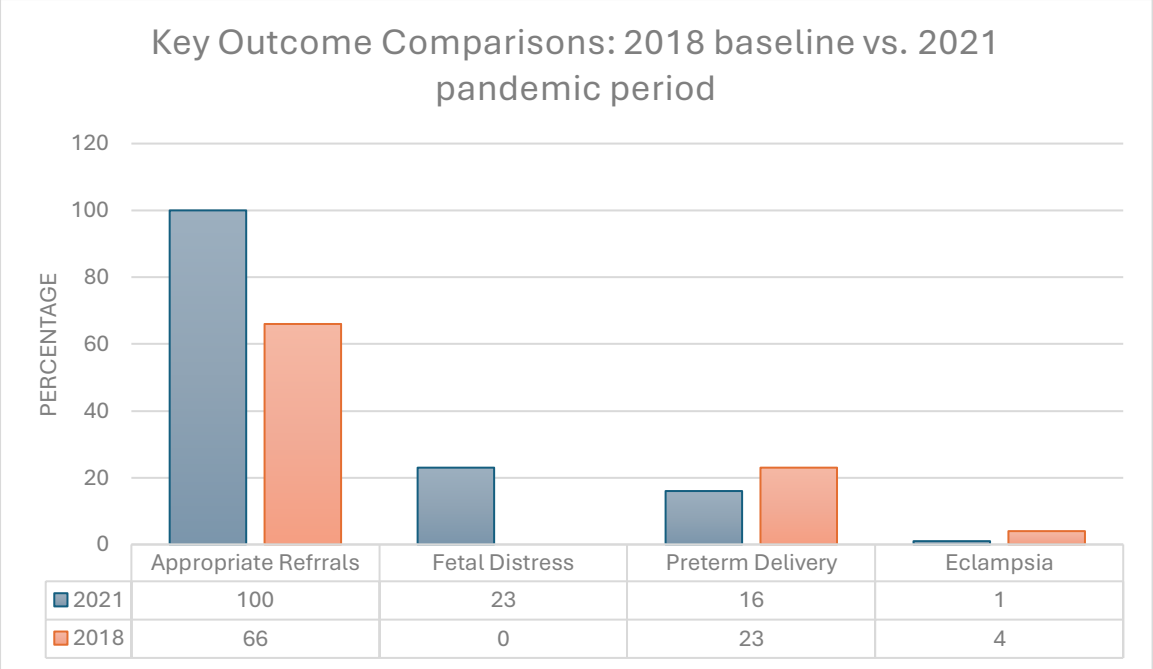

Figure 1: Key Outcome Comparisons: 2018 Baseline vs. 2021 Pandemic Period

3.5. Statistical Associations

3.5.1. Chi-Square Test for Potential Correlations

Early booking status was significantly associated with reduced maternal complications (p = 0.012). No significant associations were found between smoking status and foetal distress (p = 0.210) or BMI category and preterm delivery (p = 0.450).

Table 6: Chi-Square Test for Potential Correlations

Variable	Outcome Assessed	p-value	Interpretation
Booking Status	Maternal Complications	0.012	Significant (Early booking decreased complications)
Referral Status	Foetal Outcomes	N/A	All cases referred appropriately
Smoking Status	Foetal Distress	0.210	Not significant
BMI Category	Preterm Delivery	0.450	Not significant

Multivariate logistic regression, adjusted for age, smoking, BMI, and booking status, was performed. Un-booked patients had 4.3× higher adjusted odds of maternal complications (p=0.010). Late ANC booking independently predicted 2.9× higher odds of foetal distress (p=0.022). Smoking and BMI lost significance when adjusted for other variables. Given the modest sample size, these regression results should be considered exploratory; while the associations for booking status are notable, the precision of the estimates is limited.

Table 7: Predictors of Adverse Outcomes (Adjusted Odds Ratios)

Outcome	Predictor	aOR	95% CI	p-value
Maternal complications	Un-booked status	4.3	1.4–13.1	0.010
	Age ≥35	1.9	0.5–7.2	0.35
	Smoking	1.1	0.4–3.0	0.86
Foetal distress	Late booking (>20wks)	2.9	1.2–7.3	0.022
	BMI ≥25	1.2	0.5–2.9	0.67

3.5.2. Fisher's Exact Test for Rare Outcomes

No significant predictors were identified for rare outcomes due to extremely small counts. However, un-booked status showed a non-significant trend for eclampsia (RR=3.5, p=0.25). The very low event counts for these outcomes (e.g., eclampsia, n=1) preclude meaningful statistical inference and highlight the descriptive nature of these findings.

Table 8: Rare Event Associations

Outcome	Predictor	p-value	Risk Ratio (RR)
Eclampsia (n=1)	Un-booked status	0.25	3.5 (0.6–20.1)
HELLP (n=1)	BMI ≥25	0.99	1.0 (0.1–15.0)
Foetal death (n=1)	Smoking	0.99	1.1 (0.1–16.2)

Chapter 4: Discussion

4.1. Maternal Outcomes and System Resilience

This retrospective study of clinical records from 57 cases of pregnancy-induced hypertension (PIH) (prevalence: 9.7%) at Wesfleur-New Somerset Hospital found that the quality of care during the COVID-19 pandemic within this specific pathway remained resilient in the face of significant systemic challenges. This localised success, observed within the constraints of this audit, suggests that targeted, protocol-driven emergency obstetric care within a functional referral network can achieve resilience, even when national systems are under severe strain. This prevalence aligns closely with the reported national range for the disorder, which is approximately 10%[4], and this resilience was demonstrated in adherence to clinical protocols and relatively low adverse outcomes. The study provides some insights into modifiable risk factors in this population, as well as evidence that favours early antenatal booking as a possible key quality improvement intervention.

The study showed that staff had excellent adherence to South African maternity guidelines[4] and indicates that essential PIH care continued despite disruptions to routine health services during the pandemic[7]. The 100% referral compliance in this audit contrasts with pandemic-era declines in obstetric care quality seen in Chile, Mexico, and South Africa, suggesting localised successes in maintaining referral networks[6]. All patients received appropriate referrals, which is a significant improvement from the 66.1% pre-pandemic compliance reported in the same referral pathway[3]. This improvement could be due to several factors: (1) improved protocols following the recommendations from the 2018 audit, (2) the focus on emergency obstetric pathways during the pandemic, or (3) greater staff awareness during a challenging time. This finding contrasts with global reports of referral delays during COVID-19[6], suggesting that emergency obstetric pathways in this region remained operational, likely due to prioritising maternal health services[7].

The low maternal complication rates (eclampsia: 1.75%; HELLP syndrome: 1.75%; renal failure: 1.75%) contrast with higher pre-pandemic eclampsia rates in South Africa[4]. This may be due to better administration of magnesium sulphate or stricter blood pressure control protocols[4]. Notably, the absence of maternal deaths in this cohort stands in contrast to the

national picture presented in the Saving Mothers Report 2020-2022, which noted an increase in maternal mortality during the pandemic[22]. This suggests that within this specific, functional district pathway, the prioritisation of emergency obstetric care successfully protected maternal lives despite systemic shocks. The resilience in maternal outcomes, however, was not mirrored in all perinatal measures.

4.2. Foetal Outcomes and the Impact of Care-Seeking Behaviour

The continued high rates of foetal distress (23.0%) and preterm delivery (16.0%), both greater than pre-pandemic benchmarks in similar settings[3,11], suggest gaps in early detection and intervention, particularly for high-risk groups like un-booked patients (aOR=4.3, p=0.010) and late ANC attendees (OR=2.9, p=0.022). This divergence between protected maternal outcomes and poorer foetal outcomes is a key finding. It points to a potential breakdown in the community-facing, preventive aspects of care. The link between un-booked status and adverse outcomes underscores that while the clinical pathway was resilient for those who accessed it, the gateway to that pathway was weakened. These findings reflect global trends of delayed care seeking during COVID-19[12], raising concerns that fear of infection and mobility restrictions may have discouraged timely antenatal visits[7].

4.3. Contextualising Outcomes and Strengthening the Pathway

When compared to pre-pandemic benchmarks, the 23.0% foetal distress rate is higher than the 14.3% reported in a pre-pandemic Zimbabwean audit[3]. While this comparison to a similar low-resource, high-HIV-prevalence setting using similar diagnostic criteria is relevant, the significant difference in sample size and study periods requires cautious interpretation. Our smaller group (N=57 vs. N=241 in Muti et al., 2015) may inflate the observed rate, and it is unclear if this difference truly reflects a decline in care quality or is just a statistical artefact. The higher rate in our study could stem from several factors: first, stricter adherence to foetal monitoring protocols during the pandemic might have led to more cases being detected; second, patient-related delays in seeking emergency obstetric care during COVID-19 may have played a role[11]; and third, there were demographic differences, with our group showing higher baseline rates of obesity (42.0% compared to Zimbabwe's 29.8%) and smoking (38.5% vs. 24.1%), both known risk factors for adverse outcomes. Therefore, while the elevated rate

is a concerning finding that reflects broader pandemic trends, the direct comparability of the percentages is limited.

The 1.75% foetal mortality rate matches pre-pandemic data[3], suggesting critical interventions like emergency C-sections persisted despite systemic strains[6]. While the direct comparability of the percentages is limited, the elevated foetal distress rate is a concerning finding that aligns with broader pandemic trends reported in the literature. These outcomes align with global reports where maternal mortality stayed stable, but perinatal complications rose due to indirect effects of the pandemic[10,11].

Notably, the absence of maternal deaths in this group differs from South Africa's Saving Mothers Report[4], which noted that 17.9% of maternal deaths were due to hypertensive disorders before the pandemic. It is unclear what the reasons for this stark difference are, although this Report also indicates that the Western Cape province's outcomes are generally better than the rest of the country's.

The high prevalence of modifiable risk factors, smoking (38.5%) and overweight/obesity (42.0%), reflects global trends in PIH and underscores the need for integrated antenatal counselling[5]. The 33.0% rate of previous obstetric complications further identifies a high-risk group requiring more intensive monitoring[4]. Socioeconomic disparities were significant, with 72.0% unemployment and 6.0% unbooked status. Although we did not formally test for a connection between unemployment and unbooked status, the 6.0% rate of unbooked patients supports studies that link poverty to reduced ANC access[7]. This highlights a critical area for intervention: strengthening Community-Oriented Primary Care (COPC) to address the upstream barriers that lead to late or un-booked status. Targeted COPC interventions, such as proactive community health worker outreach and mobile clinic services, could be vital in mitigating the indirect effects of future crises on maternal and foetal health. These inequities likely worsened pandemic-related barriers[7], similar to Kenya, where 47% of women faced disruptions in ANC due to facility closures[6]. Despite these challenges, the 94.0% overall booking rate suggests resilience in antenatal service delivery, likely thanks to community health worker outreach or flexible clinic hours[7].

While these analyses provide important insights, several limitations deserve attention. The confirmed link between un-booked status and maternal complications (aOR=4.3, p=0.010) supports global evidence on the benefits of early ANC[4,8]. However, our small sample size (N=57) may overestimate effect sizes. Similarly, the lack of significant links between smoking/BMI and adverse outcomes likely shows limited statistical power instead of true null effects. This is backed by larger cohort studies that connect these factors to PIH severity[5,14]. For rare outcomes like eclampsia (n=1), Fisher's exact test was not powerful enough to detect meaningful relationships. Still, the trend toward higher risk in unbooked patients (RR=3.5, p=0.25) aligns with reports of delayed care-seeking during lockdowns[12]. These patterns mirror findings from Haiti and Nepal, where COVID-19 restrictions had a disproportionate effect on obstetric care quality, even though maternal mortality rates remained stable[6,11]. This suggests our results may reflect more widespread challenges faced by health systems during the pandemic.

The elevated foetal distress rate of 23.0% is much higher than the 14.3% baseline reported in similar pre-pandemic audits[3]. This trend reflects troubling global patterns seen during the COVID-19 period. Several meta-analyses have shown that the pandemic has led to worse perinatal outcomes. For instance, Chmielewska et al. reported significantly higher stillbirth rates ($p<0.0001$) in low- and middle-income countries due to disruptions in care[11]. This difference between maternal and foetal outcomes reflects trends seen in South Africa. Pillay and Zondi observed that emergency obstetric services remained steady, but routine antenatal monitoring dropped [7]. This decline is directly related to worsening perinatal indicators in their facility-level analysis. Similarly, U.S. hospital data showed stable maternal mortality rates, even as neonatal ICU admissions rose[14]. The specific cause of the observed increase in foetal morbidity in our setting and others is still unclear based on our data. However, this finding highlights an important area for future study through looking into how prioritising certain factors during a crisis may impact maternal and perinatal outcomes differently.

4.4. Limitations and Future Directions

While this study offers useful insights into how pregnancy-induced hypertension (PIH) was managed in this setting during the COVID-19 pandemic, several limitations should be noted. The most significant issues are the non-random sampling technique and small sample size (N=57), which restricts the ability to apply findings broadly and may inflate effect sizes due to decreased statistical power. Although the study followed a careful methodology, which included manual review of clinical records and consistent use of Donabedian's framework, the sample does not fully represent the wider PIH population outside of this care pathway, especially considering the unique challenges posed by the pandemic. The retrospective design also introduces possible documentation biases, as missing or incomplete records, particularly for unbooked patients, could distort results. Furthermore, while the 100% referral compliance indicates improvements in the system, the lack of digital tracking means some referral delays might not have been recorded. The low rates of rare outcomes, such as eclampsia and HELLP syndrome, further limit the ability to make clear conclusions about risk factors. The limitations highlight the need for larger, multi-centre studies to confirm these findings and better differentiate between pandemic-specific effects and existing systemic issues.

Conclusion

This retrospective audit of a six-month cohort in a single pathway provides important insights into the resilience of this maternal care pathway in the management of PIH during the COVID-19 pandemic. This contributes to existing knowledge by demonstrating that with focused protocols, district-level systems can protect maternal health during a crisis, but that foetal outcomes remain vulnerable to disruptions in early, community-based care.

The study tool performed well in revealing both strengths and ongoing issues in care. The audit data identified un-booked and late booking for antenatal care as key predictors of adverse outcomes. For policy and practice in South Africa, this underscores the need to strengthen both sides of the care continuum: robust clinical pathways and resilient community entry points. This is critical for preparing health systems for future pandemics.

Opportunities for ongoing health promotion were also identified. The contrast between resilient maternal outcomes and poorer foetal indicators underscores the need to fortify not just clinical pathways, but also the community-based systems that ensure early entry into care. Future research using the same tool should include multi-centre cohorts and explore digital record-keeping to lessen documentation bias and examine pandemic-specific effects more clearly. Furthermore, interventional research focusing on COPC strategies to improve early booking and engagement is recommended to translate these findings into policy.

Future research using the same tool should include multi-centre cohorts and explore digital record-keeping to lessen documentation bias and examine pandemic-specific effects more clearly.

References

1. Alobo G, Reverzani C, Sarno L, Giordani B, Greco L. Estimating the Risk of Maternal Death at Admission: A Predictive Model from a 5-Year Case Reference Study in Northern Uganda. Obstet Gynecol Int. 2022;2022:4419722. doi:10.1155/2022/4419722.
2. Das R, Biswas S. Eclapmsia: The Major Cause of Maternal Mortality in Eastern India. Ethiop J Health Sci. 2015;25(2):111-116. doi:10.4314/ejhs.v25i2.2.
3. Sobamowo TO. A clinical audit on the quality of care and the outcome of patients with pregnancy-induced hypertension within a primary-secondary care pathway: the Wesfleur-New Somerset Hospital Axis, Cape Town, South Africa [dissertation]. Cape Town: Faculty of Health Sciences, Department of Public Health and Family Medicine; 2020. Available from: http://hdl.handle.net/11427/32989.
4. Moodley J, Soma-Pillay P, Buchmann E, Pattinson RC. Hypertensive disorders in pregnancy: 2019 National guideline. S Afr Med J. 2019;109(9):12723.
5. Betrán AP, Wojdyla D, Posner SF, Gülmezoglu AM. National estimates for maternal mortality: an analysis based on the WHO systematic review of maternal mortality and morbidity. BMC Public Health. 2005;5:131.
6. Arsenault C, Gage A, Kim MK, et al. COVID-19 and resilience of healthcare systems in ten countries. Nat Med. 2022;28:1314-1324. doi:10.1038/s41591-022-01750-1.
7. Pillay Y, Zondi T. Impact of COVID-19 on routine health service delivery in South Africa: An analysis of selected indicators. S Afr Med J. 2021;111(8):719-726.
8. Khalil A, Kalafat E, Benlioglu C, et al. SARS-CoV-2 infection in pregnancy: A systematic review and meta-analysis of clinical features and pregnancy outcomes. EClinicalMedicine. 2020;25:100446. doi:10.1016/j.eclinm.2020.100446.
9. Khalil A, von Dadelszen P. The impact of COVID-19 on maternal health. Best Pract Res Clin Obstet Gynaecol. 2020;67:45-52.
10. Di Toro F, Gjoka M, Di Lorenzo G, et al. Impact of COVID-19 on maternal and neonatal outcomes: a systematic review and meta-analysis. Clin Microbiol Infect. 2021;27(1):36-46. doi:10.1016/j.cmi.2020.10.007.

11. Chmielewska B, Barratt I, Townsend R, et al. Effects of the COVID-19 pandemic on maternal and perinatal outcomes: a systematic review and meta-analysis. Lancet Glob Health. 2021;9(6):e759-e772. doi:10.1016/S2214-109X(21)00079-6.
12. Shamsher S, Tabassum S, Tabassum S, Malik NN. Pattern of obstetric patients presented to tertiary care hospital during the COVID-19 pandemic: A single centre experience. Khyber J Med Sci. 2020;13(3):375-378.
13. Mor M, Sheiner E, Wainstock T, et al. COVID-19 Pandemic and Stillbirth: Results from a Multicentric Israeli Study. Am J Perinatol. 2021;38(4):398-403. doi:10.1055/s00401721515.
14. Molina RL, Tsai TC, Dai D, et al. Comparison of Pregnancy and Birth Outcomes Before vs During the COVID-19 Pandemic. JAMA Netw Open. 2022;5(8):e2226531. doi:10.1001/jamanetworkopen.2022.26531.
15. Magee LA, Khalil A, von Dadelszen P. Pregnancy hypertension diagnosis and care in COVID-19 era and beyond. Ultrasound Obstet Gynecol. 2020;56(1):7-10. doi:10.1002/uog.22115.
16. Son M, Gallagher K, Lo JY, et al. Coronavirus Disease 2019 (COVID-19) Pandemic and Pregnancy Outcomes in a U.S. Population. Obstet Gynecol. 2021;138(4):542-551. doi:10.1097/AOG.0000000000004547.
17. Kotlar B, Gerson EM, Petrillo S, et al. Correction: The impact of the COVID-19 pandemic on maternal and perinatal health: a scoping review. Reprod Health. 2023;20:52. doi:10.1186/s12978-023-01575-2.
18. McDonnell S, McNamee E, Lindow SW, O'Connell MP. A retrospective review of maternity outcomes before, during and after the Covid-19 pandemic period. Eur J Obstet Gynecol Reprod Biol. 2020;255:172-176. doi:10.1016/j.ejogrb.2020.10.023.
19. Berwick D, Fox DM. "Evaluating the Quality of Medical Care": Donabedian's Classic Article 50 Years Later. Milbank Q. 2016 Jun;94(2):237-41. doi: 10.1111/1468-0009.12189. PMID: 27265554; PMCID: PMC4911723.
20. Statistics South Africa. (2022). *Census 2022: Statistical Release P0302.* Pretoria: Stats SA. Available at: https://www.statssa.gov.za/?page_id=4286&id=294 [27/052025].
21. Statistics South Africa (StatsSA). *General Household Survey, 2021* [Internet]. Pretoria: Statistics South Africa; 2022 [cited 2023 Oct 27]. Available from: http://www.statssa.gov.za/publications/P0318/P03182021.pdf

22. National Department of Health, South Africa. Saving Mothers Report 2020-2022: seventh Triennial Report on Confidential Enquiries into Maternal Deaths in South Africa. Pretoria: NdoH; 2023

Appendix A: Folder Review Tool for the Study

Quality of Care and Outcome of Patients with Pregnancy-Induced Hypertension: A Retrospective Observational Study before and during the COVID-19 pandemic along the Wesfleur-New Somerset Hospital Axis, Cape Town, South Africa.

VARIABLES

Demographics

- age group
- marital status
- employment status

General

- booking status
- smoker?
- Family history of hypertension
- Family history of diabetes
- Personal history of hypertension
- Personal history of diabetes
- pre-existing renal disease
- any other chronic disease

Specific:

- body mass index
- number of previous pregnancies
- gravidity
- previous obstetric complication

Antenatal care process indicators:

(1) Was the patient checked for the following at each visit?

a) Weight

b) Urine Dipsticks

c) Blood pressure

(2) Was a diagnosis of GPH made at ANC based on available clinical data?

(3) Was a timely and appropriate referral made for those diagnosed with GPH?

(4) Was basic investigations done for patients with GPH?

a) Haemoglobin
b) Platelet
c) Creatinine
d) Urea
e) AST

OUTCOME indicators:

- At diagnosis:
  - Diastolic Blood Pressure
  - protein concentration in urine
- mode of delivery

(1) Were any maternal complications documented?

a) Eclampsia
b) Cerebrovascular Accident
c) HELLP Syndrome
d) Renal Failure
e) Pulmonary Oedema
f) Maternal Death

(2) Were any foetal complications documented?

a) Intrauterine growth restriction
b) Foetal Distress
c) Abruptio Placentae
d) Preterm Delivery
e) Foetal Death

Appendix B: Permission Letter to Access Patient's Records

27 July 2025
The Facility Manager
New Somerset Hospital and Wesfleur Hospital
Cape Town.

RE: REQUEST FOR PERMISSION TO ACCESS PATIENT FOLDERS.

To Whom It May Concern:

I humbly write to seek your permission to carry out the research project titled **Quality of Care and Outcome of Patients with Pregnancy Induced Hypertension: A Retrospective Observational Study before and during the COVID-19 pandemic along the Wesfleur-New Somerset Hospital Axis, Cape Town, South Africa.**

This is a retrospective clinical audit that will involve reviewing the medical records of patients seen between January 2021 and June 2021.

The research will be conducted following the regulations of the Health Research Ethics Committee

HREC: 583/2025

I am looking forward to your favourable consideration.

Thank you.

DR AW Fakir
Family Medicine Registrar
University of Cape Town.

Appendix C: Ethics Letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 46, E-52 Old Main Building
Groote Schuur Hospital
Observatory 7925
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/home/human-research-ethics

10 July 2025

HREC REF: 583/2025

A/Prof Tasleem Ras
Division of Emergency and Family Medicine
Email: tasleem.ras@uct.ac.za
Student: Abdulwaaghied.fakir@gmail.com

Dear A/Prof Ras

PROJECT TITLE: QUALITY OF CARE AND OUTCOME OF PATIENTS WITH PREGNANCY INDUCED HYPERTENSION: A RETROSPECTIVE OBSERVATIONAL STUDY BEFORE AND DURING THE COVID-19 PANDEMIC ALONG THE WESFLEUR-NEW SOMERSET HOSPITAL AXIS, CAPE TOWN, SOUTH AFRICA (MMED (FAMILY MEDICINE) STUDENT CANDIDATE SURNAME DR ABDUL WAAGHIED FAKIR)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review and approval.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 July 2026.

Please submit a progress report, using the standardised Annual Progress Report Forms (FHS016) **or** (FHS 017) if the study continues beyond the approval period. Please submit a Standard Closure form (FHS 010) when the study has been completed, this includes after publication or thesis submission and final completion.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

The HREC acknowledges that the following MMED student will be involved in the study: Dr Abdul Waaghied Fakir.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the HREC REF number 583/2025 in all your correspondence.

Yours sincerely

Signed by candidate

PROFESSOR MARC BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

HREC REF: 583/2025

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP),
National Health Research Ethics Council (2024) South African Ethics in Health Research Guidelines: Principles, Processes and Structures, 3rd ed. Department of Health of South Africa. South African Good Clinical Practice Guidelines (SA GCP 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2024) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC REF: 583/2025