UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SHORT TERM OUTCOME OF ABDOMINAL MYOMECTOMY AT CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

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in partial fulfilment of the requirements for the degree of

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DECLARATION

I, **Dr Badi Lezi Nabatuisha**, affirm that this research report is my original work. I am submitting it for the **Master of Medicine degree in Obstetrics and Gynaecology** at the **University of the Witwatersrand, Johannesburg**. It has not been previously submitted for any degree or examination at any other university.

Candidate's signature: _____  _____

Signed at **Johannesburg, South Africa**, this **9th day of October 2025**.

DEDICATION

"Every good gift and every perfect present is from above,
coming down from the Father of the celestial lights,
who does not vary or change like the shifting shadows."
— **James 1:17**

In loving memory of my mother,
Perseverance Aimérence Kalubi Mukala,
affectionately known as **Maman Aimée**.

For everything I am, she helped me become.
Her influence on my life is immeasurable.

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Our profound gratitude goes to **Professor Chauke**, who served as the primary supervisor for the study, overseeing the conception, protocol development, and guidance throughout the study, as well as the interpretation of results, the review of drafts, and the final manuscript. Doctors **Shimange-Matsose and Khathutshelo Mukhudwani** reviewed the protocol, draft, and final manuscripts. The Chief Executive Officer of Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) granted permission to conduct the study.

Special thanks to my family, whose love and support kept me grounded despite the many challenges along the way:

• To my husband, **William Badibanga Nabatuisha**, thank you for believing in me and for your unwavering support, patience, and encouragement, which made reaching the finish line possible.

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• To my son, **Preciado Bana Nabatuisha**, my silent warrior, your courage and resilience inspire me every day. Because of you, I persist; you are a living example of strength, determination, and perseverance.

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NOMENCLATURE

ASC-H: Atypical squamous cell, cannot exclude a high-grade intraepithelial lesion.

CD4: Cluster of differentiation 4.

cm: Centimetres.

CI: Confidence interval.

CEO: Chief Executive Officer.

CMJAH: Charlotte Maxeke Johannesburg Academic Hospital.

df: Degree of freedom.

EBL: Estimated blood loss.

FIGO: International Federation of Gynaecology and Obstetrics.

HIV: Human Immunodeficiency Virus.

HREC: Human Research Ethics Committee.

min: Minutes.

μm^3: Cubic micrometres.

µL: Microlitres.

NHRD: National Health Research Database.

R^2: Coefficient of determination.

SD: Standard deviation.

SE: Standard error.

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology.

UAE: Uterine artery embolisation.

WCC: White cell count.

WHO: World Health Organisation.

LIST OF TABLES

SHORT-TERM OUTCOME OF ABDOMINAL MYOMECTOMY AT CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

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ABSTRACT

Objectives: To describe the preoperative findings in patients who underwent abdominal myomectomy, determine the indications for abdominal myomectomy based on presenting symptoms, assess intraoperative and postoperative findings and outcomes before discharge from the hospital in this cohort of patients.

Methods: This is a descriptive retrospective study. We identified and reviewed the clinical records of patients who had abdominal myomectomy at the study site from January 1, 2016, to December 31, 2019. Descriptive and inferential statistics, including Pearson's Chi-square test and simple linear regression, were used to describe the study population and to determine the relationships between patients' profiles and the outcome of abdominal myomectomy.

Results: Out of 180 patients who underwent an abdominal myomectomy, only 120 (66.7%) had complete records available for analysis. The mean age of the patients was 35.8 years (SD = 4.9). Most patients were nulliparous (87, 72.5%) and desired future fertility (116, 96.7%). The primary reason for myomectomy was vaginal bleeding (86, 71.7%). An average of 7.53 fibroids (SD = 6.34) were removed per patient, and the mean uterine size was equivalent to 19 weeks of gestation (SD = 5.6). Apart from a longer operation time (mean = 122.1 minutes, SD = 49.9) and increased blood loss (mean = 878.3 mL, SD = 600.8), no other adverse

outcomes like death or conversion to hysterectomy were observed. A significant association was observed between uterine size and the number of fibroids, with both longer duration of operation and greater blood loss.

Conclusions: Abdominal myomectomy is a safe surgical option for women of reproductive age who wish to preserve their uteruses. Despite an increased operative time and blood loss associated with a higher number of fibroids or larger uterine size, no major complications—including mortality or conversion to hysterectomy—were observed. These findings support the continued use of abdominal myomectomy in appropriately selected patients seeking a uterine preservation surgical procedure.

Ethics: Ethics clearance was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (approval number: M220340), and the study was registered in the National Health Research Database (NHRD number: GP_202205_058).

Keywords: leiomyoma; gynaecologic surgical procedures; genital neoplasms, female; developing countries

INTRODUCTION

Uterine fibroids are benign tumours that develop from the smooth muscle of the uterus.[1] They affect approximately 25% of reproductive-age women.[2,3] Approximately 20-50% of affected patients are symptomatic and require treatment.[4,5] The best management option depends on age, fertility desire, tumour size, and patient preference.[6,8] Available treatment modalities include medical, radiological, and operative procedures such as myomectomy and hysterectomy. [9-11] However, the evidence for the use of non-surgical options in patients with fibroids who require preservation of fertility is limited. Given these limitations, conservative surgical treatment, amongst them myomectomy, remains one of the best options.[10,12]

The annual rate of myomectomy is approximately 14.6 per 10,000 women in population-based studies.[13] In developing countries, myomectomy constitutes around 24.1% of gynaecological surgeries, of which 86.7% are performed via the abdominal route.[14] In the United States (US), myomectomy accounts for 30-40% of fibroid-related operations, making it the second most common surgical treatment after hysterectomy.[15,16] Importantly, 58% of myomectomies in the US are performed via the open abdominal approach, with the remaining

cases carried out using minimally invasive techniques.[17] The abdominal route is preferred in cases of large and multiple fibroids.[18,19]

Considering the tendency to postpone childbearing for personal and cultural reasons, patients often present with large and multiple fibroids requiring abdominal myomectomy, whilst others request uterine preservation procedures even after completing their families for personal or cultural reasons.[10,20] However, this option is underutilised for various reasons, including surgeons' perceptions that the procedure carries a higher risk of morbidity and mortality in patients with large fibroids compared to other treatment modalities.[21] Although current studies are sparse, they indicate that abdominal myomectomy is a safe surgical option instead of hysterectomy and can effectively remove large fibroids.[22,23] There is a lack of research on the safety and outcomes of abdominal myomectomy for large and multiple fibroids from resource-limited settings. This study sought to address this gap.

This descriptive retrospective study aimed to describe the profile of patients who underwent abdominal myomectomy at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) from January 1, 2016, to December 31, 2019, and to assess their short-term outcomes. The specific objectives were to describe the preoperative characteristics, determine the indications for abdominal myomectomy based on presenting symptoms, and assess intraoperative and postoperative findings and outcomes before discharge from the hospital in this cohort of patients.

METHODS

Study design

This was a descriptive retrospective study based on the assessment of patients' clinical records.

Study setting

The study was conducted at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) in Parktown, Johannesburg, South Africa. CMJAH is one of the ten national hospitals in South Africa and a teaching hospital associated with the University of the Witwatersrand, Johannesburg, South Africa. The hospital provides tertiary and quaternary clinical services to patients in the South of Gauteng, including patients from neighbouring Mpumalanga and North West provinces and patients from the neighbouring Southern African Development Community (SADC) region.

Study population and sample size

The study population consisted of patients who underwent abdominal myomectomy from January 1, 2016, to December 31, 2019. The sample included all patients with complete clinical records who had abdominal myomectomy at the study site during this period; patients with incomplete data or missing files were excluded. This study employed a census sampling approach. A total of 180 patients underwent abdominal myomectomy at CMJAH during the study period. After applying the inclusion and exclusion criteria, 120 patients were eligible and included in the analysis.

Given the retrospective census design, a formal sample size calculation was not required. Of 180 available files, 120 (66.7%) were retrieved, which was considered adequate to analyse the short-term outcomes of abdominal myomectomy. This retrieval rate was consistent with methodological best practices for retrospective chart reviews, helping to minimise sampling bias and enhance internal validity.

Data collection

All patients admitted for gynaecological surgery were routinely recorded in the ward admission register and theatre surgical record book on the day of surgery. The names and file numbers of the patients were obtained from the above sources and used to access their clinical records from the hospital records department's electronic database. Data collection was conducted using a specially designed data-capturing form.

This retrospective study included patients who underwent abdominal myomectomy, either electively after full optimisation or emergently due to active bleeding. All patients were managed according to the hospital's standard preoperative requirements, which included full blood counts, urinalysis, chest X-ray, electrocardiogram for patients aged 40 years or older, Pap smear, evaluation of all comorbidities (including HIV infection, hypertension, diabetes, coagulopathies, and other clinically relevant conditions), and confirmation of normal vital signs. Any correctable abnormalities were addressed prior to elective surgery to ensure patients were optimised and fit for the procedure. A pelvic ultrasound was routinely performed for all patients, but findings were excluded from analysis due to inconsistent reporting. Uterine size, estimated by equivalent gestational weeks, was assessed through physical examination.

Data collected included demographic and reproductive factors (age, parity, gravidity, fertility desire), uterine size as described above, past surgical and medical history, urinalysis, Pap

smear results (reported only for patients eligible for surgery, as malignancy precludes myomectomy), and haematological parameters (haemoglobin, white blood cell count, platelet count). Intraoperative variables included the number of fibroids, operation duration, estimated blood loss, and complications such as metabolic acidosis, bladder or bowel injury, and unintended procedures (conversion to hysterectomy, relook laparotomy, or adnexal surgery). Postoperative outcomes assessed before discharge included ICU admission, fever ≥38°C, paralytic ileus, bowel obstruction, wound sepsis, pelvic abscess, hospital stay duration, readmission, and death. All data were collected and analysed to provide a comprehensive description of patient characteristics, operative findings, and short-term surgical outcomes in this cohort.

Categorisation of variables

Uterine size was initially assessed clinically through preoperative physical examination and then compared with intraoperative fibroid measurements to confirm accuracy. For analysis, uterine size was categorised into three groups (10-19, 20-29, and 30-39 weeks), reflecting clinically meaningful thresholds commonly cited in gynaecology. The largest fibroid was measured intraoperatively in centimetres and grouped into five categories (<5, 5-10, 11-15, 16–20, and >20 cm), based on thresholds relevant to surgical complexity. This categorisation enabled evaluation of the relationship between uterine size and fibroid size, providing insight into the accuracy of clinical uterine assessment as a surrogate for fibroid burden. The number of fibroids at myomectomy was initially recorded as a count variable and later categorised into three groups (1-4, 5-10, >10), guided by prior studies.[22,23] This classification reflects a progression from simpler to more complex surgical scenarios, enables subgroup comparisons, reduces the influence of outliers, and provides a stronger basis for analysing associations with short-term outcomes.

Statistical analysis

Descriptive and inferential statistics were done using R software and SPSS version 28. Data were transferred to Microsoft Excel and analysed in R software (version 4.0.0; www.r-project.org) and SPSS version 28. The data set comprised both continuous and categorical data. Categorical data are not normally distributed; therefore, non-parametric statistics were applied. Statistical analyses were conducted using Pearson's Chi-squared goodness-of-fit tests to assess whether the distribution of counts per question deviated from a null model. Binary post-hoc tests were employed to evaluate pairwise comparisons of significant

outcomes. All tests were two-tailed, and the model significance was set at $\alpha = 0.05$. The study applied descriptive statistics, including mean, standard deviation (SD), frequency, and percentages, to describe categorical data. The chi-square test assessed the association between the size of fibroids and uterine size in gestational weeks. Two separate linear regression models were developed to evaluate predictors of surgical outcomes. The association between the number of fibroids and operation duration was modelled using fibroid group as the predictor. The number of fibroids was categorised into three clinically relevant groups. This categorical method was chosen because operative duration is not expected to increase in a strictly linear fashion with each fibroid, and surgeons generally anticipate operative difficulty based on these groupings. Estimated blood loss (EBL) was modelled using the number of fibroids as a continuous predictor. This specification was chosen because the estimated blood loss is more likely to increase in an approximately linear fashion with each additional fibroid. Therefore, this model more accurately captures the incremental effect of each fibroid on blood loss. Fibroid size in gestational weeks and related outcomes were also assessed using the two models. A simple linear regression was applied to evaluate the relationship between continuous uterine size and estimated blood loss. For operation duration, a regression model with categorical predictors (uterine size groups) was employed. The results are presented in charts, tables, or text.

Ethics Clearance

Permission to conduct the study was granted by the Chief Executive Officer (CEO) of CMJAH, and ethics clearance was obtained from the Human Research Ethics Committee (Medical) at the University of Witwatersrand (Approval number: M220340). The study has been registered in the National Health Research Database (NHRD number: GP_202205_058).

Before analysis, all identifying information was removed from the collected data, resulting in a waiver of the informed consent requirement due to the study's retrospective nature.

RESULTS

A total of 180 patients had abdominal myomectomy during the study period; however, only 120 (66.7%) were analysed. Fifty-six files were missing from the electronic database, and the corresponding hard copies could not be retrieved. Four files could not be analysed due to incomplete data.

The mean age of the patients was 35.8 years (SD = 4.9; Range 25–46). A total of 87 (72.5%) and 56 (46.7%) of the patients had a gravidity and parity of zero, respectively. The majority (116, 96.7%) of the patients expressed a desire for fertility, reported no comorbidities (87, 72.5%) or previous surgeries (87, 72.5%), had normal Pap smears (89, 74.2%) and were HIV-negative (94, 78.3%). Among the patients who were HIV positive, the median CD4 count and viral load were 512 and 1695, respectively. According to the urinalysis results, just over half of the study population (67%) did not have a urinary tract infection before surgery, as there were no leucocytes, nitrites, or protein in their urine (Table 1).

Regarding preoperative laboratory results, the mean haemoglobin (Hb) level prior to surgery was 11.5 g/dL (SD = 2.0; Range 5.3–14.9), while the mean corpuscular volume (MCV) was 81.4 (SD = 9.8). Both the white blood cells (WBC) and platelet counts fell within normal limits (Table 2).

Most patients had more than one indication for abdominal myomectomy; however, the most common indication was vaginal bleeding (86, 71.7%), followed by lower abdominal pain (62, 51.7%) (Table 3).

The average uterine size was equivalent to 19 weeks of gestation (SD = 5.6; Range 10 to 39 weeks). Intraoperatively, under half (55, 45.8%) of the patients had 5-10 cm fibroids. This was followed by the group with fibroids measuring 10-15 cm, accounting for 21 (17.5%) of the total study population. Only 5 (4.2%) of the patients had fibroids that exceeded 20 cm. The fibroid size was not recorded in 11 (9.2%) patients. The estimated mean intraoperative blood loss was 878.3 mL (SD = 600.8); the most common range was 501-1000 mL (Table 4).

In this study, the relationship between uterine size (expressed in gestational weeks) and fibroid size (categorised by diameter) was evaluated. A statistically significant association was observed ($\chi^2 = 45.2$, df = 10, $p < 0.001$). Medium-sized fibroids (5-10 cm) were the most common overall (45.8%), predominantly in the 10-19 weeks uterine size group. Larger fibroids (≥11 cm) were more frequently associated with increased uterine size, particularly in the 20-29 weeks and 30–39 weeks categories. These findings suggest that uterine enlargement in fibroid cases is strongly influenced by fibroid size, with larger fibroids contributing to higher gestational-size equivalents. As fibroid diameter increases, the uterus tends to enlarge proportionally, contributing to higher gestational-size equivalents on clinical examination. This supports the use of uterine size as a surrogate indicator of fibroid burden;

however, the relationship is not absolute and may still be influenced by the number and distribution of fibroids (Table 5).

In terms of short-term outcomes, there were no reported deaths, and among the 120 patients, only 3 (2.5%) required conversion to a hysterectomy. There was only one case each (0.8%) of bowel injury, bladder injury, or relook laparotomy (Table 6).

The mean operation duration was 122.1 minutes (SD = 50.9). Each increase in fibroid number group was associated with an average increase of 22.7 minutes (95% CI: 15.1-30.3, $p < 0.001$). Predicted mean operative durations were 105.1 minutes for 1-4 fibroids, 127.8 minutes for 5-10 fibroids, and 150.5 minutes for >10 fibroids, with the model explaining 29% of the variance in operative time ($R^2 = 0.29$). Clinically, higher fibroid burden was associated with longer operations. Similarly, for estimated blood loss, each additional fibroid increased blood loss by 39 mL (95% CI: 25.4–52.5, $p < 0.001$). Predicted mean blood loss was 538 mL with no fibroids, 733 mL with 5 fibroids, and 928 mL with 10 fibroids; the zero-fibroids value represents the intercept of the model and is included for reference, as all patients had at least one fibroid. The model explained 22% of the variance in blood loss ($R^2 = 0.22$) (Table 7).

The regression analysis demonstrated that uterine size is a significant predictor of intraoperative blood loss (slope, 35.5 mL per week; $R^2 = 0.107$; $p < 0.001$). This means that for each additional gestational week of uterine size, blood loss increased by approximately 35 mL. Although the R^2 is modest, the association is statistically significant. These findings suggest that an increase in uterine size is associated with greater blood loss during surgery. Similarly, for operation duration, the categorical model showed that the 20-29 week group had significantly longer operations compared to the 10-19 week reference group (+19.9 min, $p = 0.039$). The 30–39 week group did not reach significance due to wide confidence intervals (–27.1 to 50.4 minutes), likely reflecting the smaller number of patients in this category. Thus, results for the 30-39 week category should be interpreted with caution (Table 8).

DISCUSSION

In this study, we described the profile and short-term outcomes of patients who underwent abdominal myomectomy. Most of the patients were in the reproductive age group, with a

mean age of 35.8 years (SD 4.9). This finding is similar to a study conducted in Nigeria by Abgboola and colleagues.[23] Regarding parity, nulliparity was the most common status observed in 72.5% of the patients. Our result slightly exceeds the 68.1% reported in a study conducted in Cameroon by Guy et al.[24] In our study, 46.7% of patients were nulligravida. Our finding is also higher than Guy et al.'s study, which found 37.7%.[24] The majority of the patients in our study desired fertility (96.7%). Previous studies have identified subfertility as a leading indication for abdominal myomectomy.[19,23,24] Specifically, submucosal or intracavitary fibroids have been identified as playing a crucial role.[25] In addition to subfertility, a significant number of patients presented with vaginal bleeding (71.7%). According to research, more than half of patients with symptomatic fibroids experience heavy bleeding.[26]

The majority of our study population had no comorbidities (87, 72.5%), although hypertension was the most common comorbidity among those with comorbid conditions, accounting for approximately 14.2% of such cases. This prevalence is consistent with the 14.5% reported in women of reproductive age in a study conducted in the United States.[27] The higher prevalence of hypertension in this study could be because the majority of our patients were of reproductive age. Moreover, hypertension has been identified as one of the risk factors for developing uterine fibroids; this could have also contributed to the fact that hypertension is the most common comorbidity among patients in this study.[28] In terms of the impact of hypertension on surgical outcomes, it has been reported that hypertension before and after surgery increases the risk of cardiovascular and cerebrovascular events, bleeding, and mortality, necessitating management before elective surgery.[29] Given that the number of patients affected by hypertension was minimal and that most patients did not experience any cardiovascular or neurovascular events, we can conclude that hypertension did not significantly affect the procedure's outcomes.

Despite the high prevalence of HIV in South Africa, most patients in this study were HIV-negative.[30,31] Studies on surgical outcomes in HIV-infected patients have not described many HIV-related surgical complications except for post-operative pneumonia.[32] HIV-positive patients in this current study did not develop any HIV-related complications like pneumonia. We found that more patients had negative Pap smears, demonstrating rigorous preoperative screening. In 2009, the World Health Organization (WHO) implemented safe surgery guidelines and suggested that prevention was the first step in mitigating blood loss.

Therefore, known coagulation deficits should be corrected before surgery.[33] In our study, before surgery, the patients had a mean Hb of 11.5 (SD = 1.98) g/dL, MCV of 81.4 (SD = 9.78) fL, and platelet counts of 319.1 (SD = 104.77) × 10^9/L, thus complying with the WHO's recommendations.[29] Anaemia increases postoperative morbidity and mortality, hence the need to investigate and correct anaemia before surgery.[34] Regarding the impact of coagulation deficit on surgical outcomes, our patients had normal platelets; however, we did not assess other coagulation factors. The mean white blood cell count was 6.0 (SD = 3.0), suggesting that the patients had no underlying infectious process before surgery. It is essential to screen for infection to reduce post-operative morbidity. We used urine dipsticks and WCC to exclude active infection. Our findings regarding coagulation deficits, anaemia, and infection highlight that the patients in this study were well prepared and optimised by correcting abnormalities before surgery.

Patients' uterine size in gestational weeks ranged from 10 to 39 weeks, with a mean of 19 weeks (SD = 5.57). The majority of admitted patients had uterine sizes between 10 and 19 weeks, with 68 patients (56.7%) falling into this category. Additionally, 44 out of 120 patients (36.7%) had uterine sizes between 20-29 weeks. A small number of patients (7, 5.8%) had uterine sizes of 30 to 39 weeks at admission. In terms of the classification of uterine size using gestational weeks, some studies have considered large fibroids as those measuring more than 20 weeks of gestation.[23,35] Other studies used a cut-off size of 16 weeks of gestation or more to measure uterine size-related morbidity.[22,24] No universally accepted threshold exists for distinguishing small from large uteri. In the present study, a cut-off of 19 weeks was adopted to define large uteri, in line with the methodology of Agboola et al.[23] Morbidity has been shown to increase with uterine size of 16 weeks or more.[22,24] The above suggests that the majority of our study population had large uteruses.

Regarding the short-term outcomes, the mean intraoperative estimated blood loss was 878.3 (SD = 600.8) mL. Patients in all three gestational week groups (33 of 68 between 10 and 19 weeks, 22 of 49 between 20 and 29 weeks, and 3 of 7 between 30 and 39 weeks) had intraoperative estimated blood loss in the range of 501-1000 mL. In terms of bleeding during surgery, an intraoperative blood loss of more than 1000 mL or blood loss that requires transfusion is usually defined as intraoperative haemorrhage; thus, patients in this study did not reach the critical range of blood loss.[36] Furthermore, this study's results are similar to

other studies that have demonstrated that abdominal myomectomy is a feasible procedure in the case of large fibroids despite the increased risk of blood loss.[22-23,35]

In this study, the relationship between uterine size (expressed in gestational weeks) and fibroid size (categorised by diameter) was evaluated. A statistically significant association was observed ($\chi^2 = 45.2$, df = 10, $p < 0.001$), indicating that uterine size is not independent of fibroid size. Clinically, this suggests that uterine enlargement in fibroid cases is strongly influenced by fibroid diameter, with larger fibroids contributing to proportionally greater uterine size equivalents on clinical examination. These findings support the use of uterine size as a surrogate marker of fibroid burden, although the relationship may be modified by fibroid number and distribution. Importantly, clinical estimation of uterine size provides a useful, low-cost tool for assessing fibroid burden in settings where ultrasound is unavailable or inaccessible, thus supporting decision-making in resource-limited environments.

The mean duration of operation in this study was 122.1 minutes (SD = 50.9). Previous investigations found that more than four hours of operation leads to complications.[22] We suspect that in this study, the surgical operation duration of less than four hours could have contributed to the absence of severe adverse events, which are reported to occur when the operation lasts four or more hours. Our findings are in keeping with other research regarding the relationship between the duration of surgery and the occurrence of complications.[22]

In our South African cohort, both the number of fibroids and uterine size were significant determinants of intraoperative outcomes. Operation duration rose steadily with increasing fibroid number, from 105 minutes (1-4 fibroids) to 151 minutes (>10 fibroids), while blood loss increased from 538 mL to 928 mL at 10 fibroids. Uterine size also predicted blood loss (559 mL at 10 weeks vs 1269 mL at 30 weeks) and was associated with longer operations, particularly in the 20-29 week group (+19.9 minutes, $p = 0.039$). These findings confirm that surgical complexity increases in parallel with fibroid burden and uterine enlargement. Our results are consistent with Adesina et al., who reported that uterine size ≥16 weeks significantly predicted haemorrhage and transfusion in Nigerian women, and with Agboola et al., who similarly found uterine size to be a determinant of blood loss.[22,23] Notably, neither study assessed the impact on operative duration. By contrast, Saccardi et al., in a prospective Italian series of laparoscopic myomectomy, demonstrated that the uterine fibroid mass independently predicted operative time.[37] In addition, Sleiman et al., in a systematic review, identified uterine size, number of fibroids, and operative duration as major risk factors for

intraoperative haemorrhage during laparoscopic myomectomy, reinforcing our observation that these variables are critical drivers of surgical morbidity.[38] Taken together, these findings emphasise that, across various settings and surgical methods, a larger uterus and higher fibroid count lead to longer surgeries and increased blood loss. Our study adds novel evidence from South Africa, bridging a gap in regional data by quantifying the relationship between uterine size and operative duration in abdominal myomectomy.

In terms of adverse outcomes, there was no death; there was only one case each (0.8%) of bladder injury, bowel injury, and conversion to hysterectomy. Postoperatively, the patients' mean hospital stay was three days (SD = 1.4). The occurrence of these adverse events would have increased patients' length of hospital stay. Like other studies, this study had no single death.[22,18] Optimisation of patients before surgery and the absence of adverse events, apart from haemorrhagic complications, may explain the lack of mortality. Furthermore, the management of haemorrhagic events during surgery, as well as the surgeon's skills, could have played a vital role.

STRENGTHS

In our setting, abdominal myomectomy remains the primary conservative surgical option for patients who wish to preserve their uterus. Research on this topic is limited in our context, making this study a valuable resource regarding the procedure.

This descriptive retrospective study provides significant insights into the correlation between the number of fibroids, uterine size, operation duration, and haemorrhagic complications. Since bleeding is the primary complication, prospective research studies can be conducted on the efficacy of different techniques used to reduce blood loss during abdominal myomectomy.

The study includes an adequate sample size, allowing for informed conclusions and inferences.

LIMITATIONS

The results of this retrospective study may have been affected by missing clinical records from 60 files. However, the 120 accessible files were representative of the 180 total patients who underwent abdominal myomectomy during the study period.

Because the study was conducted in a single centre, it is impossible to generalise the findings.

CONCLUSIONS

Abdominal myomectomy is a safe surgical option for women of reproductive age who wish to preserve their uterus. Despite an increased operative time and blood loss associated with a higher number of fibroids or larger uterine size, no major complications—including mortality or conversion to hysterectomy—were observed. These findings support the continued use of abdominal myomectomy in appropriately selected patients seeking a uterine preservation surgical procedure.

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TABLES

Table 1. Characteristics of patients who underwent abdominal myomectomy (n = 120)

Variable	Frequency (n)	Percent (%)
Parity		
0	87	72.5
1	26	21.7
2	4	3.3
3	3	2.5
Gravidity		
0	56	46.7
1	32	26.7
2	16	13.3
3	8	6.7
4	4	3.3
5	4	3.3
Fertility desire		
No	4	3.3
Yes	116	96.7
Desire for uterine preservation (no fertility desire)		
No	116	96.7
Yes	4	3.3
Previous surgery[1]		
None	87	72.5
Gastroscopy, chest surgery	1	0.8
Appendicectomy	3	2.5
Caesarean section ×1	3	2.5
Ectopic pregnancy	5	4.2
Ectopic ×1, cystectomy	1	0.8
Ectopic ×1, laparoscopic myomectomy	1	0.8
Ectopic ×1, appendicectomy, breast surgery	1	0.8
Laparoscopic ectopic pregnancy	1	0.8
Left breast lumpectomy	1	0.8
Myomectomy	7	5.8
Polypectomy	1	0.8
Caesarean section ×3	1	0.8
Previous laparoscopy	2	1.7
Previous Bartholin abscess marsupialization	1	0.8
Previous myomectomy ×1, Caesarean section ×1	1	0.8

Variable	Frequency (n)	Percent (%)
Previous uterine artery embolization	1	0.8
Right breast lumpectomy	1	0.8
Umbilical herniorrhaphy	1	0.8
Comorbidities[2]		
None	87	72.5
Hypertension	17	14.2
Asthma	4	3.3
Class 3 obesity	2	1.7
Asthma, obesity	1	0.8
Bipolar mood disorder	1	0.8
Dermoid cyst	1	0.8
Endometriosis	1	0.8
Hyperprolactinemia	1	0.8
Polycystic kidney	1	0.8
Previous pulmonary tuberculosis	1	0.8
Previous pregnancy termination	1	0.8
Right hydrosalpinx	1	0.8
Right hydrosalpinx, partial cervical os obstruction, left tubal occlusion	1	0.8
Urine pregnancy test		
Negative	73	60.8
Not done	47	39.2
Urine dipstick		
Albumin	2	1.7
Bilirubin	1	0.8
Blood	22	18.3
Ketones	3	2.5
No abnormalities detected	66	55.0
Nitrite positive	1	0.8
Not done	21	17.5
Protein positive	4	3.3
HIV status		
Negative	94	78.3
Positive	24	20.0
Unknown	2	1.7
If HIV positive (n = 24)		
CD4 count (cells/mm^3), mean (SD)	95.1	211.4
Viral load (copies/mL), mean (SD)	98.9	587.7
Pap smear result		

Variable	Frequency (n)	Percent (%)
ASC-H	2	1.7
ASC-US	14	11.7
HSIL	3	2.5
Inadequate squamous components	1	0.8
LSIL	8	6.7
NILM	89	74.2
Not done	2	1.7
Not sexually active	1	0.8

[1] Combined categories indicate patients with multiple previous procedures.

[2] Combined categories indicate patients with multiple comorbidities.

Abbreviations: ASC-H, atypical squamous cells — cannot exclude high-grade lesion; ASC-US, atypical squamous cells of undetermined significance; CD4, cluster of differentiation 4; HIV, human immunodeficiency virus; HSIL, high-grade squamous intraepithelial lesion; LSIL, low-grade squamous intraepithelial lesion; NILM, negative for intraepithelial lesion or malignancy; SD, standard deviation.

Table 2. Preoperative haematologic laboratory findings (n = 120)

Variable	Mean	SE	Median	SD	Minimum	Maximum
Hemoglobin (g/dL)	11.5	0.18	11.8	1.99	5.3	14.9
Mean corpuscular volume (μm³)	81.4	0.90	82.5	9.79	58.0	109.3
White cell count (×10³/μL)	6.0	0.27	5.2	3.01	2.53	25.16
Platelet count (×10³/μL)	319.1	9.56	301.5	104.78	130	644

Abbreviations: μm³, cubic micrometre; μL, microliter; SE, standard error; SD, standard deviation.

Table 3. Indications for abdominal myomectomy (n = 120)

Variable	Count (n)	Percent (%)
Vaginal bleeding		
Yes	86	71.7
No	34	28.3
Lower abdominal pain		
Yes	62	51.7
No	58	48.3
Urinary symptoms		

Variable	Count (n)	Percent (%)
Yes	14	11.7
No	106	88.3
Compression		
No	111	92.5
Hydronephrosis	8	6.7
Varicose veins	1	0.8
Abdominal heaviness		
Yes	13	10.8
No	107	89.2
Pressure symptoms		
Yes	13	10.8
No	107	89.2

Table 4. Grouped data for uterine size, intraoperative blood loss, operation duration, and fibroid size (n = 120)

Variable	Group	Frequency (n)	Percent (%)
Uterine size (gestational weeks)			
10–19	68	56.7	
20–29	45	37.5	
30–39	7	5.8	
Total		120	100.0
Intraoperative blood loss (mL)			
0–500	32	26.7	
501–1000	58	48.3	
1001–1500	14	11.7	
1501–2000	10	8.3	
> 2000	6	5.0	
Total		120	100.0
Operation duration (minutes)			
< 60	7	5.8	
60–120	56	46.7	
>120	57	47.5	
Total		120	100.0
Fibroid size (cm)			
< 5	19	15.8	
5–10	55	45.8	
10–15	21	17.5	
16–20	9	7.5	
> 20	5	4.2	
Not specified	11	9.2	

Variable	Group	Frequency (n)	Percent (%)
Total		120	100.0

Table 5. Relationship between fibroid size (cm) and uterine size (gestational weeks) (n = 120)

Fibroid size (cm)	10–19 weeks	20–29 weeks	30–39 weeks	Total (n)	% of total
<5	15	3	1	19	15.8
5–10	38	17	0	55	45.8
11–15	2	15	4	21	17.5
16–20	1	6	2	9	7.5
>20	4	1	0	5	4.2
Not specified	8	3	0	11	9.2
Total	68	45	7	120	100.0

Note: χ^2 test, df = 10, P < 0.0001 indicates a statistically significant association.

Abbreviations: cm, centimetres; %, percentage of total cases.

Table 6. Short-term outcomes of abdominal myomectomy (n = 120)

Outcome category	Outcome	Yes (n)	Yes (%)	No (n)	No (%)
Metabolic complications	Metabolic acidosis	1	0.8	119	99.2
Intraoperative complications	Bladder injury	1	0.8	119	99.2
	Bowel injury	1	0.8	119	99.2
Unintended surgery	Conversion to hysterectomy	3	2.5	117	97.5
	Adnexal surgery*	10	8.3	110	91.7
	Relook laparotomy	1	0.8	119	99.2
Postoperative findings	High care/ICU admission	2	1.7	118	98.3
	Temperature ≥38.2°C	2	1.7	118	98.3
	Paralytic ileus	1	0.8	119	99.2
	Bowel obstruction	1	0.8	119	99.2
	Wound sepsis	1	0.8	119	99.2
	Pelvic abscess	1	0.8	119	99.2
	Readmission	1	0.8	119	99.2
Death	Death	0	0.0	120	100.0

Note: All outcomes were statistically significant (p < 0.001), indicating complications were rare, with most patients having no adverse events.

Abbreviations: ICU, intensive care unit; %, percentage of total patients.

*Adnexal surgery includes cystectomy, bilateral salpingo-oophorectomy, or unilateral salpingectomy.

Table 7. Trends in operation duration and estimated blood loss according to the number of fibroids (simple linear regression)

Outcome	Predictor	Slope (95% CI)	R^2	p-value	Predicted mean
Operation duration (min)	Fibroid group	22.7 (15.1–30.3)	0.29	<0.001	—
	Group 1–4	—	—	—	105.1 min
	Group 5–10	—	—	—	127.8 min
	Group >10	—	—	—	150.5 min
Estimated blood loss (mL)	Fibroid number	39.0 (25.4–52.5)	0.22	<0.001	—
	0 fibroids*	—	—	—	538 mL
	5 fibroids	—	—	—	733 mL
	10 fibroids	—	—	—	928 mL

Equations:

- Duration = 82.4 + 22.7 × Group
- EBL = 537.96 + 38.97 × Number

Note: The predicted value for zero fibroids represents the intercept of the regression model and is included for reference only; all patients had at least one fibroid.

Abbreviations: min, minutes; mL, millilitres; CI, confidence interval; R^2, coefficient of determination.

Table 8. Trends in estimated blood loss and operation duration according to uterine size (n = 120)

Outcome	Predictor	Slope (95% CI)	R^2	p-value	Predicted mean
Estimated blood loss (mL)	Uterine size (weeks)	35.5 (16.7–54.2)	0.107	<0.001	10 wks: 559 mL 20 wks: 914 mL 30 wks: 1269 mL
Operation duration (min)	Uterine size group		0.29	Overall <0.001	10–19 wks: 114.1 min 20–29 wks: 134.0 min 30–39 wks: 125.7 min
	20–29 wks coefficient	19.9 (1.1–38.8)		0.039	
	30–39 wks coefficient	11.6 (–27.1–50.4)		0.553	

Equations:

- Estimated blood loss (mL) = 203.9 + 35.5 × (uterine size in weeks)
- Operation duration (min) = 114.1 + 19.9 × (20–29 wks) + 11.6 × (30–39 wks)

Abbreviations: mL, millilitres; min, minutes; wks, weeks; R^2, coefficient of determination; CI, confidence interval.

APPENDICES

APPENDIX A

AUTHORS' GUIDELINES: REPRODUCTIVE, FEMALE AND CHILD HEALTH JOURNAL

ORIGINAL RESEARCH

PURPOSE

To report research findings or conceptual analyses that make a significant contribution to knowledge.

WORD LIMITS

The word limit for the main body of the manuscript is 3500 words, exclusive of references, Tables and figures, and abstract. The introduction should be no more than 400 words or 1.5 pages.

The main text should be in Word as an editable file.

Upload the manuscript as a single document, including the title page, abstract, main text, table and figures, and supplemental materials.

On submission, the main text file should be designated as the main document.

Figures and tables should have legends.

Page numbers and continuous line numbers should be included.

TITLE PAGE

Should include:

- Research title: A brief informative title containing the major keywords. The title should not contain abbreviations
- A short-running title of no more than 40 characters (including spaces).
- Authors names.
- Author's affiliation.
- Authors' Email addresses.
- ***ORCID IDS***: a unique author identifier for all authors to help distinguish the researcher's work from that of other researchers.
- Corresponding author's name, affiliation, and email address.
- Acknowledgements: This section should include acknowledgements with a statement confirming the individual's consent to be acknowledged.
- Funding: Include a list of all funding sources, highlighting the abbreviated names of the funders.

- Data availability statement: Clinical trials starting enrollment on or after January 1, 2019, must include a data-sharing plan in the trial's registration.
- Ethics approval statement.
- Patient consent statement.
- Permission to reproduce material from other sources.
- Author's contributions.
- Conflict of interest.
- The clinical trial registration number.
- The word count of the main manuscript should be provided.
- Declaration of transparency: The lead author must declare that the manuscript is an honest, accurate, and transparent account of the study being reported and that no important aspect of the study has been omitted.

REQUIRED MANUSCRIPT ELEMENTS

Abstract, introduction, material and methods, Results, conclusions, and artwork/table with captions.

Conflict of interest disclosure and other ethics statements.

ABSTRACT

The abstract word count:250

The abstract should be structured as objective, methods, results, and conclusion.

Objective: a single sentence that encapsulates the primary objective and perhaps secondary objectives written as a ``To`` statement. No background should be included.

Funding sources should be added to the abstract and contain the abbreviated list of funders.

The clinical trial registration number should be added at the end of the abstract.

Keywords: include 1-6 keywords selected from a list of possible terms provided by the journal.

Practitioner points: Authors should provide no more than three brief 'key points' written with practitioners in mind that summarize the key messages of their paper, highlighting how the manuscript could assist clinicians without merely restating the results and conclusions

INTRODUCTION

The introduction should be no more than 400 words or 1.5 pages.

METHODS

Subheadings can be added for better structure and content.

Ethics approval statement

The manuscript should include details on IRB approval, the ethical treatment of human and animal research participants, and the appropriate collection of informed consent.

Role of funding source

In the manuscript, the heading the role of funding source should be inserted before the methods and contain a detailed description of the sponsor ‘s role as well as the following languages:” The authors had access to relevant aggregated study data and other information (such as study protocol, analytic plan and report, validated data table, and clinical study report) required to understand and report research findings. The authors take responsibility for the presentation and publication of the research findings, have been fully involved at all stages of publication and presentation development, and are willing to take public responsibility for all aspects of the work. All individuals included as authors and contributors who made substantial intellectual contributions to the research, data analysis, and publication or presentation development are listed appropriately.”

Study design and population

Authors are requested to refer to the Equator(enhancing the quality and transparency of health research) for consensus reporting for observational studies and other study designs.
The journal requires observational studies to follow the STROBE(Strengthening the Reporting of Observational Studies in Epidemiology) publication guidelines.
If the guideline includes a checklist, it should be submitted with the initial manuscript.
The publication guideline used should be noted in the manuscript.

Statistical analysis

The statistical analysis method used should be provided.

RESULTS

It should be provided in accordance with the reporting guidelines used. The Strobe guideline is attached.

DISCUSSION

According to the STROBE guidelines, the discussion should present Key results, limitations, interpretation, and generalizability. Additional information should be included, and funding information must also be provided.

REFERENCES

The journal uses the AMA style of referencing

TABLES AND FIGURES

They should be placed at the end of the manuscript or in a separate file. Tables should be high-resolution

APPENDIX B RESEARCH PROPOSAL SUBMITTED TO THE FACULTY

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY

School of Clinical Medicine, Faculty of Health Sciences,

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SHORT TERM OUTCOME OF ABDOMINAL MYOMECTOMY AT CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

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Gynaecology Charlotte Maxeke Johannesburg hospital

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LIST OF ABBREVIATIONS

ACOG: American Society of Obstetricians and Gynaecologists

CEO: Chief Executive Officer

CMJAH: Charlotte Maxeke Johannesburg Academic Hospital

ESGE: European Society for Gynaecological Endoscopy

FIGO: International Federation of Gynaecologists and Obstetricians

GnRH: Gonadotropin Releasing Hormone

HIFU: High Intensity Focused Ultrasound

LM: Laparoscopic myomectomy

MCS: Microscopy, Culture and Sensitivity

MCV: Mean Corpuscular Volume

MRg-FUS: High-frequency Magnetic resonance-guided Focused Ultrasound

HM: Hysteroscopic myomectomy

RCT: Randomised control trial

RFVTA: Radiofrequency Volumetric Thermal Ablation

+RF: Radiofrequency

STEP-W: Size, topography, extension of the base, Penetration

UPA: Ulipristal Acetate

1. BACKGROUND AND INTRODUCTION

Non-malignant growths that come from the smooth muscle of the uterus are called uterine fibroids.[1] They are the most frequent non-malignant tumours in reproductive patients.[2] They are linked to ill health, and occur in 25% of patients of childbearing age.[3] Although several fibroids are asymptomatic, 30-40% of cases present with different symptoms according to their position, size, number and vascular supply.[4-5]

Consequently, symptomatic fibroids require treatment. Generally, the best management depends on numerous factors such as age, future fertility wishes, previous obstetrical history, location and the dimension of the tumour, preference and lifestyle of the patient.[6-8] Presently, many options exist for effective fibroid treatment, ranging from the most conservative to the most invasive treatment.[9] Different treatment modalities are medical treatment, radiological methods such as High Intensity Focused Ultrasound (HIFU), uterine artery embolisation (UAE), and operative methods, namely myomectomy and hysterectomy.[9]

Regarding medical treatment, modulators of progesterone receptor, such as Ulipristal Acetate (UPA), are an option for uterine fibroids. In fact, UPA reduces uterine fibroid size, and it is promising in terms of fertility treatment. However, its effect lasts only for six months thus additional surgical management is recommended.[10] Along with UAE, focused energy delivery systems such as HIFU, are minimally invasive procedures that are available for fibroids treatment. Both options have limitations regarding fertility preservation and the size of the targeted fibroids. Surgical treatment might still be needed in these instances.[11, 10]

Myomectomy is another modality to treat uterine fibroids. A surgical technique to remove fibroids, myomectomy can be performed via different approaches, namely abdominal, laparoscopic, and hysteroscopic.[6] The selection of the abdominal or laparoscopic method is governed by the accessibility of facilities and the skills of the surgeon. The abdominal approach is beneficial in case of enormous and multiple fibroids and wherever a laparoscopic method is not feasible [12- 13]

Considering the tendency to postpone childbearing for personal and societal motives, patients report with huge or many uterine fibroids necessitating abdominal myomectomy. Even after completion of childbearing, some patients desire uterine conservation.[14,10] Abdominal myomectomy is, however, an underutilised procedure, as many surgeons consider it to carry an increased risk of morbidity.[14] This is despite the fact that studies that compared abdominal myomectomy with hysterectomy have reckoned that abdominal myomectomy is harmless and an alternative route to hysterectomy.[15] Indeed, big fibroids can be totally and successfully removed via abdominal myomectomy.[16]

2. LITERATURE REVIEW

Classification, symptoms, investigation, and treatment options.

2.1 CLASSIFICATION

Uterine fibroids classification is set to unite the diagnosis, permitting the assessment of therapeutic and operative prognosis.[8]

2.1.1 THE EUROPEAN SOCIETY FOR GYNAECOLOGICAL ENDOSCOPY (ESGE) CLASSIFICATION

This classification evaluation factor is the sub-mucous fibroids' level of infiltration into the myometrium. Consequently, three levels ranging from 0 to 2 are taken into consideration in this classification:

0: Myomas are totally inside the uterine cavity.[8]

1: More than 50% of the nodule is located in the uterine cavity.[8]

2: More than 50% of the fibroid uterus is located inside the myometrium.[8]

2.1.3 THE INTERNATIONAL FEDERATION OF GYNECOLOGISTS AND OBSTETRICIAN(FIGO) CLASSIFICATION OF UTERINE FIBROIDS

Unlike the ESGE, the FIGO classification describes eight varieties of fibroids over and above a hybrid category, which combines two fibroid types. Depending on their site, various fibroid types are habitually present at the same time. Thus, the FIGO classification presents a more illustrative `map' of fibroid scattering. [4]

According to FIGO, fibroids are grouped into eight categories.[4,17]

Type 0: represents pedunculated and intracavitary fibroids

Type 1: represents submucosal fibroids, which are less than 50% intramural

Type 2: represents submucosal fibroids, which are 50% or more intramural

Type 3: describes fibroids that are touching base with endometrium, but 100% intramural

Type 4: describes intramural fibroids

Type 5: describes subserosal fibroids, which are 50% or more intramural

Type 6: Fibroids in this group are subserosal and <50% intramural

Type 7: fibroids in this group are subserosal, pedunculated

Type 8: This group includes extra varieties such as cervical and parasitic.[4] In case of paired numbers, for instance, 2–5, the initial digit indicates the correlation with the endometrium, whereas the final digit indicates the correlation with the serosa. In the case of 2–5, it means submucosal and subserosal, with both having less than half the diameter in the endometrial and peritoneal cavities, respectively.[4]

2.2 SYMPTOMS

Uterine fibroid symptoms vary according to their type, size, site, number and vascular supply. Symptoms include menstrual disorders, pain, pressure effects and fertility challenges.[5]

Firstly, different symptoms are associated with uterine fibroids, with the most common being abnormal uterine bleeding.[11] A published series of myomectomies found that 30% of patients were affected by heavy menstrual bleeding.[11]

Secondly, pelvic pain is uncommon in cases of uterine fibroids and mostly means degeneration, torsion, or concomitant adenomyosis and or endometriosis.[11] Thirdly, pelvic heaviness, bowel function disturbance, and urinary dysfunction, such as frequent urination as well as urgency, might be present with big uterine fibroids. Before surgical management of uterine fibroids, urinary symptoms ought to be investigated in order to rule out other causes.[11]

Lastly, fertility problems and recurrent miscarriages are possible clinical manifestations of uterine fibroids, depending on their position as well as size, mainly in cases of cavity-distorting submucosal as well as intramural fibroids .[4]

2.3 DIAGNOSIS

While the symptoms mentioned above are found in patients with uterine fibroids, they are not specific.

However, patient examination and imaging are required for the diagnosis of uterine fibroids.

2.3.1 PELVIC EXAMINATION

The bimanual examination is often the first indication that a patient may have uterine fibroids, as assessment of the pelvis may reveal a large uterus or a pelvic mass. [18, 4]

2.3.2 LABORATORY INVESTIGATION

In case of suspicion of uterine fibroids and heavy menstrual bleeding being reported, a haemoglobin assessment will lead to the detection of iron deficiency anaemia as a result of chronic blood loss.[4]

2.3.3 ULTRASONOGRAPHY

The gold standard method for the diagnosis of uterine fibroids is ultrasonography. It is widely available and allows an easy and low-cost confirmation of the diagnosis of uterine fibroids in nearly all cases. Besides, ultrasound after saline infusion in the uterus helps to demarcate submucosal fibroids and point out the closeness of intramural fibroids to the endometrial cavity. [4]

2.3.4 HYSTEROSCOPY

A hysteroscopic evaluation might be necessary to establish differences between intracavitary myomas and a huge endometrial polyp. [4]

2.3.5 MAGNETIC RESONANCE IMAGING

Magnetic resonance imaging (MRI) gives information regarding fibroid numbers, size as well as vascular supply, rapport with the endometrial cavity and serosal surface, as well as limitations with a normal myometrium.[4]

2.4 CURRENT OPTIONS FOR MANAGEMENT OF UTERINE FIBROIDS

Treatment options for fibroids uterus vary from conservative pharmacotherapy to radiological procedures and surgery.[19] Surgical approaches include hysteroscopic, laparoscopic and abdominal myomectomy. Uterine artery embolization (UAE), together with other procedures using ultrasound or various radiologic modalities, are part of radiological therapy.[4]

This section discusses the most commonly available surgical options and compares them with abdominal myomectomy, which is our subject of interest.

2.4.1 CURRENT SURGICAL INTERVENTION FOR UTERINE FIBROIDS

Surgery continues to be the principal treatment for patients who present with huge or symptomatic uterine fibroids.[20] In fact, surgical treatment for uterine fibroids is indicated in the presence of pain or compression leading to low quality of life, severe uterine bleeding, fertility challenges, suspected malignancy, enlargement after menopause, frequent micturition and obstruction symptoms.[6] Surgical management can be either hysterectomy or myomectomy.[12]

2.4.1.1 ABDOMINAL MYOMECTOMY

As a treatment for uterine fibroids, abdominal myomectomy has been used for a long time.[16] Made popular in 1931 by Victor Bonney, abdominal myomectomy consists of surgical ablation of the fibroid via an abdominal wall incision, subsequent uterine empty gap closure and repair of the remaining uterus.[20]

The major benefit of abdominal myomectomy is ample field exposure, which leads to adequate and systematic inspection and palpation of the entire uterus and fibroids. In fact, big uterine fibroids can totally and effectively be taken out by means of abdominal myomectomy.[15]

Positive effects of abdominal myomectomy have been described. In fact, abdominal myomectomy can be utilised for the treatment of fibroids measuring up to 36 weeks gestation and weighing up to 2467 g; with adequate procedure time and estimated blood loss, and no conversion to hysterectomy.[15]

2.4.1.2 ABDOMINAL MYOMECTOMY VS LAPAROSCOPIC MYOMECTOMY

Laparoscopic myomectomy involves fibroids excision through uterus's diathermy incision, frequently supported by morcellation; with small hole abdominal cavity incisions via which instruments are passed with telescopic help.[20]

Laparoscopic excision of bigger fibroids located in challenging sites like the uterus lower segment or the cervix junction has an increased danger of complications such as profuse bleeding; in such circumstances, an abdominal procedure is a better choice.[11]

Lengthy time of operation required during a laparoscopic procedure in case of huge (> 10 cm) or multiple fibroids should be taken into consideration; in these situations an abdominal approach may be more suitable.[11]

2.4.1.3 HYSTEROSCOPIC MYOMECTOMY

This procedure consists of the excision of fibroids through the cervix.[20] Generally, type 0, 1, and 2 submucosal fibroids measuring up to 4 to 5 cm in diameter can be excised via hysteroscopic myomectomy by skilled surgeons. And Type II fibroids have a tendency to necessitate a 2-step technique than types 0 and I due to the danger of extreme fluid absorption and puncture of the uterus. [11]Abdominal or laparoscopic myomectomy should be considered in huge fibroids (FIGO L2 >5cm diameter and above). [10] It has been demonstrated in a systematic review of data that both approaches have similar outcomes.[10]

2.4.1.4 ABDOMINAL MYOMECTOMY VS ABDOMINAL HYSTERECTOMY

Abdominal myomectomy and abdominal hysterectomy are recognised surgical treatment options for symptomatic uterine fibroids.[14]

Physiological function restoration and maintenance is, or should be, the definitive goal of surgical management.[21] But patients might be advised that myomectomy is unsuitable as hysterectomy is harmless or associated with a lesser amount of blood loss, and sarcoma may be present; recent reports do not support these fears.[16]

In 2008, level A scientific evidence emerged from ACOG recommending abdominal myomectomy as a reliable and useful hysterectomy alternative for symptomatic patients [22, 14]

In a systematic review about abdominal myomectomy perioperative morbidity compared to total abdominal hysterectomy in uterine fibroids cases, Pundir et al. concluded that major morbidity risks and blood transfusion rate are the same for myomectomy and hysterectomy done abdominally for uterine size up to 18 weeks.[14]

For patients having big fibroids uterus who desire to keep their uterus, myomectomy may be considered. In fact, a study of 91 patients with uterus measuring between 16-36 weeks gestation reported no hysterectomy conversion.[16]

Case-controlled studies have shown the possibility of fewer risk of injury during operation with myomectomy when compared to hysterectomy[16]

3. PROBLEM STATEMENT

Abdominal myomectomy is an underutilised surgical technique for uterine fibroid removal, as the procedure has been associated with high patient morbidity.

However, for patients who desire to conserve the uterus for fertility reasons or personal reasons, there is need for abdominal myomectomy.

Moreover, abdominal myomectomy is the most common technique for the removal of uterine fibroids at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), but this practice remains unevaluated.

4. STUDY AIM

The study aim is to describe the profile and short term outcome such as intraoperative findings, post operative findings prior discharge, of patients who underwent abdominal myomectomy at CMJAH and to use the information to improve future practice.

5. STUDY OBJECTIVES

This study has the following objectives:

1. To describe the profile of patients who underwent abdominal myomectomy at CMJAH from the 1st of January 2016, to the 31st December 2019.
2. To determine the indications of abdominal myomectomy in terms of symptomatology.
3. To describe the short term outcome, such as intraoperative and postoperative findings prior to hospital discharge, of patients who underwent abdominal myomectomy.

6. METHODS

6.1 STUDY DESIGN

The study will be a descriptive retrospective study based on a review of patient clinical records.

6.2 STUDY SETTING

The study will be conducted at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH),

located in Parktown, Johannesburg, South Africa. This hospital offers tertiary services in all major disciplines. It is the main teaching hospital for the University of the Witwatersrand, Faculty of Health Sciences. CMJAH has a capacity of 1068 beds, conducts 4000 admissions per months and 9500 outpatient department visits per months.

The hospital provides its services not only to the population of Gauteng Province but also neighbouring provinces such as Northwest, Limpopo, Mpumalanga and neighbouring SADC countries.

6.3 STUDY POPULATION

All patients who underwent abdominal myomectomies between 1st January 2016 and 31st December 2019 will be identified by the unit booking system and theatre register.

6.4 INCLUSION CRITERIA

All patients diagnosed with fibroid uterus, who were operated by means of abdominal myomectomy during the study period.

6.5 EXCLUSION CRITERIA

- Incomplete clinical notes.
- Missing files from records department.

6.6 DATA COLLECTION

All patients admitted for gynaecological surgery are routinely captured into a ward admission register and recorded in the theatre record book on the day of surgery. The names and file numbers will be obtained from the two sources. This information will be used to access patient's clinical records, from the hospital patient records department. Patient data sets will be extracted from the patient clinical records using a purposefully designated data collecting sheet (Appendix A), and later transferred to an Excel sheet for the purpose of data analysis. All patient identifiers, such as names,hospital numbers, etc, will be removed.

6.7 SAMPLE SIZE

An assessment of Z scores indicated that a total sample size of 220 patients will detect significant differences at a low effect size. However, a sample size of 80 patients will be adequate, assuming a large effect size.

6.8 DATA ANALYSIS

Statistical analyses will be conducted in R software (version 4.00; www.R-project.org). Analyses will be two-tailed, and model-level significance set at 0.05. The data set for this study will be generated from assessments of categorical scores. Categorical data are usually non-normal, so appropriate non-parametric analyses will be used. Pearson's chi-squared contingency table analyses will be used to analyse whether the distribution of scores for each variable in all three objectives deviates from chance (i.e. a null model). Data will be reported descriptively as mean and SD for continuous data (e.g. age) and counts and percentages for categorical data. Data will be presented in charts, tables or in text.

7. ETHICAL CONSIDERATIONS

Permission to conduct the study will be sought from the Head of the Department of Obstetrics and Gynaecology and the chief executive officer (CEO) of CMJAH before commencing the study.

The study will be registered with the national health research database (NHRD)

Ethical clearance will be obtained from the Wits Human Research Ethics Committee (HREC).

8. LIMITATIONS

This study is a retrospective study, therefore limitations related to the nature of the study may be expected, among these are:

- Missing clinical records
- Incomplete clinical data.

9. TIME SCHEDULE AND ACTION PLAN

Data collection will be done in a period of 3 months or less.

ACTIVITIES	TIME FRAME
Protocol draft	September 2021
Submission to wits post graduate committee	December 2021
Submission to HREC	March 2022
Looking at recommendations from HREC	April 2022
HREC clearance	May 2022
Data collection	May 2022
Data analysis	August 2022
First draft write up dissertation	October 2022
Final draft write up dissertation	November 2022

10. BUDGET AND RESSOURCES

EXPENSES	AVERAGE COST
Transport	1000
Telephoning	200
Usage of internet	1000

Printing	500
Stationary	300
Binding of dissertation	400
Statistical support	1000
Total cost	4400

The researcher will personally fund the study

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APPENDICES

APPENDIX A: DATA COLLECTION SHEET

PATIENT PROFILE			
Age			
Parity			
Gravidity			
Desire fertility		Yes	
		No	
Desire uterus preservation for personal reasons		Yes	
		No	
Previous surgery		Yes(specify)	
		No	
Comorbidities		Yes(specify)	Obesity
			Chronic hypertension
			Diabetes
			Thyroid disease
			Cardiac disease
			Autoimmune disease
			Other
		No	
SYMPTOMS			
PV bleeding		Yes	
		No	
Lower abdominal pain		Yes	
		No	
Pressure symptoms	Urinary symptoms	Yes	
		No	
		Yes	

	Vascular compression	No				
	Abdominal heaviness	Yes				
		No				
	Other					
PREOPERATIVE FINDINGS						
Physical examination		Uterine size in gestational weeks				
Imaging		Ultrasound findings	Submucosal	Yes		
				No		
			Subserosal	Yes		
				No		
			Intramural	Yes		
				No		
			Number			
			Size			
Laboratory findings		Haemoglobin				
		MCV				
		White cell count				
		Platelets				
		Pregnancy test				
		Urine dipstix/mcs				
		HIV	Neg			
			Pos	Viral load		
				CD4 Counts		
				Treatment	Yes	
					No	

	Pap smear	Yes(specify results)	
		No	
INTRAOPERATIVE FINDINGS			
	Estimated blood loss		
	Bladder injury	Yes	
		No	
	Bowel injury	Yes	
		No	
	Adverse events (life threatening events)	Yes	
		No	
	Conversion to hysterectomy	Yes	
		No	
	Other unintended procedures	Yes(Specify)	
		No	
	Duration of the procedure		
	Theatre findings	Subserosal	
		Submucosal	
		Intramural	
		Size	
		Number	
	Intraoperative death	Yes	
		No	
POST OPERATIVE FINDINGS			
	PV bleeding	Yes	
		No	

	Relook	Yes	
		No	
	Readmission within 14 days	Yes	
		No	
	Bowel obstruction	Yes	
		No	
	Pelvic abscess	Yes	
		No	
	Wound infection	Yes	
		No	
	temperature>38°c	Yes	
		No	
	Total days of hospital stay after the surgery		
	High care / ICU admission	Yes	
		No	
	Death post operation	Yes	
		No	

APPENDIX C ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Dr B Lezi Nabatuisha

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M220340

NAME: (Principal Investigator)	Dr B Lezi Nabatuisha
DEPARTMENT:	School of Clinical Medicine Department of Obststrics and Gynaecology Medical School University
PROJECT TITLE:	*Short term outcome of abdominal myomectomy at Charlotte Maxeke Johannesburg Academic Hospital*
DATE CONSIDERED:	2022/03/25
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Prof L Chauke; Drs K Mukhudwani & L Shimange-Matsose
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2022/06/06

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 **March** and therefore reports and re-certification will be due in the month of **March** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator — Date: 06/06/2022

APPENDIX D CEO APPROVAL LETTER

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL (CMJAH)
OFFICE OF THE SENIOR CLINICAL MANAGER

Enquiries: *Ms. TT Mahlangu*
Email: Thandi.Mahlangu4@gauteng.gov.za
Tel: *011 488 3365*
Ref: *1/7/2*
Date: 13 June 2022

GP_202205_058

Dear Dr Badi Lezi Nabatuisha

RE: FINAL APPROVAL OF STUDY

TITLE: SHORT TERM OUTCOME OF ABDOMINAL MYOMECTOMY AT CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

Permission is granted for you to conduct the above-mentioned study as described in your request provided:

1. Charlotte Maxeke Johannesburg Academic Hospital will not in any way incur or inherit costs as a result of the said study.
2. Your study shall not disrupt services at the study sites.
3. Strict confidentiality shall always be observed.
4. Informed consent shall be solicited from patients participating in your study.

Please liaise with the HOD and Unit Manager or Sister in charge to agree on the dates and time that would suit all parties.

Kindly forward this office with the results of your study on completion of the research.

Supported/~~Not Supported~~

_____
Dr J. Punwasi
Senior Clinical Manager

Approved/~~Not Approved~~

_____
Ms. G Bogoshi
Chief Executive Officer

APPENDIX E TURNITIN ORIGINALITY REPORT.docx

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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APPENDIX F: STRENGTHENING THE REPORTING OF OBSERVATIONAL STUDIES IN EPIDEMIOLOGY(STROBE) CHECKLIST.

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	
Objectives	3	State specific objectives, including any prespecified hypotheses	
Methods			
Study design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Patients	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of patients	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	

Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Patients	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study patients (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of patients with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for exposed and unexposed groups.