

Safety of Cesarean Myomectomy: A Case Series from Sudan

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ABSTRACT

Background: Uterine fibroids are benign tumors common among women of reproductive age. While cesarean myomectomy is often avoided due to potential complications, advances in surgical techniques and perioperative care have made it a viable option. This study evaluates the safety and outcomes of cesarean myomectomy, focusing on intraoperative, postoperative and reproductive outcomes among women in the Red Sea State, Sudan.

Methods: A retrospective study was conducted on 120 women who underwent cesarean myomectomy at Port Sudan Maternity Hospital from 2014 to 2022. Demographic, clinical, obstetric and perinatal data were collected and analyzed. Intraoperative and postoperative outcomes, including blood loss, pain levels, hospital stay duration and subsequent pregnancy rates, were assessed. Statistical analyses, including logistic regression and chi-square tests, were used to identify factors influencing these outcomes.

Results: The mean age of the participants was 28 years, with the majority being primigravida. Each patient had an average of 2 fibroids, with intramural fibroids being the most common type (66.7%). Nearly all surgeries were completed with blood loss between 250-500 mL and only one patient required a transfusion. No cases of hysterectomy or surgical reopening occurred. Postoperative pain was mostly mild (58.3%), with moderate pain reported by 41.7% of patients. Most patients (64.2%) were discharged within two days and 60% of the participants successfully conceived following the procedure. Logistic regression showed that having multiple fibroid types or more than two fibroids increased the likelihood of longer hospital stays, while chi-square tests revealed a significant association between the number of fibroids and postoperative pain.

Conclusion: Cesarean myomectomy is a safe procedure with minimal complications and favorable reproductive outcomes in appropriately selected patients. While factors like fibroid number and type influence postoperative recovery and pain levels, the procedure offers a viable option for managing fibroids during cesarean delivery, reducing the need for future surgeries.

Keywords: Myomectomy; Benign tumor; Uterine fibroid; Primigravida

Background

Uterine fibroids (leiomyomas) are one of the most common benign tumors of the uterus and about 20-50% of women who are of reproductive age have them^{1,2}. Particularly among black women, who are more likely to report experiencing severe symptoms, as a result of various environmental exposures and genetic variations³. Fibroids are subdivided according to their location into subserosal, intramural and submucosal. The size, quantity and location of the fibroids influence the symptoms and available treatment options⁴. Abnormal uterine bleeding, typically excessive menstrual bleeding, is the most prevalent symptom. Pelvic pressure, bowel issues, frequent and urgent urination, retention of urine, low back pain, constipation and dyspareunia are other symptoms^{5,6}.

The prevalence of uterine fibroids in pregnancy was found to be about 16.7% in a recent study in Cameroon⁷. Lower prevalence rates, such as 0.87% in Pakistan, were found in non-African populations⁸. It is difficult to determine their precise incidence during pregnancy⁹. Nonetheless, a study indicates an incidence of 3.9%, due to the increased vascularity of the gravid uterus, which might result in excessive bleeding, unnecessary obstetric hysterectomy and increased perioperative morbidity and mortality¹⁰.

Variable growth patterns of the fibroids are influenced by hormonal and vascular changes during gestation. While fibroids can increase the risks of complications such as miscarriage, preterm birth, placenta previa, placental abruption and postpartum hemorrhage, these effects depend on their size, number and location with submucosal and multiple fibroids pose the highest risks¹¹. Poor neonatal outcomes, such as low 5-minute Apgar scores, which suggest a higher risk of newborn distress, have also been associated with the presence of fibroids. While most pregnancies reach term, risks include preterm delivery, low birth weight and increased neonatal intensive care unit admissions. However, there were no neonatal deaths, suggesting fair overall perinatal outcomes despite higher risks associated with fibroids¹².

In general, symptomatic fibroids should be detected early for optimal treatment, given the prevalence of intramural fibroids in Sudanese women. It is advised to conduct additional imaging methods like MRI to have a better understanding of the anatomical distribution of uterine fibroids¹³. Close observation and a high degree of suspicion regarding possible problems are necessary for the management of pregnancies affected by fibroids to prevent its complications¹⁴.

Cesarean Myomectomy is a surgical procedure where fibroids are being removed during the Cesarean section. It is considered complex and it is usually avoided due to the potential increase in blood loss, infection, uterine rupture and other complications. It has been a topic of considerable debate, with differing opinions on whether it should be considered a feasible and safe procedure or an absolute contraindication, growing evidence now supports its safety in carefully selected cases¹⁵. Moreover, obstetricians increasingly choose to perform myomectomy during the cesarean section in modern obstetrics due to improvements in anesthesia, sufficient blood product availability, selective devascularization techniques and a multidisciplinary approach. This saves the patient from future morbidity caused by multiple surgeries, anesthetic complications and out-of-pocket expenses¹⁶.

This study aims to evaluate the safety and the nature of intraoperative and postoperative outcomes associated with cesarean myomectomy among women in the Red Sea State, Sudan.

Methods and Materials

This was a retrospective case series study with longitudinal follow-up for short and long term outcomes post cesarean myomectomy. We report a total of 120 patients with their demographic, clinical and obstetric data as well as perinatal outcomes. The study was conducted at Port Sudan maternity hospital, Red Sea State, Sudan. Which is the largest hospital in the region to provide maternal healthcare services and it is considered a referral center for all complicated cases in the Eastern part of Sudan.

Data was collected from the records over eight years (2014–2022), included records of pregnant women with uterine fibroids who underwent cesarean myomectomy during cesarean section after providing informed consent following detailed counseling on the procedure's potential risks and benefits, with data collected on estimated blood loss, risk of intraoperative bleeding, need for blood transfusion, risk of peripartum hysterectomy, hospital stay duration and postoperative pain.

Data Management and Analysis

Data were collected using a structured Google Forms questionnaire and then transferred to Excel for initial cleaning and coding. The coded dataset was subsequently imported into IBM SPSS Statistics Version 23 for analysis. Descriptive statistics summarized demographic and clinical variables, with means and standard deviations for continuous data and frequencies with percentages for categorical data. Results were presented in tables for clarity. Direct logistic regression assessed associations between predictors (age, fibroid number/type, parity) and two outcomes: postoperative hospital stays duration and pregnancy rate. Chi-square tests evaluated relationships between pain levels and fibroid characteristics, with Cramer's V indicating effect size where applicable. Analyses used a 95% confidence level, with significance set at $p < 0.05$.

Ethical Considerations

Ethical approval was granted by the Red Sea State Ministry of Health Ethical Committee and the Local Research Committee at Port Sudan maternity hospital, Red Sea State, Sudan. Permissions from the hospital management were also obtained from the general manager and the medical director. Patients' data was secured and anonymized using serial numbers to protect confidentiality and privacy. Identifiable information was removed and all analyses were conducted on de-identified datasets, ensuring compliance with ethical standards and relevant data protection regulations. The data were exclusively used for research purposes in adherence to these guidelines.

Description of the Procedure

A low transverse or vertical uterine incision is made depending on the location of the fibroids, followed by the delivery of the baby and complete removal of the placenta and membranes. After delivery, fibroids, typically subserosal or intramural, are visually identified and addressed. A direct incision is made over the fibroid using a scalpel or electrosurgical device and techniques such as the use of a tourniquet or vasopressin are employed to

minimize blood loss. When a tourniquet is used, an on-and-off technique is applied to mitigate the risk of uterine atony after its removal. For cases involving multiple uterine fibroids, efforts are made to minimize incisions by removing multiple fibroids through a single incision. The fibroid is carefully dissected from the surrounding myometrium, with any adhesions released. Bleeding vessels are clamped, sutured or cauterized and uterotonic agents, such as oxytocin, are administered to promote uterine contraction and reduce hemorrhage. The myometrial defect is repaired in multiple layers using absorbable sutures (Vicryl size 2) to ensure uterine integrity and reduce the risk of uterine rupture in subsequent pregnancies, with the serosa closed using Vicryl size 2-0 or 3-0. The uterine incision made for delivery is sutured in layers and the abdominal wall is closed in the standard manner. A surgical drain is routinely placed for 24 hours to monitor blood loss. Postoperatively, the patient is closely monitored for complications such as postpartum hemorrhage, infection or thromboembolic events, with pain management, early mobilization and administration of uterotonic medications provided as part of routine care. In general cesarean myomectomy can be done for all types of fibroids, whether submucosal, intramural, subserosal or mixed type (Figure 1).

years and the majority were primigravida (50.8%, N = 61), while the remaining (49.2%, N = 59) had experienced one or more previous pregnancies. (Table 1).

Table 1: Patient demographic and clinical characteristics.

Mean	SD	Range	Frequency	Percentage %
Age (years)	28.02	4.268	20 - 35	
Marriage duration (years)	3.58	2.141	1 - 8	
Gravidity			61	50.8 %
Primigravida			34	28.3 %
Para 1			15	12.5 %
Para 2			7	5.8 %
Para 3			3	2.5 %

The number of fibroids per patient ranged from 1 to 4, with an average of 2.04 ± 0.85 . (Table 2) Intramural fibroids were the most common type, affecting 66.7% of the patients (N = 80), while sub-mucosal fibroids were the least common. A small subset of patients (6.7%, N = 8) had multiple fibroid types, while the majority (93.3%, N = 112) had only one type.

Intraoperative and postoperative outcomes

During the surgeries, the average intraoperative blood loss for the vast majority of patients (99.2%, N= 119) was 250 - 500 mL. Only one patient (0.8%) required a blood transfusion due to excessive intraoperative blood loss of more than 500 ml. However, none of our 120 patients required hysterectomy nor reopening following the procedure.

All the surgical procedures had a duration ranging from 30 to 60 minutes. Postoperatively, the length of hospital stay varied between 1 and 4 days, with 64.2% (N = 77) of patients staying for 1–2 days and 35.8% (N = 43) staying for 3-4 days. (Table 2).

Table 2: Fibroid characteristics.

	Mean	SD	Range	Frequency	Percentage %
Number of fibroids per patient	2.03	0.855	1 - 4		
Type of fibroid					
Submucosal				21	17.5%
Intramural				80	66.7%
Subserosal				27	22.5%

Most patients reported mild pain following the procedure (58.3%, N = 70), while 41.7% (N = 50) reported moderate pain and none reported severe pain (0%, N = 0).

More than half of patients got pregnant following the procedure (60%, N = 72).

Statistical Assessment of Surgical Outcomes and Pain

Direct logistic regression was performed to assess the impact of a set of factors on the duration of post-operative admission. The model contained a set of independent variables (age, number of fibroids, type of fibroid and number of parity). The strongest predictor for a longer duration of post-operative admission was having two types of fibroids with an odds ratio of 9.2. An increased number of fibroids was also associated with a higher likelihood of a longer post-operative admission (Odds ratio (OR) = 1.385 for 2 fibroids and OR = 1.789 for 3 or more fibroids).

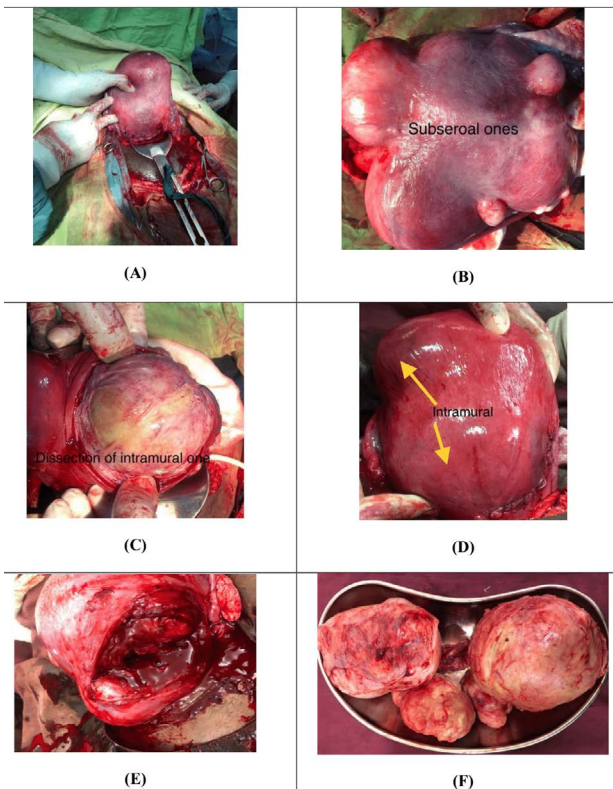


Figure 1: Pictures of Different Fibroid Types Following Cesarean Myomectomy: Subserosal type are shown as single (A) and multiple (B). Intramural type shown in (C) and (D). Mixed with all types of fibroids are presented in one patient shown in (E) and (F).

Results

Demographics

Our study included a total of 120 women who underwent cesarean myomectomy at Port Sudan Maternity Hospital during the study period (2014 - 2022). The mean age of patients was 28.02 ± 4.27 years, ranging from 20 to 35 years. All the patients were married with a mean duration of marriage of 3.58 ± 2.14

However, the overall model, containing all predictors, was statistically insignificant, $\chi^2 (9, N = 120) = 9.99, p = 0.351$, indicating that the full model was not able to reliably distinguish between patients based on their post-operative admission duration. (Table 3).

Table 3: Logistic regression predicting the duration of post-operative admission.

	B	S.E	Odds Ratio	95% CI for Odds Ratio		P-value
				Lower	Upper	
Age	-0.73	0.055	0.93	0.835	1.036	0.188
Number of fibroids						
One						0.621
Two	0.325	0.497	1.385	0.523	3.666	0.512
Three or more	0.582	0.608	1.789	0.543	5.896	0.339
Type of fibroid						
Submucosal						0.237
Intramural	0.819	0.699	2.268	0.576	8.922	0.241
Subserosal	0.611	0.790	1.843	0.392	8.667	0.439
Two types	2.220	1.104	9.204	1.058	80.064	0.044
Number of parity						
Zero						0.822
One	0.051	0.483	1.052	0.408	2.713	0.916
Two	-0.355	0.706	0.701	0.176	2.800	0.615
Three or more	0.539	0.816	1.713	0.346	8.488	0.509

Another Direct logistic regression was performed to assess the impact of the same factors on the rate of pregnancy after 1st surgery. Having only intramural or subserosal fibroids was linked to less likelihood of pregnancy after surgery (OR = 0.145 or = 0.112 respectively). However, the full model containing all predictors was statistically insignificant, $\chi^2 (9, N = 120) = 16.183, p = .063$, indicating that the model was not able to reliably predict the rate of pregnancy based on these factors. (Table 4).

Table 4: Logistic regression predicting the rate of pregnancy after 1st surgery.

	B	S.E	Odds Ratio	95% CI for Odds Ratio		P-value
				Lower	Upper	
Age	0.090	0.055	1.094	0.981	1.219	0.106
Number of fibroids						
One						0.664
Two	0.445	0.492	1.560	0.595	4.091	0.366
Three or more	0.276	0.610	1.318	0.399	4.354	0.650
Type of fibroid						
Submucosal						0.064
Intramural	-1.903	0.838	0.149	0.029	0.772	0.023
Subserosal	-2.193	0.905	0.112	0.019	0.658	0.015
Two types	-0.808	1.230	0.446	0.040	4.965	0.511
Number of parity						
Zero						0.280
One	0.957	0.508	2.603	0.961	7.050	0.060
Two	0.707	0.674	2.028	0.541	7.596	0.294
Three or more	0.591	0.838	1.805	0.350	9.324	0.481

A chi-square test of independence was performed to examine the association between post-operative pain levels (mild vs. moderate) and two independent variables: the number of fibroids and the type of fibroids. (Table 5).

Table 5: Crosstabulation for post-operative pain level and fibroid characteristics.

Mild		Post-operative pain		Total
		Moderate		
Number of fibroids	One	27 (71.1%)	11 (28.9%)	38 (100%)
	Two	28 (62.2%)	17 (37.8%)	45 (100%)
	Three or more	15 (40.5%)	22 (59.5%)	37 (100%)

Post-operative pain level and number of fibroids

There was a statistically significant association between post-operative pain level and the number of fibroids, $\chi^2 (2, N = 120) = 7.629, p = 0.022$, Cramer’s V = 0.252. Patients with three or more fibroids were significantly more likely to report moderate post-operative pain compared to those with fewer fibroids.

Post-operative pain level and type of fibroid:

Patients with subserosal fibroids were more likely to experience moderate post-operative pain, while those with submucosal fibroids tended to report mild pain. However, the chi-square test was not statistically significant, $\chi^2 (2, N = 120) = 3.958, p = 0.138$, Cramer’s V = 0.188.

Discussion

Our study examined the intraoperative and postoperative outcomes of cesarean myomectomy involved 120 women at Port Sudan Maternity Hospital, in the period from 2008 to 2022. Our findings demonstrate a generally favorable profile for cesarean myomectomy, with minimal intraoperative complications, manageable postoperative pain levels and promising fertility outcomes^{17,18}. Demographic data indicates that the majority of patients were young (mean age 28.02 years), primarily primigravida and underwent surgery with an average of two fibroids, predominantly intramural. In our study, more than half of the participants were nulliparous (50.8%), indicating a significant proportion of first-time mothers undergoing cesarean myomectomy. This finding aligns with the results reported by Ramya et al, who also observed a predominance of nulliparous women in their study population (70%)¹⁹. Similarly, Kanthi et al. highlighted the occurrence of cesarean myomectomy in nulliparous women, emphasizing the importance of careful surgical planning in this group due to their desire for future fertility²⁰. This may be attributed to hormonal fluctuations and a decreased responsiveness of leiomyomas to estrogen receptors^{21,22}.

Another explanation for higher prevalence of nulliparous women undergoing cesarean myomectomy could reflect their increased likelihood of presenting with symptomatic fibroids during their first pregnancy, as well as the tendency for physicians to address these fibroids during cesarean delivery to prevent future complications²³.

Intraoperatively, blood loss remained within acceptable limits (250-500 mL for 99.2% of patients) and none required a hysterectomy or surgical reopening, indicating a low risk profile for this procedure. Notably, only one patient (0.8%) required a blood transfusion due to intraoperative blood loss exceeding 500 mL. This finding aligns with the results reported by Ramya et al, who also observed that cesarean myomectomy could

be conducted without the need for blood transfusions in the majority of cases²⁴. The low incidence of significant bleeding in our study can be attributed to careful surgical techniques, improved anesthesia protocols and the availability of blood products and advanced hemostatic measures. Moreover, the increased vascularity of the gravid uterus, traditionally viewed as a deterrent to performing myomectomy during cesarean section, can be effectively managed with modern surgical tools and a multidisciplinary approach^{25,26}. The reduced intraoperative complication rates in this study underscore the importance of careful patient assessment and surgical precision in minimizing risks²⁷. Postoperative recovery, reflected in hospital stays and pain levels, was manageable for most patients. The majority had short hospital stays (1-2 days) and reported mild pain. Statistical analysis revealed a significant association between the number of fibroids and pain level, with those having three or more fibroids more likely to experience moderate pain. The absence of severe pain reports further emphasizes the procedure's tolerability, though pain management may need closer attention for patients with multiple fibroids^{28,29}. Fertility outcomes are of particular relevance, given the patient population's profile and reproductive goals. The study found that 60% of patients achieved pregnancy within 1-2 years post-surgery, suggesting that cesarean myomectomy can support future fertility. However, the logistic regression analysis revealed that intramural and subserosal fibroids were associated with a lower likelihood of pregnancy, highlighting the potential impact of fibroid type on fertility outcomes³⁰. Despite the valuable insights, this study had limitations, including its single-center design and the lack of a comparative group of cesarean deliveries without myomectomy. Further research across multiple centers could validate these findings and provide a broader understanding of cesarean myomectomy's impact on fertility and recovery outcomes.

Conclusion

Cesarean myomectomy is a safe and effective option for addressing fibroids in women desiring fertility preservation, challenging the traditional preference for interval myomectomy. With proper patient selection, preoperative planning and the involvement of trained and experienced surgeons, it offers favorable intraoperative and postoperative outcomes, reduces the need for additional surgeries and supports reproductive health. The findings advocate for revising clinical guidelines to integrate cesarean myomectomy into routine practice, emphasizing the importance of specialized training to ensure safety and success. This is particularly crucial in resource-limited settings, where access to advanced surgical care is restricted. Future research should focus on refining techniques and patient selection criteria to further optimize outcomes, solidifying cesarean myomectomy as a valuable advancement in obstetric surgery.

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